Douglas PARTNERS

GROUNDED EXPERTISE

Report on Hydrogeological Investigation

Proposed Wollongong Private Hospital Expansion

366 - 368 Crown Street & 15 - 23 Urunga Parade, Wollongong NSW

Prepared for AA Crown Holdings Pty Ltd

Project 73522.15

21 October 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.

	Signature		Date
Author			21 October 2025
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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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Appendix A: Drawings

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Report on Hydrogeological Investigation
Proposed Wollongong Private Hospital Expansion
366 - 368 Crown Street & 15 - 23 Urunga Parade, Wollongong NSW

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a hydrogeological investigation undertaken for the proposed Wollongong Private Hospital Expansion (WPHE) located at 366 - 368 Crown Street & 15 - 23 Urunga Parade, Wollongong NSW (hereinafter referred to as 'the site'). The site is shown on Figure 1 and Drawing 1, Appendix A.

The investigation was commissioned by email instructing to proceed dated 29 September 2025 from Mr Marcelo Ramirez of 360 Property Agency on behalf of AA Crown Holdings Pty Ltd and was undertaken in accordance with Douglas' email proposal dated 8 August 2025.

It is understood that the proposed development of the site includes the construction of a four-level basement which will extend below the water table.

The scope of this report is to provide an assessment of potential groundwater impacts, assess the viability of a drained basement and provide a dewatering management plan for construction of the basement.

Geotechnical and Contaminated Land investigations for the proposed development have been undertaken concurrently by Douglas, the results of which are presented in detail in Reports 73522.14.R.001.Rev0 and 73522.15.R.001.Rev0, respectively. Relevant results from the investigations have been referred to in this report.

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

2. Site description

The site, which comprises Lots A and B in DP 343680, Lots 9, 46 and 47 of DP 5507, Lot D in DP 402234 and Lot 1 in SP 73256, is an irregular shaped area of approximately 4,415 m^2 with a 31 m frontage to the northern side of Crown Street and a 76 m frontage to the southern side of Urunga Parade at Wollongong (refer Drawing 1 in Appendix A). It is bounded to the east by the existing Wollongong Private Hospital and to the west by low-density residential developments.

Surface levels generally fall in the north-westerly direction and south-westerly directions from the rear boundaries of the existing lots at average grades of 1 in 5 to 1 in 20, from approximately RL 44 m relative to the Australian Height Datum (AHD) in the north-eastern corner section of No. 366 Crown Street to RL 40 AHD along the eastern edge of No. 15 Urunga Parade, and RL 39 m AHD along the north western edge of 23 Urunga Parde.

Site improvements at the time of the investigation comprised low-density residential dwellings at No.'s 366 and 368 Crown Street and No. 15, 19, 21 and 23 Urunga Parade and a 2 – 3 storey residential unit block at No. 17 Urunga Parade. The residential dwellings at No. 366 and 368 Crown Street and No. 15 Urunga Parade appeared to have historically been converted into medical practices and included concrete and asphalt surfaced parking areas to the rear. The remaining properties generally included grassed and landscape gardens at the front and/or rear. Retaining walls of various construction were located on the northern boundaries of No.'s 15, 21 and 23 Urunga Parade, along the side boundaries and driveways of No. 368 Crown Street and No.'s 15 and 17 Urunga Parade. Batters were also located along the southern boundaries of No.'s 366 and 367 Crown Street and 15 Urunga Parade.

Various features observed during the inspection are shown in Photos 1 – 16 in Appendix C.

Figure 1: Site Locality

3. Proposed Development

The information provided by the client indicates that the proposed WPHE, a state significant development application (SSDA), will comprise a twelve-storey building over 5 – 6 basement levels that includes car parking and an oncology section in Basement Level 6.

Based on the Wollongong Private Hospital Master Plan prepared by Conybeare Morrison International Pty Ltd dated 18 August to 2 September 2025, the proposed building and basement

footprint is mostly located in the lots adjacent to Urunga Parade and extends into the rear part of the lots adjacent to Crown Street (ie the footprint doesn't extend into the heritage buildings located in the Crown Street lots). The proposed excavation will be set back approximately 0.5 m to 1.5 m from Urunga Parade pavement, approximately 5.8 m to 10.3 m from the western site boundary with 25 Urunga Parade, 2.8 m to 3.8 m from southern and western site boundaries with 370 Crown Street, and about 42 m from the Crown Street pavement. The proposed excavation abuts and ties into the existing basement for the current WPH site.

The plans show that the finished floor levels for Basement Levels 5 and 6 will be RL 26.9 and RL 20.9, respectively. To achieve the proposed finished floor levels, excavation depths in the range of about 12.0 m to 17.5 m for Basement Level 5 and 18.0 m to 23.5 m for Basement Level 6 (oncology) are anticipated.

The basement is proposed to include appropriate drainage to manage hydrostatic pressures on the structure.

4. Previous Investigations

Douglas and others have previously carried out geotechnical investigations for the existing Wollongong Private Hospital site. From a review of accessible files, the most relevant reports are:

- Geo-Environmental Engineering (GEE) Report ID: GI002TPG-R01F "Geotechnical Investigation Report, Proposed Wollongong Private Hospital", dated 29 March 2010;
- Arup Pty Ltd (Arup) Ref Rep/224118/GIR "Wollongong Private Hospital, Geotechnical Interpretive Report" dated 14 May 2012;
- Douglas *Supplementary Report on Geotechnical Investigation, Proposed Wollongong Private Hospital, 360 – 364 Crown Street, Wollongong* Project 73522 dated 17 July 2013;
- Douglas *Report on Geotechnical Investigation, Wollongong Private Hospital Expansion, 366 – 368 Crown Steet and 15 – 21 Urunga Parade, Wollongong*, Project 73522.07 dated 22 April 2022 (Douglas, 2022); and
- Douglas *Report on Geotechnical Investigation, Proposed Wollongong Private Hospital Expansion, 366 – 368 Crown Street & 15 – 23 Urunga Parade, Wollongong*, Project 73522.11 dated 16 April 2025 (Douglas, 2025).

The existing hospital development is located immediately adjacent the proposed extension and also includes a three-level basement over a similar sized footprint, with a finished floor levels of RL 32.0 to 33.5 m AHD.

Previous investigations indicated that ground conditions comprised fill and clay soil overlying sandstone, the degree of weathering and fracturing of the sandstone decreasing with depth. One of bores (Bore 2) encountered a highly fractured to fragmented latite igneous intrusion at about RL 29 AHD.

Only limited groundwater observations were made previously with one monitoring well installed at Bore 2. This indicated a water level of RL 39.9 AHD in 2010 prior to construction.

Although no formal groundwater flow measurements were taken during construction of this basement, observations made during various site inspections undertaken by Douglas suggested

that groundwater inflows were in the form of limited seeps through fractures that were easily managed and reduced over time.

It is understood that a drainage system was installed in the basement and this includes a sump and pump arrangement. No records are available on the pumping rates from this drainage system.

The Douglas (2022) and Douglas (2025) investigations were undertaken for previous SSDA submissions for different designs of the current proposed development. Relevant information from the previous investigations have been incorporated into this report.

5. Site Setting

The proposed hospital expansion is located immediately to the west of the existing private hospital, which was constructed between 2013 and 2015. The extent of the proposed expansion is shown in red below and currently comprises seven residential lots. The surrounding area is typically urban residential. Although there are significant impervious areas including roadways and rooftops, most of the residential lots also include grassed pervious areas, estimated to be about 30% to 40% of overall surface area.

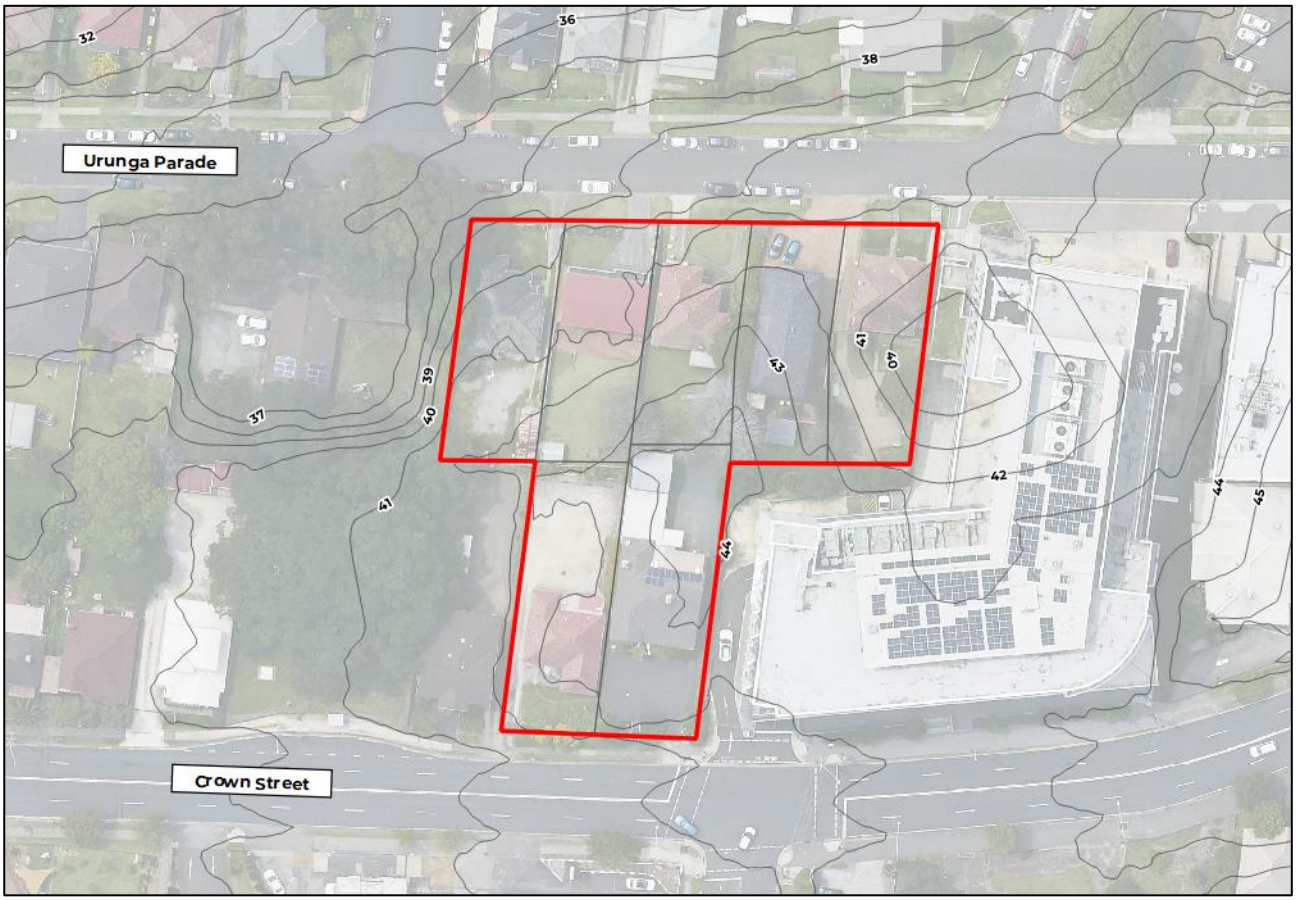

Figure 2: Surface level contours of site and surrounds

The site is located on a local topographic high with surface levels in the range RL 39 to 44 AHD. Surface level contours (1 m) are shown on Figure 2 below with the wider topography.

Reference to the NSW Seamless Geology (GSNSW, 2023) as presented in Figure 3 below indicates the site is underlain by Broughton Formation Sandstone with fingers of Quaternary Alluvium on lower ground about 500 m to the north and 250 m to the south east. Mapping suggests the alluvium are fluvially deposited quartz lithic sand, silt, gravel and clay. On more elevated ground, about 300 – 500 m to the south and west of the site the Broughton Sandstone is overlain by Pheasants Nest Formation which comprises shale, siltstone and sandstone with lenticular coal seams.

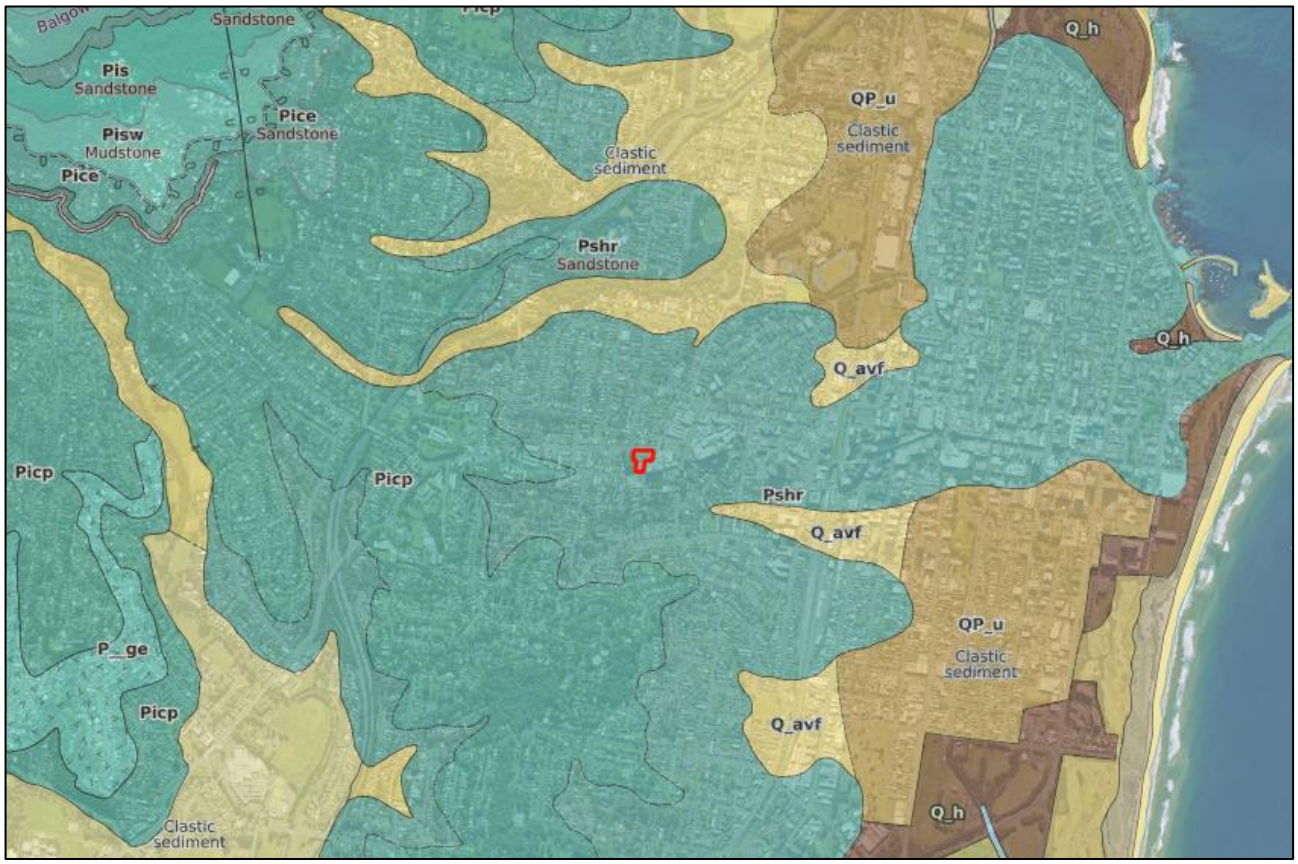

Figure 3: Geological setting (GSNSW, 2023)

Figure 4 below combines the surface geology with the LIDAR shading to provide a qualitative indication of the wider topography with the darker green shading indicating higher topography. This figure also shows the presence of creek lines with the alluvium to the north of the site (shown in pink) and a second order creek about 500 m to the north of the site.

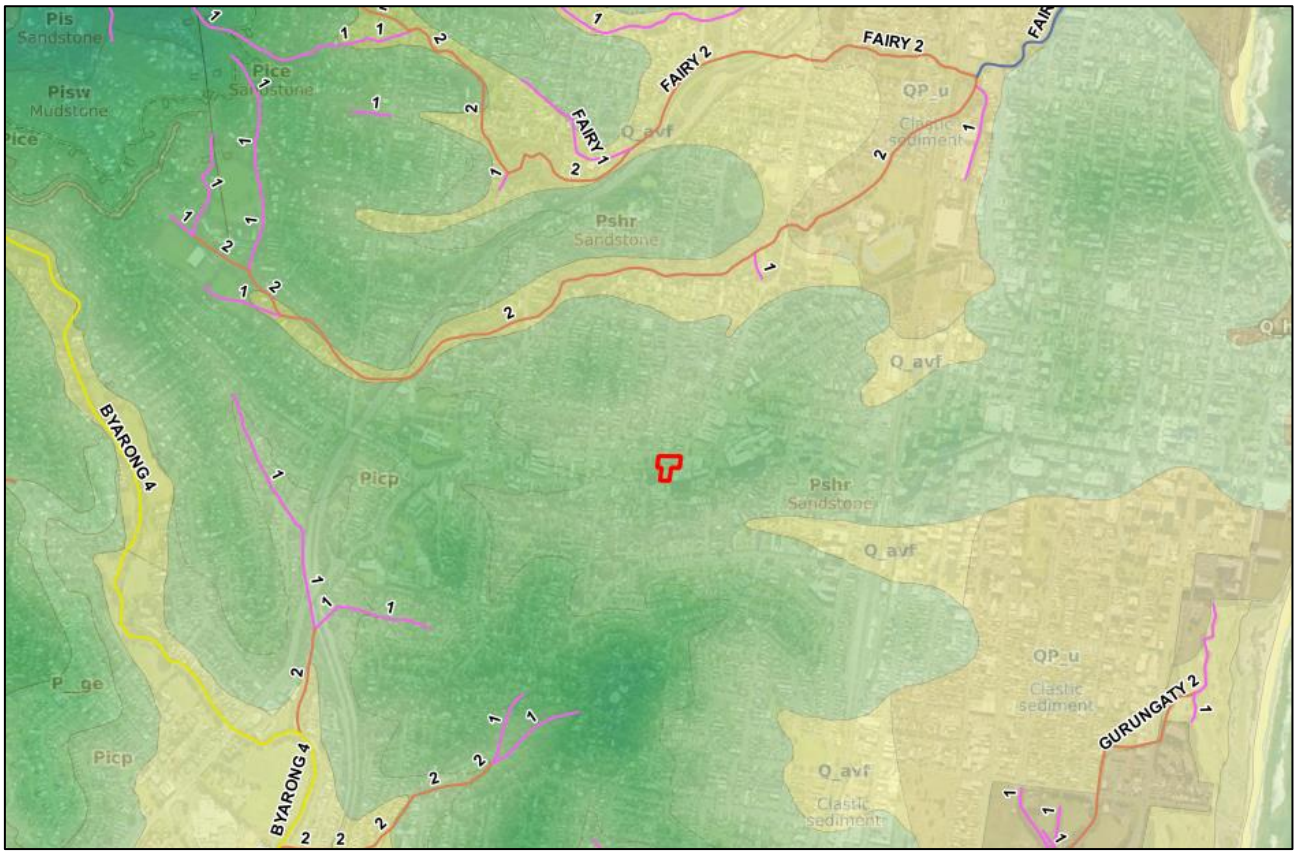

Figure 4: LIDAR and creek lines superimposed on geology

Figure 5 below plots both registered wells (blue triangles) and mapped Groundwater Dependant Ecosystems (GDEs) from the Australia GDE Atlas published by the Australian Bureau of Meteorology. The figure indicates the following:

- There are no registered wells within the Broughton sandstone. The closest wells are located within alluvial sediments at least 1 km to the north east and approximately 750 m to the south east of the site.
- Potential GDEs are mapped within the alluvial soils and riparian zone associated with the creek line located at least 1 km to the north of the site as follows:
  - Red: High potential GDEs associated with South Coast Grassy Woodland;
  - Orange: Moderate potential GDEs associated with South Coast Grassy Woodland.
- Potential GDEs are also mapped within the Pheasants Nest Formation which overlies the Broughton Sandstone at least 550 m south east of the site. These are moderate potential GDEs associated with Illawarra Gully Wet Forest and mapped on undeveloped and forested topographical highs, with elevations typically in the range RL 80 to RL 100 AHD.

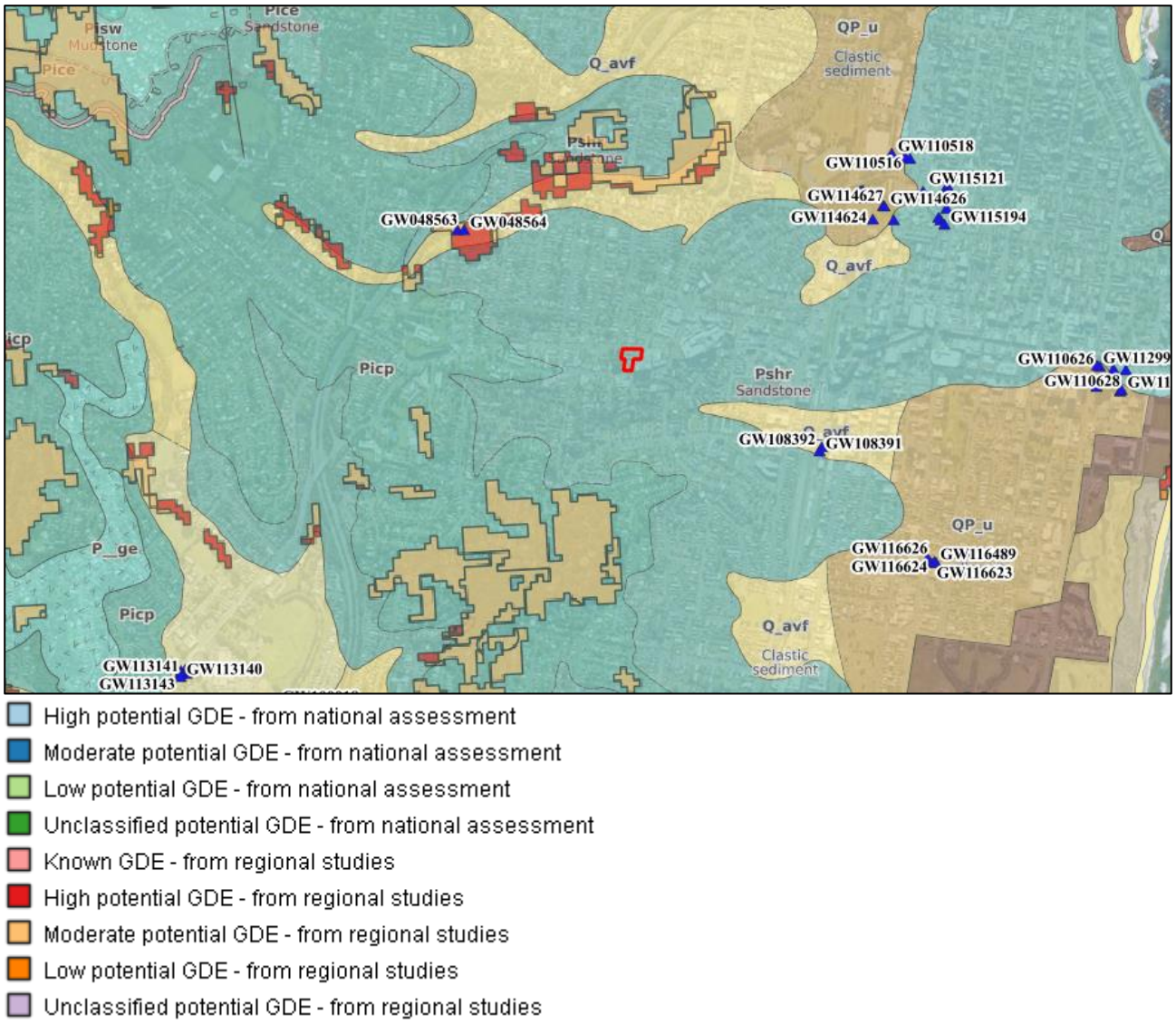

Figure 5: Mapping of Groundwater Dependent Ecosystems - Australian GDE Atlas

6. Geotechnical Investigation Results

The results of the concurrent geotechnical investigation are presented in detailed separately in report 73522.14.R.001.Rev0. The borehole logs from the current and previous investigation are provided in Appendix D.

Geological cross-sections across the proposed basement excavation are shown on Drawings 2 and 3 in Appendix A. The following is a summary of the results relevant to the hydrogeological investigation.

The results of drilling indicate the conditions at borehole locations within the proposed excavation depth comprise sand and clay fill and sandy clay to depths ranging from 2.6 m to 6.0 m, underlain by sandstone. The upper layers of sandstone encountered in the boreholes were

highly weathered with significant iron staining and fracture spacings of 0.5 m or less. With depth the degree of weathering and fracturing reduces and from the approximate basement level and below the rock is often only slightly weathered with occasional iron-stained fractures.

Of particular note is Bore 302, which recorded particularly low water levels within the fresher rock strata. A number of relatively open iron stained joints were observed at a similar level to the observed groundwater level.

7. Groundwater Monitoring and Hydraulic Testing

7.1 Groundwater Monitoring

Groundwater monitoring wells were installed in four bores on site, Bores 301 to 303 and Bore 403, in locations as shown in Drawing 1, Appendix A. Observed groundwater levels are presented in Table 1.

Table 1: Recorded groundwater elevations in monitoring wells

Date	Water Level (AHD)			
	Bore 301	Bore 302	Bore 303	Bore 401
8/3/22	39.7	32.1	41.0	-
29/3/22	37.7	32.8	38.4	-
8/4/22	-	32.8	-	-
13/4/22	39.2	32.7	40.6	-
18/4/23	36.6	32.3	37.6	-
13/2/25	35.9	32.3	36.6	35.6
19/3/25	35.5	32.2	36.3	35.3

Hydrostatic data loggers were installed in Bores 301 to 303 from 1 April 2022 and monitored groundwater levels up until 18 April 2023. After being engaged to undertake the supplementary investigations Douglas re-installed groundwater loggers in Bores 301 to 303 and Bore 401 from 21 February 2025. The hydrostatic data loggers are used to facilitate the long-term monitoring of groundwater levels and assess the season variation and response of the aquifer to rainfall. Data collected from the data loggers has been analysed and compared against the proposed Basement 6 (Oncology) finished floor level of RL 20.60, shown in Figure E1, Appendix E.

The groundwater level monitoring results indicate the water table at the time of the observations was generally located within the clay and fill above the sandstone, with an overall flow direction following the topography towards the north. An exception to this is Bore 302 where the standing water level was below the other bores and located within relatively fresh sandstone at depth. The measured water level in this instance is at a similar elevation to the level of the adjacent basement of the existing hospital developments to the east.

The monitoring suggests that groundwater levels at Bores 301 and 303 (in the soil / weathered rock) has a higher response to rainfall compared to the groundwater levels at Bore 302 where levels were recorded in the deeper sandstone.

It is noted that groundwater levels are transient and vary depending on preceding climatic conditions. In terms of readings taken in February and March 2025, analyses of the cumulative residual rainfall mass balance (RRMB) records at Bellambi indicate close to positive preceding long term rainfall conditions. The rainfall in the weeks and months immediately prior were well above monthly average conditions, and therefore may represent above average water table levels. Higher water levels were recorded in 2022 which corresponded to a sharp increase in the RRMB (Figure 6 below).

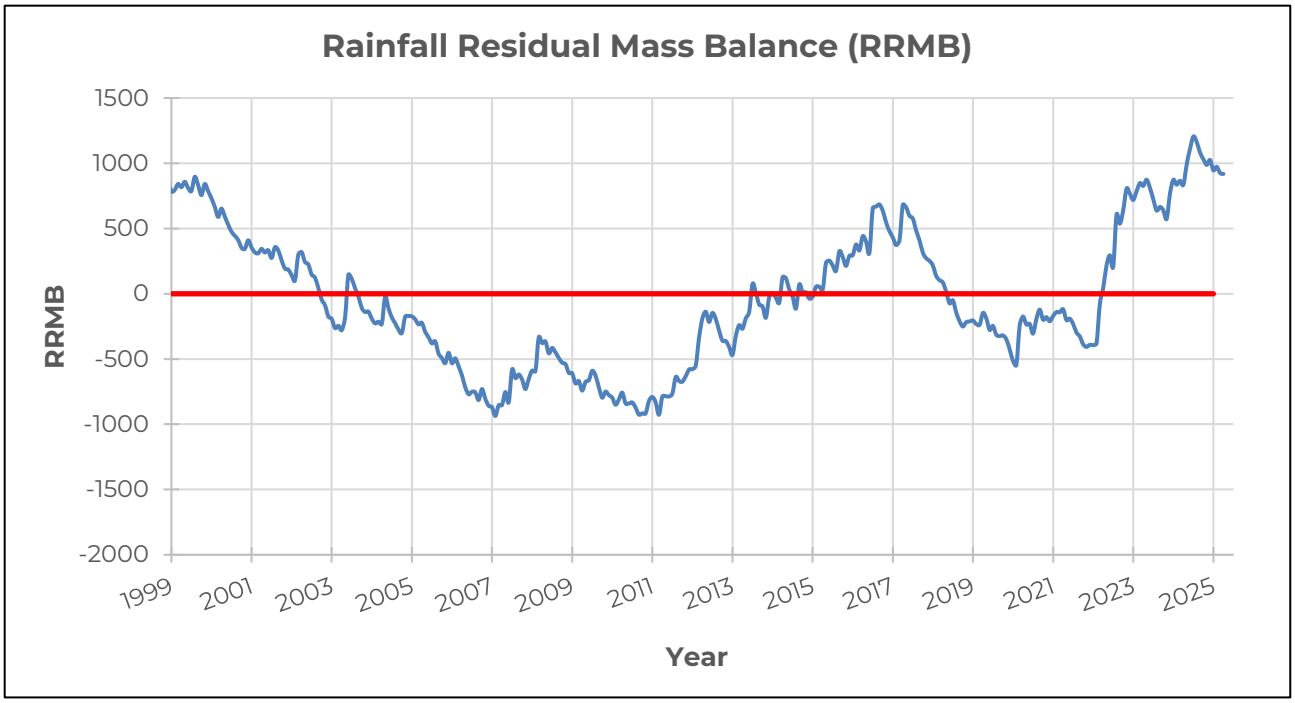

Figure 6: Residual Rainfall Mass Balance (RRMB) for Bellambi (Station ID: 68228)

7.2 Hydraulic Testing

Hydraulic testing was performed in each of the wells installed in Bores 301 – 303 and Bore 401.

Rising and falling head tests were analysed using Hvorslevs' method to estimate the saturated hydraulic conductivity. Detailed test results sheets are included in Appendix E and the results are presented in Table 2 below, which also provides details of the relevant screen depth range and relevant strata for each test.

Table 2: Estimated Hydraulic Conductivity

Bore No.	Screened Range			Estimated Hydraulic Conductivity (K)			
	Full range of screen (m)	Effective range of screen for test (m)	Relevant Strata for Test	m/s[1]	m/day[1]	m/s[2]	m/day[2]
BH301 Rising Head	0.7 – 12.7	0.7 – 12.7	Sandy clay overlying slightly fractured sandstone with minimal fracturing below 9.5 m.	3.8×10^{-7}	0.032	1.6×10^{-7}	0.01
BH302 Rising Head	2.6 – 14.6	8.9 – 14.6	Sandstone, slightly fractured with some iron stained jointing.	4×10^{-7}	0.03	4.0×10^{-8}	0.003
BH302 Falling Head		7.5 – 14.6	As above, some additional joints above 8.9 m.	$4.6 – 5.9 \times 10^{-7}$	0.04 – 0.05	3.1×10^{-7}	0.03
		5.7 – 14.6	As above, plus some additional jointing above 7.5 m.	4.7×10^{-7}	0.04	2.4×10^{-7}	0.02
		4.9 – 14.6	As above plus incorporating highly weathered layer.	7.2×10^{-7}	0.06	2.4×10^{-7}	0.02
		2.6 – 14.6	Whole range of the screen which ranges from slightly fractured highly weathered to massive fresh sandstone. The screen does not extend into the overlying soil.	4.7×10^{-7}	0.04	1.4×10^{-7}	0.01
BH303 Rising Head	1.8 – 16.8	3.1 – 16.8	Sandy clay overlying slightly fractured sandstone with minimal	1.1×10^{-7}	0.01	3.7×10^{-7}	0.03

			fracturing below 9.5 m.				
BH401 Rising Head	2.6 – 5.5	4.5 – 5.5	Extremely to highly weathered, fractured sandstone.	-	-	2.9×10^{-7}	0.03
				-	-	3.0×10^{-7}	0.03

NOTES:
(1) Estimated hydraulic conductivity values obtained from the Douglas (2022) report
(2) Estimated hydraulic conductivity values obtained from permeability data inputted into AquiferTest

Whilst the magnitude of estimated hydraulic conductivity values remained broadly consistent with the Douglas (2022) estimation method, some variability in permeability values is observed in Table 2. This is likely a result of differing methods / assumptions adopted for the Douglas (2022) and current estimation techniques (AquiferTest). To ensure consistency with previous data, both datasets will be appropriately used to inform the upper and lower bounds for subsequent modelling.

8. Conceptual Hydrogeological Model

8.1 Background Conditions

The available data has been used to develop a conceptual hydrogeological model for the site and surrounds. Groundwater flows are expected to follow the topography and Figure 6 below presents estimated groundwater flow directions (blue arrows) and groundwater divides (dashed lines). The site is shown in red.

Groundwater recharge is expected to occur due to rainfall across the area, however, will be limited in the vicinity of the site due to relatively impermeable clay soils, high percentages of impervious

surfaces and relatively steep levels. Recharge is expected to be greater in the alluvial areas located to the north of the site due to the low grades and more permeable soils.

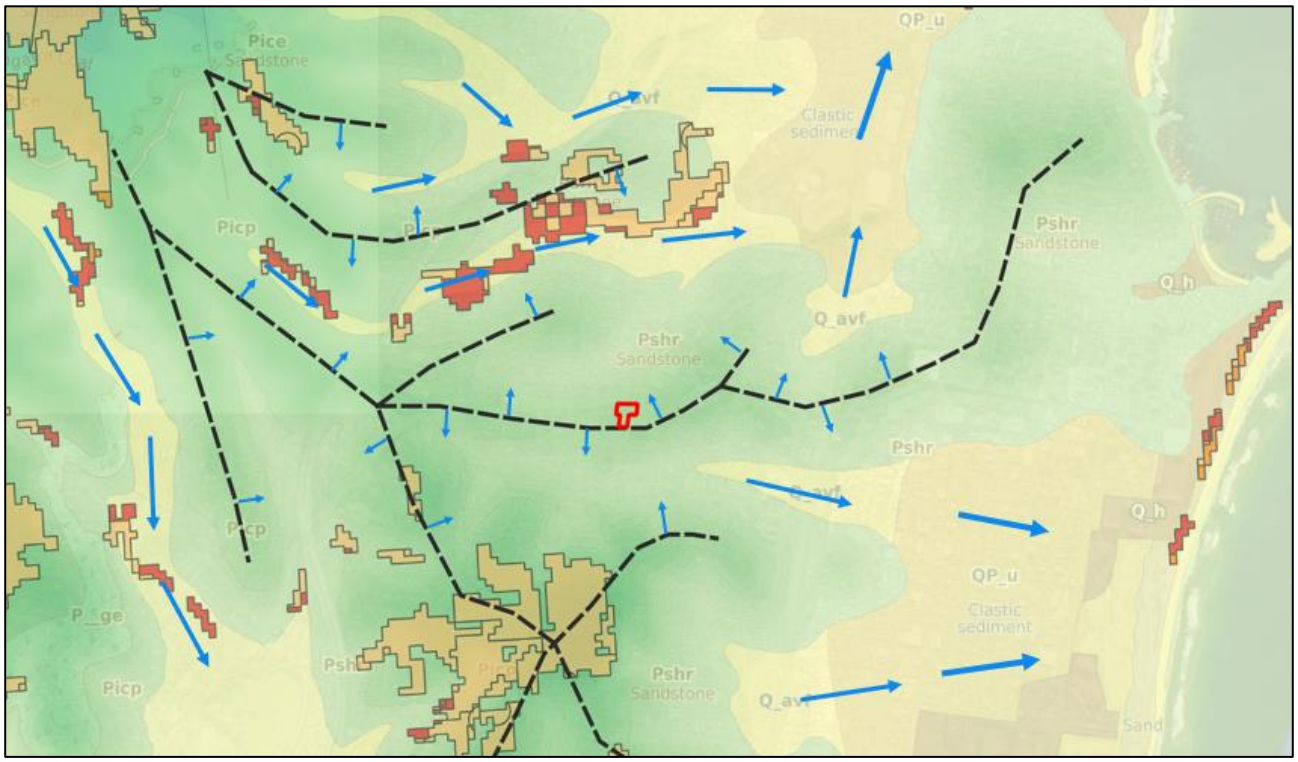

Figure 7: Conceptual Horizontal Flow Paths

The area of GDEs on the higher ground to the south and west of the site are expected to be recharge areas, however recharge is expected to be limited due to the relatively low permeability of the soils expected here.

Groundwater flows in the sandstone are expected to be limited due to the limited recharge and relatively low permeability of the sandstone. This is supported by the absence of registered wells in these areas. Flow in the sandstone is expected to primarily occur in the fractures and therefore primarily occurring in the upper weathered and fractured zone and overlying sandy soils. The deeper less weathered and fractured sandstone is expected to be substantially lower permeability with very limited flows. The upper levels of the proposed excavation is primarily within the more permeable sandstone and overlying soils but the lower levels are located in the less permeable sandstone.

The alluvial areas to the north and south of the site are expected to represent more significant aquifers due to the presence of more permeable sandy soils and higher rates of recharge both as direct rainfall and creek recharge as well as limited groundwater baseflow from the sandstone.

The site is located across an expected groundwater divide and therefore recharge to the site will be limited to the immediate vicinity. Groundwater flows would generally be expected to follow the topography, with flows to the north and south. A northerly hydraulic gradient is evident from the observed water levels in Bores 301 and 401 with Bore 303. This natural flow direction however has possibly been influenced by the presence of the existing three-level drained basement

immediately to the east of the site as indicated by the low water level observed in Bore 302 which is about 25 m west of the existing basement where groundwater levels were a similar elevation with the adjacent lower basement level. The drawdown effect from the adjacent basement seems to be quite limited in extent (ie affecting groundwater levels in Bore 302 but not Bore 301) Bore 301 is located 25 m west of Bore 302 which shows an elevated water table. Such a deep, localised drawdown may be caused by direct connect of jointing between Bore 302 and the existing basement and with the jointing not continuing to Bore 301.

8.2 **Potential Impacts from Development**

The conceptual model has been used to provide a qualitative assessment of the potential impacts from the development on surrounding surface and groundwater resources (quantity and quality), including infrastructure, hydrology, aquatic and groundwater dependent ecosystems, drainage lines, downstream assets and watercourses.

The development has potential to impact groundwater in the following ways:

- Extraction of groundwater during construction and longer term into the proposed basement drainage system;
- Reduction of groundwater recharge due to loss of pervious surfaces on site; and
- Possible introduction or mobilisation of contaminants into the groundwater system.

The proposed basement will be excavated within the Broughton Sandstone Formation and overlying associated residual soils. The review of published mapping indicated no presence of GDEs or registered wells within this formation. There are several high and moderate potential GDEs within the alluvium to the north as well as a watercourse and several registered wells. This alluvial area is within the same overall groundwater catchment as the site and therefore considered to be hydraulically linked.

As outlined in the baseline conceptual model, groundwater recharge to the site is expected to be limited to direct infiltration on the site due to limited pervious areas currently existing and the generally low permeability of surface soils. Further to this, as the proposed basement is located at the groundwater divide, drainage into the excavation is not expected to intercept any upstream flows. Impacts of drawdown from the existing basement have also been demonstrated to be highly localised and any drawdowns on adjacent sites and alluvial systems is expected to be limited.

Therefore, it is considered that the potential impact on overall aquifer flows to the alluvium to the north is negligible. Furthermore, the relative area of the site is less than 0.5% of the overall aquifer catchment and therefore any impact from the development on the site to the sensitive receptors in the alluvium to the north of the site including GDEs, watercourses, and registered wells are expected to be negligible.

The potential Illawarra Gully Wet Forest GDE to the west and south of the site are considered to be essentially hydraulically isolated from the site. They are located in an overlying formation on the other side of the groundwater divide and water levels will be largely controlled by local recharge conditions. The development is not expected to have any impact on these GDEs.

9. Groundwater Modelling

9.1 Methodology

Groundwater modelling was undertaken to assess the potential inflow rates into the proposed basement during construction and in the long-term for a drained basement design. The drawdown, or cone of depression, likely to be induced by the 'drained' basement was also assessed.

A 2-dimensional (2D) numerical groundwater model was developed. The modelling was carried using 2D finite element hydrogeological software SEEP/W (a component of Geostudio 2023, Version 2023.1.2) developed by GEOSLOPE International Ltd. Both steady-state and transient flow conditions were modelled in the analysis.

9.2 Model Geometry

Groundwater flows in the immediate vicinity of the proposed basement are expected to occur from the west with some minor flows from the southern and northern sides with minimal flows expected from the east due to the existing private hospital basement.

A vertical cross section model has been developed to represent flows and this has been based on an idealised vertical section including a combination of the most conservative aspects of geometry on each of the relevant orientations.

This includes a Basement 5 width of 70 m and Basement 6 (oncology) width of 55 m corresponding to the widest section of basements and a background water table of RL 42 AHD (ie, ~0.5 m greater than the maximum observed groundwater elevation in Bore 303 in March 2022). Fractured rock was assumed to extend to RL 31 AHD, with slightly fractured material extending well below basement floor levels. The basements (including the oncology) were assumed to extend 45 m into the page.

The geological units were simulated by assigning multiple materials with different hydraulic conductivities (permeabilities) to the model layers. Details of the layering are provided in Figure 8. All layers were assigned as SEEP/W saturated/unsaturated materials.

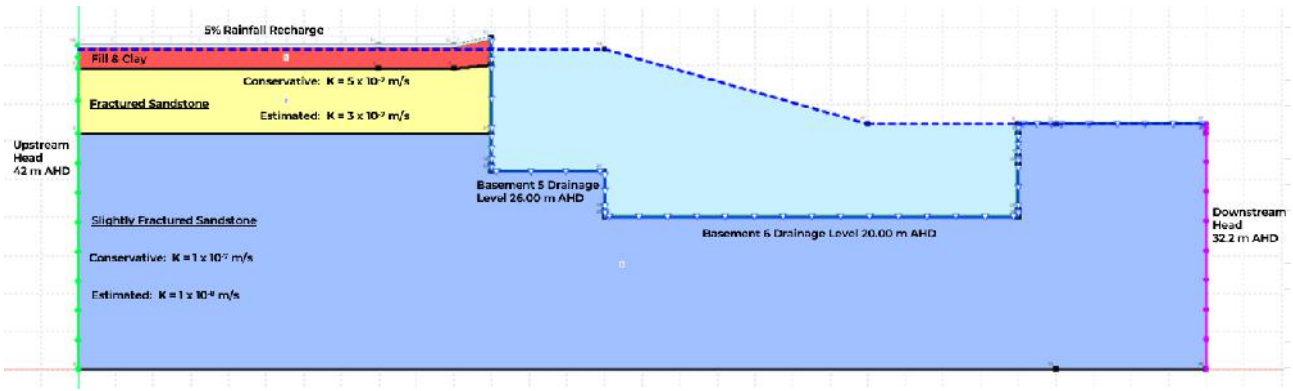

Figure 8: Groundwater Model Geometry

9.3 Boundary Conditions and Hydraulic Parameters

The upstream boundary condition was set at a fixed head of RL 42 AHD (ie, 0.5 m greater than the maximum recorded groundwater table elevation observed in Bore 303 in March 2022) during wet weather conditions (ie, RRMB positive).

This is considered to be a conservative estimate of the possible head condition such that might apply in the south easterly direction from the site, with heads to the north and west typically expected to be less than this. A surface recharge of 5% of the annual average rainfall of 1130 mm/year at Bellambi weather station was also set at the surface to represent limited recharge in the pervious areas surrounding the site.

Hydraulic parameters required for the multi-layer model include horizontal (K_h) and vertical (K_v) hydraulic conductivities, as well as the volumetric water content curves.

Hydraulic conductivity values of rock were based on the highest readings from the in-situ hydraulic testing results for each respective layer. The volumetric water content functions were set to an effective storage of about 0.1.

The permeability for each model unit adopted is summarised in Table 3. It was assumed that the materials were isotropic with $K_h = K_v$ which is a conservative assumption as it is likely that some degree of anisotropy exist.

Table 3: Model Layer Summary

Model Layer	Layer Represents	Horizontal Hydraulic Conductivity (m/sec)	
		Upper Bound (conservative)	Lower Bound (estimated)
1	Fill & Clay	5×10^{-7}	5×10^{-7}
2	Fractured Sandstone	5×10^{-7}	3×10^{-7}
3	Slightly Fractured Sandstone	1×10^{-7}	1×10^{-8}

9.4 Basement Shoring Wall and Dewatering

At the time of reporting, the design of basement shoring had not commenced. However, it is assumed that the basement shoring wall will comprise soldier piles with drainage and shotcrete in-fill panels and/or vertically cut sandstone faces, similar to the existing Wollongong Private Hospital basement. The strip drains to be installed behind the wall shotcrete will essentially collect all groundwater inflow along the basement sidewalls. The shoring wall and the associated strip drains were simulated as 'seepage faces' in SEEP/W with zero hydraulic pressure head along the full height.

The subsoil drainage and the sump were simulated by a horizontal boundary condition of 'zero hydraulic pressure head', below the proposed Basement 5 floor level (RL 26.00) and Basement 6 (Oncology) (RL 20.00), to allow for the thickness of a 900 mm slab and the drainage layer/sump underneath.

9.5 Groundwater Inflow

Groundwater inflow into the 'zero pressure' boundaries representing the strip drains and subsoil drainage layer was monitored throughout the model simulations using a mesh cross section. The inflow rates represent the estimated total rate of groundwater flowing into the excavation and the volume (per unit time) requiring extraction via the dewatering system (sump-and-pump) in order to dewater the basement excavation during construction and in the long-term.

Simulated results for the 'conservative' and 'estimated' flow conditions are summarised in Table 4. During the early stages of construction, inflow rates will be higher and will then gradually decrease as the hydraulic gradient around the excavation decreases. Inflows during early dewatering works are predicted to be between about 2.45 m^3/day and 0.99 m^3/day (or 0.89 ML/year to 0.36 ML/year). Towards the end of construction, inflows are predicted to reduce to between about 1.1 m^3/day and 0.3 m^3/day (<1 ML/year) and could further reduce in the long term.

Table 4: Predictive Model Simulated Inflow Results (ie, dewatering pumping rate)

Elapsed Time	Dewatering Flow Rate			
	Upper Bound (conservative)		Lower Bound (estimated)	
	m^3/day	ML/year	m^3/day	ML/year
1 day	2.45	0.89	0.99	0.36
3 days	2.24	0.82	0.85	0.31
5 days	2.13	0.78	0.80	0.29
7 days	2.05	0.75	0.76	0.28
14 days	1.84	0.67	0.67	0.24
30 days	1.60	0.58	0.57	0.21
60 days	1.39	0.51	0.48	0.17
90 days	1.30	0.47	0.43	0.16
180 days	1.17	0.43	0.36	0.13
270 days	1.12	0.41	0.33	0.12
1 year	1.09	**0.40**	0.31	**0.11**

The inflow rates modelled are only indicative of anticipated groundwater inflow from an east-west orientation. The proposed basement will also intersect groundwater flowing in a general north-south direction. Inflow in the north-south orientation is expected to be lower, however, likely not negligible.

Based on a review of flow vectors produced by the model, as local drawdown of the aquifer occurs over the 365-day duration, upstream groundwater flows into the basement are expected to decrease due to the lower permeability of the slightly fractured sandstone being the dominant upstream water bearing strata. Following periods of substantial rainfall, groundwater infiltration upstream may be significant enough to raise the groundwater elevation above the intersection

of overburden soils and fractured sandstone strata resulting in the short-circuiting of groundwater through the higher permeable layers, likely characterised by periodically higher inflow rates.

The inflow rates are sensitive to the nature and frequency of the defects present in the rock that are to be intersected by the basement excavation. The estimates given above are expected to be moderately conservative and the precision of the results is not a reflection of the accuracy of the analyses. Actual flows are expected to be less although unexpected conditions may lead to larger flows ie across the fault zone.

Douglas has been involved with several nearby basement excavations within similar geology and at similar and also much deeper elevations. These basements have encountered only minor seepage during excavation and have been constructed as drained basements without any reported issues in terms of groundwater management or impacts to surrounding groundwater systems or property.

9.6 Sensitivity Analysis

A sensitivity analysis was conducted to determine the variance of modelled inflow rates into the Basement for a variety of adopted hydraulic conductivities. The simulated annual inflows were compared against the adopted 'conservative' baseline conditions outlined in Table 4. Table 5 outlines the adopted hydraulic conductivities and the corresponding annual inflow rate into the basement.

Table 5: Hydraulic Conductivity Sensitivity Analysis

Run	Hydraulic Conductivities			Basement Annual Inflow Rate (ML/year)	Difference to Baseline (%)
	Fill & Clay	Fractured Sandstone	Slightly Fractured Sandstone		
Baseline (conservative)	5×10^{-7}	5×10^{-7}	1×10^{-7}	0.40	-
1	5×10^{-8}	5×10^{-7}	1×10^{-7}	0.39	-2
2	5×10^{-6}	5×10^{-7}	1×10^{-7}	0.47	+17
3	5×10^{-7}	5×10^{-8}	1×10^{-7}	0.33	-18
4	5×10^{-7}	5×10^{-6}	1×10^{-7}	1.16	+190
5	5×10^{-7}	5×10^{-7}	1×10^{-8}	0.15	-63
6	5×10^{-7}	5×10^{-7}	1×10^{-6}	2.90	+625

NOTE:
GREEN CELL: Decrease hydraulic conductivity (one order of magnitude)
RED CELL: Increase hydraulic conductivity (one order of magnitude)

Based on the sensitivity analysis of simulated inflow rates into the basement, provided in Table 5, the following observations are made:

- The change in overburden soil (fill and clay) hydraulic conductivity ± one order of magnitude from the baseline conservative condition had negligible effect on the simulated annual inflow rate into the basement;
- Decreasing the hydraulic conductivity of the fractured sandstone and slightly fractured sandstone had similar reduction of predictive inflow rates; and
- Increasing the hydraulic conductivity of the of the fractured sandstone and slightly fractured sandstone resulted in large increases (ie, 190% and 625%, respectively) in predicted groundwater inflow.

Based on the simulated response to changing hydraulic conductivities the model is considered to be sensitive to increased permeability of the fractured sandstone and even more so for the slightly fractured sandstone. It should be noted that none of the predicted groundwater inflows were modelled to be 3 ML/year or greater.

Further investigations would be required to increase the representativeness and robustness of the model. Such investigations could potentially include drilling across the fault zone to estimate the hydraulic conductivities of the fault.

9.7 Drawdown and Settlement

The lowered groundwater levels, or impact to the water table, outside the basement footprint was simulated by subtracting the long term groundwater level based on drained conditions from the original groundwater level prior to basement excavation. The drawdown at the upstream side at various distances away from the basement excavation are summarised in Table 6.

Table 6: Groundwater Table Drawdown

Location	Estimated Drawdown (m)
Immediately adjacent to Basement	22
20 m away from Basement	10
50 m away from Basement	3
100 m away from Basement	<2

These drawdowns are based on an upper bound groundwater head of RL 42 AHD, observed in Bore 303 in March 2022 during wet weather conditions (ie, RRMB extremely positive) and therefore expected to be a reasonable upper bound value.

The soil and rock surrounding the site will have been historically subject to a range of natural groundwater fluctuations and the groundwater levels used for the model would only occur during extreme rainfall conditions, if at all. The sandstone is of sufficient strength that changes in groundwater levels would have negligible settlement effects. The overlying clay soils will be more susceptible to drawdown induced settlement, however, the soils are stiff or stronger that will have been subject to significantly lower water levels than observed at the time of the investigation, due to natural fluctuations in the water table resulting from climatic variations.

At the time of the investigation the saturated thickness of clay soils on the site ranged up to 4.4 m in Bore 301. The material consisted of a highly weathered sandstone logged as stiff to very stiff

clay. It can be expected that up to about 1 m to 2 m of natural variations in water levels have occurred on the site in the past and therefore there may be potential for about 3.5 m of additional drawdown in the clay, in the immediate vicinity of the site.

Calculations indicate that settlements in this instance would be expected to be less than about 5 m to 10 mm with decreasing likelihood of settlements with distance from the excavation. Associated impacts on adjacent structures would be expected to be negligible.

10. 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.

The site is underlain by stiff to hard clay soils and rock that is typically fractured then slightly fractured. The soil and rock profile on the site is of relatively low permeability with low yield, and is considered to be a "less productive groundwater source" as outlined in the AIP.

It is expected that the measured water levels on the site are probably associated with seepage flowing through bedding planes, fractures and joints in the rock. Once the groundwater level stabilises following initial excavation, these seepage flows are likely to be relatively minor during periods of dry weather and may increase slightly following periods of wet weather.

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 groundwater sources:

- less than or equal to 10% cumulative variation in water table 40 m from any high priority groundwater dependant ecosystem, high priority culturally significant site, or less than a 2 m decline at any water supply work;
- a cumulative pressure head decline of not more than a 2 m at any water supply work;
- any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.

The minimal consideration impacts relate to impacts on groundwater dependant ecosystems and groundwater users. The proposed excavation on the site is considered to comply with the AIP minimal consideration requirements for the following reasons:

- water take for the basement does not involve pumping or extraction of large volumes of groundwater. Water seepage through the rock is to be collected in subfloor drainage and directed to the stormwater system (subject to approval by Council);
- It is expected that drawdown in groundwater levels on adjacent properties will be less than 2 m beyond 100 m from the site and any measurable drawdown would be limited to within the Broughton Sandstone Formation. Any settlements due to dewatering are expected to be negligible; and

- registered groundwater wells and groundwater dependant ecosystems are located in a separate aquifer and a substantial distance from the site and impacts on these are expected to be negligible as outlined in Section 8.2 of this report.

11. Assessment of Discharge / Disposal of Extracted Groundwater

Water requiring disposal needs to be managed and disposed of in accordance with the requirements of the *Protection of the Environment Operations Act 1997* (POEO Act).

In general, water generated from dewatering operations can be managed by:

- On-site reuse for dust suppression;
- On-site treatment and disposal to stormwater subject to regulatory approval;
- Disposal to the sewer under a Trade Waste Agreement with Sydney Water; and
- Tanker off-site for disposal at an appropriately licensed aqueous treatment plant.

The later three management options, as outlined above, are required to meet different assessment criteria and associated licences/approvals. Note that discharge to sewer via a trade waste agreement with Sydney Water is usually only considered if there are no other options. Therefore, it is anticipated that disposal would be via stormwater following treatment given the results of analysis, as discussed below.

The following assessment criteria have been selected as a screening level for disposal to stormwater and the assessment criteria are included in Table G1 in Appendix G. The assessment criteria are based on the screening levels in the following guidance:

- ANZG, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018* (ANZG, 2018);
- ANZECC, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australia and New Zealand Environment and Conservation Council (ANZECC, 2000);
- National Environment Protection Council, *National Environment Protection Measure 1999, as amended*' (NEPC, 2013); and
- Sydney Water Trade Wastewater Acceptance Standards – Industrial Customers (Sydney Water, 2023)

For stormwater disposal, assessment criteria utilised is as follows:

- 95% level of protection (LOP) criteria for most analytes; and
- 99% level of protection where analyte is bio-accumulative.

11.1 Laboratory Results - Groundwater

Groundwater sampling and laboratory testing was conducted as part of the previous and recent investigation works. Four groundwater samples were collected, one from each well on 29 March 2022 (Bores 301 to 303) and 20 February 2025 (Bore 401). Groundwater samples were delivered to Envirolab Services Pty Ltd a National Association of Testing Authorities (NATA)

accredited laboratory for analysis of a range of physical and chemical parameters. Groundwater sampling complied with the Standard Operating Procedures described in Douglas' Field Procedures Manual, and Geoscience Australia (2009).

The detailed results are presented in Table F1, Appendix F and summarised against the relevant guidelines. The following analytes exceeded the screening criteria for disposal to stormwater (ANZECC, 2000; ANZG, 2018 and Sydney Water, 2023):

- Field pH in Bores 301, 303 and 401 at recorded pH values of 6.3, 6.0 and 5.5 respectively outside the ANZECC (2000) pH range of 6.5 – 8.0. Recorded pH in these samples as well as Bore 302 (pH 6.7) were also outside of the Sydney Water Trade Wastewater criteria range of 7 – 10 pH units;
- Electrical conductivity (EC) in Bore 401 outside the ANZECC (2000) criteria range of 125 – 2,200 µS/cm;
- Nickel in Bores 301 and 401 at reported concentrations of 21 µg/L and 150 µg/L, respectively exceeding the ANZG (2018) discharge value of 11 µg/L;
- Zinc in Bores 301, 303 and 401 at reported concentrations of 120 µg/L, 77 µg/L and 24 µg/L, respectively exceeding the ANZG (2018) discharge value of 8 µg/L;
- Total oxidized nitrogen (NO_x) in Bores 301, 302 and 303 at reported concentrations of 1.9 mg/L, 3.3 mg/L and 1.7 mg/L, respectively exceeding the ANZECC (2000) criteria of 0.04 mg/L;
- Total nitrogen (TN) in Bores 301, 302, 303 and 401 at reported concentrations of 2 mg/L, 4.1 mg/L, 2.21 mg/L and 2 mg/L, respectively exceeding the ANZECC (2000) criteria of 0.35 mg/L;
- Total phosphorus (TP) in Bores 301, 303 and 401 at reported concentrations of 0.5 mg/L, 0.2 mg/L and 15 mg/L, respectively exceeding the ANZECC (2000) criteria of 0.025 mg/L;
- Reactive phosphorus in Bore 302 at reported concentration of 0.03 mg/L exceeding the ANZECC (2000) criteria of 0.02 mg/L; and
- Total suspended solids (TSS) in Bores 301 and 401 at reported concentrations of 840 mg/L and 14,000 mg/L, respectively exceeding the Sydney Water Trade Wastewater criteria of 600 mg/L.

It is noted that laboratory testing did not comprise oil and grease testing. The oil and grease test procedure is a gravimetric method and does not differentiate hydrocarbon species and other organic species making up the 'oil and grease' test. Total recoverable hydrocarbons (TRH) and polycyclic aromatic hydrocarbons (PAH) were detected in Bore 401 at trace concentrations. There were no observations of hydrocarbon odours or oil slicks made during groundwater sampling.

The concentrations of metals in groundwater are considered to likely represent local/background concentrations of groundwater, attributed to mineralogy of the soils and underlying sandstone bedrock.

11.2 Extracted Groundwater Treatment Options

Regardless of disposal, the groundwater would require treatment prior to disposal to:

- Adjust pH;
- Reduce TSS;

- Reduce the concentrations of heavy metals and nutrients.

General treatment options for water quality are shown in Table 7 and Table 8.

Table 7: Assessment Criteria for Field Sampling Water Quality Parameters

Analyte	Measurement Units	PQL	Environmental Screening Values – Fresh Water 95% Level of Protection [1]
Visual Inspection	-	-	No visual sheen, discolouring or odour
Oil and Grease	mg/L	0.0001	0.3
pH [2]	units	0.1	6.5 – 8.0
Electrical Conductivity [2]	µS/cm	1	125 – 2200 [3]
Turbidity [2]	NTU	0.1	50
Total Suspended Solids [2]	mg/L	5	50

NOTES:

1 ANZG, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2018) for the 95% level of protection for marine ecosystems (ANZG, 2018).

2 ANZECC, *Australian Water Quality Guidelines (2000)*, Tables 3.3.2-3.3.3 Default trigger values for physical and chemical stressors in south-east Australia for slightly disturbed ecosystems (ANZECC, 2000).

3 ANZECC, *Australian Water Quality Guidelines (2000)*, Tables 3.3.7 Default trigger values for physical and chemical stressors in south-east Australia low land river (ANZECC, 2000).

Table 8: Assessment Criteria for Laboratory Testing of Discharge Waters

Analyte	Measurement Units	PQL	Environmental Screening Values – Fresh Water 95% Level of Protection [1]
Ammonia	µg/L	5	900
Total Phosphorus	µg/L	5	25 (low land rivers)
Aluminium	µg/L	10	55
Arsenic	µg/L	1	24
Cadmium	µg/L	0.1	0.2
Chromium (III + IV)	µg/L	1	1
Copper	µg/L	1	1.4
Lead	µg/L	1	3.4
Manganese	µg/L	5	1900
Mercury	µg/L	0.5	0.06
Molybdenum	µg/L	1	34
Nickel	µg/L	1	11
Zinc	µg/L	1	8

Analyte	Measurement Units	PQL	Environmental Screening Values – Fresh Water 95% Level of Protection [1]
Benzene	µg/L	10	950
Ethylbenzene	µg/L	10	80
Toluene	µg/L	10	180
Xylene (m & p)	µg/L	20	75
Xylene (o)	µg/L	10	50
Anthracene	µg/L	0.1	0.01
Benzo(a)pyrene	µg/L	0.1	0.1
Naphthalene	µg/L	0.1	16
Phenanthrene	µg/L	0.1	0.6
Oil and Grease	µg/L	0.1	300

Note to Table:

1 ANZG, Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018) for the 95% level of protection for marine ecosystems (ANZG, 2018).

2 ANZECC, Australian Water Quality Guidelines (2000), Tables 3.3.2-3.3.3 Default trigger values for physical and chemical stressors in south-east Australia for slightly disturbed ecosystems (ANZECC, 2000).

Treatment options for the above analytes may include the following:

- Activated carbon and aeration stripping;
- Addition of calcined magnesia;
- Flocculants; and
- Settling using a settling tank.

Final treatment system is to be recommended by the dewatering contractor. It is recommended that the water be stored in a settling / holding tank for the appropriate treatment prior to discharge (i.e., application of a flocculant for the reduction in the TSS / metals concentrations together with pH adjustment prior to discharge). The water should be re-tested following treatment to confirm that the water meets the criteria prior to discharge/disposal., this process can be automated with specialist equipment during proposed dewatering.

12. Conclusion and Recommendations

The geotechnical investigation on the site has identified fill and residual clay soils overlying fractured sandstone, with the degree of weathering and fracturing generally reducing significantly with depth. Groundwater has been measured in wells on the site at levels in the range of RL 32 and RL41 AHD with the water table fluctuating within the fractured sandstone and overlying residual clay soils.

Review of published records indicates that there are no groundwater dependant ecosystems, registered wells or waterways within the Broughton Formation sandstone which could be affected by the proposed development. Groundwater dependent ecosystems, watercourses and registered wells which have been identified around the site are considered to be in essentially hydraulically isolated aquifer systems and impacts from the proposed development on these is expected to be negligible.

Groundwater modelling has been undertaken based on a local site model assuming a drained basement with strip drains in the walls and underfloor drainage blanket using upper bound measured parameters. It is predicted that groundwater inflow of less than 1 ML/year may be expected during excavation (less than 1 year). The groundwater inflow rate is likely to reduce with time and may be relatively minor and significantly less than 1 ML/year during dry periods. Douglas has been involved with nearby basement excavations within similar geology and depth of excavation. These basements have been three levels deep and have only encountered minor seepage during excavation. These basements have been constructed as drained basements with no reported issues in terms of groundwater management or impacts to surrounding groundwater systems or property.

Given that the predicted inflow is less than 1 ML/year the proposed excavation is exempt from requiring a Water Access Licence from Water NSW (see Fact Sheet in Appendix G) and rather, requires a Water Supply Works Approval for construction dewatering.

From a geotechnical perspective it is considered that a permanently drained basement design is feasible with only minor impact to surrounding groundwater systems or property. This will be subject to review and approval from Council and relevant authorities.

Available water quality data from the site suggests the presence of some elevated metals and nutrients which are potentially representative of background groundwater concentrations. The suitability of the groundwater for disposal to stormwater or sewer should be confirmed by the authority receiving the water and some on-site treatment may be required prior to disposal.

As recommended in the concurrently geotechnical assessment, to confirm the rock quality assumptions and the subsurface profile/s for Basement Levels 5 and 6, additional deep cored boreholes will be required at the site. Borehole depths should be targeted considering the hydraulic properties of the fault zone, the proposed footing dimensions, founding depths, the depth of influence of the footing on the subsurface profile and any local excavations such as lift pits, sumps, etc..

13. 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.

ARUP. (2012). *Wollongong Private Hospital, Geotechnical Interpretive Report*.

Douglas. (2013). *Supplementary Report on Geotechnical Investigation, Proposed Wollongong Private Hospital, 360 – 364 Crown Street, Wollongong*.

Geo-Environmental Engineering. (2010). *GI002TPG-R01F "Geotechnical Investigation Report, Proposed Wollongong Private Hospital*.

GSNSW. (2023). *NSW Seamless Geology*. Geological Survey NSW Web Map Service.

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Sydney Water. (2023). *Trade Wastewater Acceptance Standards – Industrial Customers*.

14. **Limitations**

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 366 - 368 Crown Street & 15 - 23 Urunga Parade, Wollongong NSW in line with Douglas' email proposal dated 8 August 2025 and acceptance received from Mr Marcelo Ramirez of 360 Property Agency on behalf of AA Crown Holdings Pty Ltd dated 29 September 2025. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of AA Crown Holdings 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/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

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

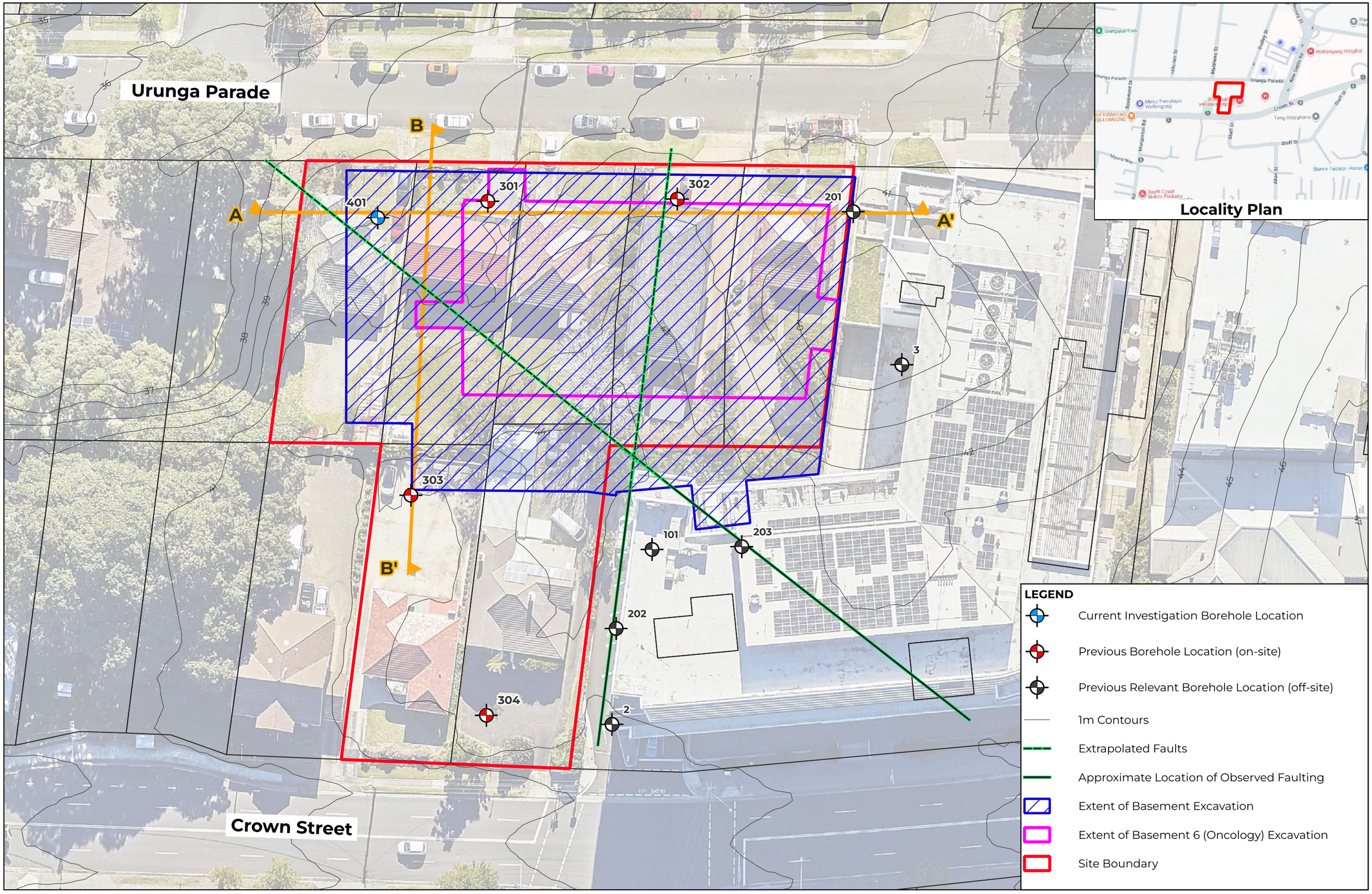
The assessment of atypical safety hazards arising from this advice is restricted to the groundwater components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' 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 shoul7d be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

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

Appendix A

Drawings



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	Borehole Location Plan	07.10.2025	ZAK

0 5 10 15 20 25 30 m

1:500 @ A3

Douglas PARTNERS
OFFICE: Wollongong
1 Luso Drive, Unanderra NSW
(02) 4271 1836

CLIENT:
AA Crown Holdings Pty Ltd

NOTE:
1: Basemap from Metromap.com (Dated 7.10.2025)

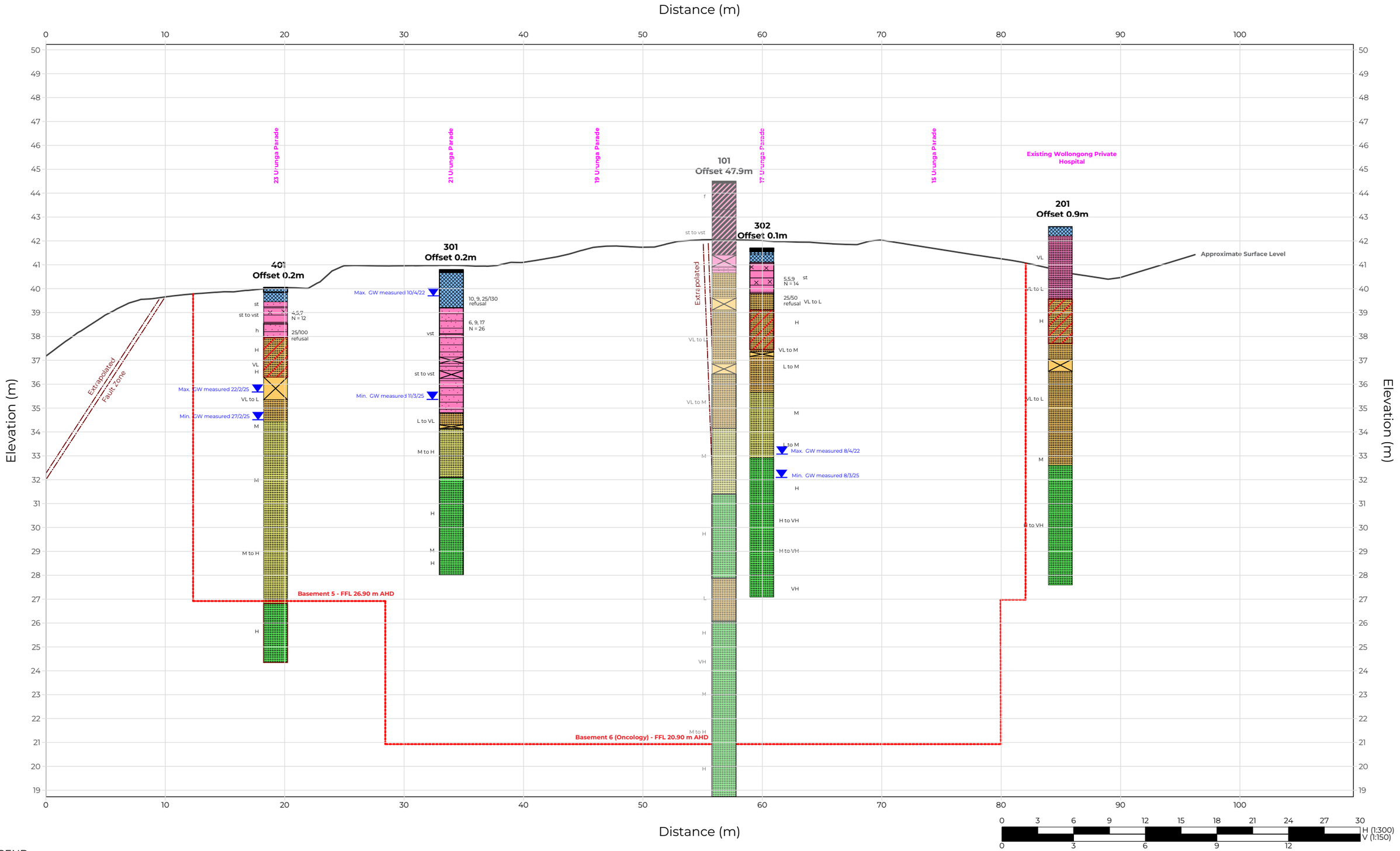
COORDINATE REFERENCE SYSTEM: GDA2020, MGA ZONE 56

PROJECT NAME:
Wollongong Private Hospital Expansion

PROJECT ADDRESS:
366-368 Crown Street & 15-23 Urunga Parade, Wollongong

DRAWING TITLE:
Borehole Location Plan

PROJECT NO:	73522.15
DRAWING NO:	1
REVISION:	0



LEGEND

- ASPHALT / CONCRETE
- CORE LOSS
- Sandy CLAY
- Silty CLAY
- CORE LOSS
- FILL
- SOIL
- SANDSTONE
- Ground Surface
- Water Level
- Class V-IV* Sandstone
- Class III-II* Sandstone
- Class I* Sandstone
- 'Cap Rock'

Rock Strength

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

Soil Consistency

vs - very soft
s - soft
f - firm
st - stiff
vst - very stiff
h - hard
vl - very loose
l - loose
md - medium dense
d - dense
vd - very dense

H (1:300)
V (1:150)

Section Length: 96.2m

Douglas PARTNERS

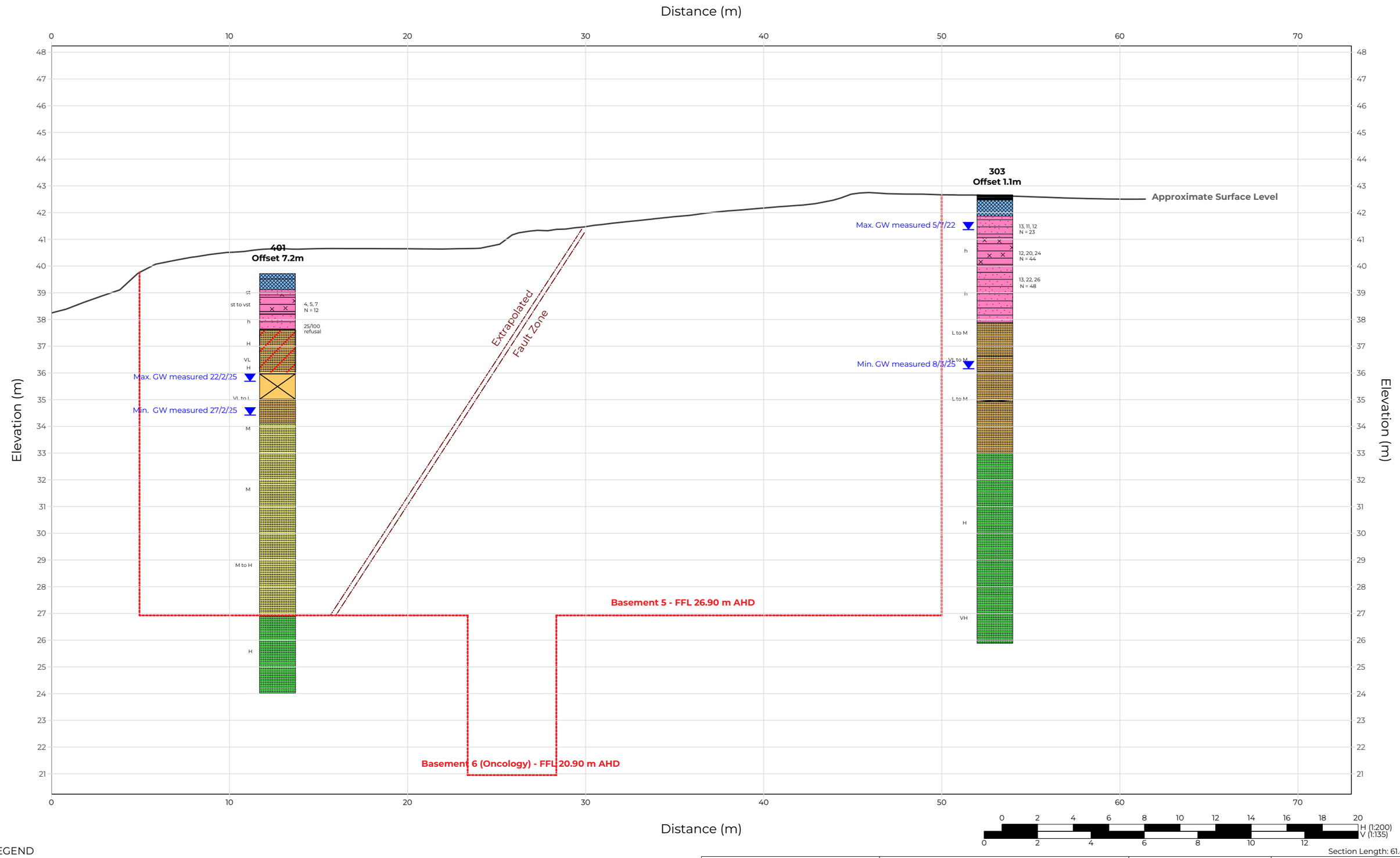
TITLE:

Cross Section A - A'

Wollongong Private Hospital Expansion

366 - 368 Crown Street & 15 - 23 Urunga Parade, Wollongong NSW

DRAWN: ZAK	DATE: 7-10-25		
CHECKED: RJH	DATE: 7-10-25		
SCALE: H 1:300 V 1:150		A3	
PROJECT No: 73522.14	FIGURE No: D.002		



Section Length: 61.4m

LEGEND

- ASPHALT / CONCRETE
- CORE LOSS
- Sandy CLAY
- Silty CLAY
- CORE LOSS
- FILL
- SOIL
- SANDSTONE
- Ground Surface
- Water Level
- Class V-IV* Sandstone
- Class III-II* Sandstone
- Class I* Sandstone
- 'Cap Rock'

Rock Strength

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

Soil Consistency

vs - very soft
s - soft
f - firm
st - stiff
vst - very stiff
h - hard

vl - very loose
l - loose
md - medium dense
d - dense
vd - very dense

Douglas PARTNERS

TITLE:
Cross Section B - B'

Wollongong Private Hospital Expansion

366 - 368 Crown Street & 15 - 23 Urunga Parade, Wollongong NSW

DRAWN: ZAK	DATE: 7-10-25		
CHECKED: RJH	DATE: 7-10-25		
SCALE: H 1:200 V 1:135		A3	
PROJECT No: 73522.14	FIGURE No: D.003		

Appendix B

About this Report

About this Report

November 2023

Introduction

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

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

Copyright

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

March 2024

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:

The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to its engineering properties	All other components	All other components

[1] As defined in AS1726-2017 6.1.4.4

[2] In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Soil Descriptions

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component [1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type		Particle size (mm)
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 – 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as "extremely weathered material" in reports and by the abbreviation code XWM on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

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Rock Strength

Rock strength is defined by the unconfined compressive strength, and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $I_{s(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Unconfined Compressive Strength (MPa)	Point Load Index[1] $I_{s(50)}$ MPa	Abbreviation Code
Very low	0.6 - 2	0.03 - 0.1	VL
Low	2 - 6	0.1 - 0.3	L
Medium	6 - 20	0.3 - 1.0	M
High	20 - 60	1 - 3	H
Very high	60 - 200	3 - 10	VH
Extremely high	>200	>10	EH

[1] Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material "within rock" but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the "Description of Strata" and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.	RS
Extremely weathered[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.	HW
Moderately weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.	DW

[1] The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections > 100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e., drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Cleavage	CL
Crushed seam	CS
Crushed zone	CZ
Drilling break	DB
Decomposed seam	DS
Drill lift	DL
Extremely Weathered seam	EW
Fault	F
Fracture	FC
Fragmented	FG
Handling break	HB
Infilled seam	IS
Joint	JT
Lamination	LAM
Shear seam	SS
Shear zone	SZ
Vein	VN
Mechanical break	MB
Parting	P
Sheared Surface	S

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Discontinuous	DIS
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Smooth	SM
Slickensided	SL
Very rough	VR

Defect Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

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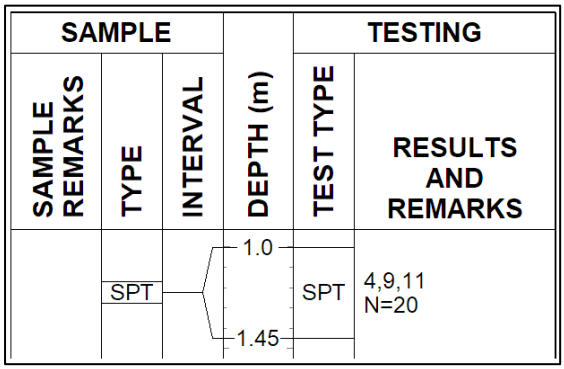
Sampling, Testing and Excavation Methodology

Terminology
Symbols
Abbreviations

March 2024

Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U[1]
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =x blows for y mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS

Field and laboratory testing (continued)

Test Type	Code
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	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
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

[1] – numeric suffixes indicate tool diameter/width in mm

Douglas PARTNERS

Appendix C

Site Photographs

Photo 1: View looking south east towards No. 17 - 21 Urunga Parade (the site).

Photo 2: View looking south west towards No. 15 and 17 Urunga Parade (the site).

Photo 3: View looking south across the rear of No. 368 Crown Street . Note: Bore 303 in the lower left of the photo.

Photo 4: View looking east across the front of No. 366 Crown Street. Note: Bore 304 in the centre of the photo.

Douglas PARTNERS	CLIENT: AA Crown Holdings Pty Ltd		**Site Photographs 1 to 4**	PROJECT No:	73522.15
	OFFICE: Wollongong	DRAWN BY: ZAK	**Wollongong Private Hospital Expansion**	PLATE No:	1
	SCALE: NTS	DATE: 9 Oct 2025	**366 - 368 Crown Street and 15 - 23 Urunga Parade, Wollongong**	REVISION:	0

Photo 5: View looking at medium strength sandstone blocks exposed in the nature strip at the front of No. 17 Urunga Parade.

Photo 6: View looking at seepage from No. 17 Urunga Parade.

Photo 7: View looking south west at the Crown Street ramp entrance to the existing Wollongong Private Hospital B1 car park. Note: minor seepage near joins in the shotcrete.

Photo 8: View looking at minor seepage in the western wall of the existing B1 car park of the Wollongong Private Hospital basement.

Douglas PARTNERS	CLIENT: AA Crown Holdings Pty Ltd		**Site Photographs 5 to 8**	PROJECT No:	73522.15
	OFFICE: Wollongong	DRAWN BY: ZAK	**Wollongong Private Hospital Expansion**	PLATE No:	2
	SCALE: NTS	DATE: 9 Oct 2025	**366 - 368 Crown Street and 15 - 23 Urunga Parade, Wollongong**	REVISION:	0

Photo 9: View looking north at the ramp connecting B1 and B2 car parks in the existing Wollongong Private Hospital basement. Note: very little seepage observed along the

Photo 10: View looking at seepage along the northern face of the B2 car park of the existing Wollongong Private Hospital basement. Note: some splash from dripping on

Photo 11: View looking at seepage along the northern face of the B2 car park of the existing Wollongong Private Hospital basement. Note: some splash from dripping on the adjacent

Photo 12: View looking north at the ramp connecting B2 and B3 car parks in the existing Wollongong Private Hospital basement. Note: minor seepage observed along the

Douglas PARTNERS	CLIENT: AA Crown Holdings Pty Ltd		**Site Photographs 9 to 12**	PROJECT No:	73522.15
	OFFICE: Wollongong	DRAWN BY: ZAK	**Wollongong Private Hospital Expansion**	PLATE No:	3
	SCALE: NTS	DATE: 9 Oct 2025	**366 - 368 Crown Street and 15 - 23 Urunga Parade, Wollongong**	REVISION:	0

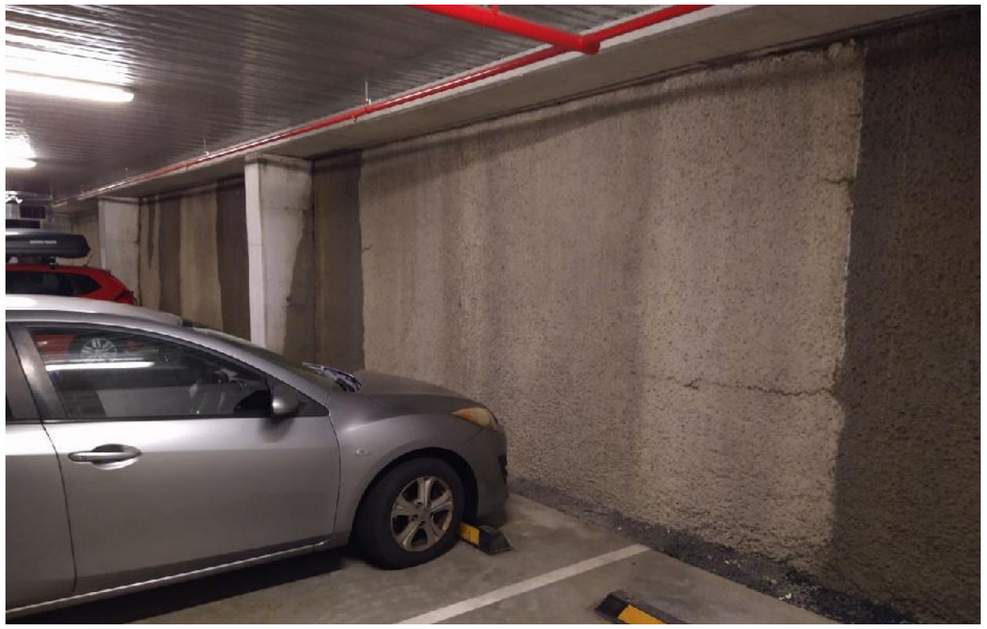


Photo 13: View looking at seepage along the northern face of the B3 car park of the existing Wollongong Private Hospital basement.

Photo 14: View looking at seepage along the northern face of the B3 car park of the existing Wollongong Private Hospital basement. Note: some splash from dripping on

Photo 15: View looking at seepage along the northern face of the B3 car park of the existing Wollongong Private Hospital basement. Note: some splash from dripping on the adjacent slab.

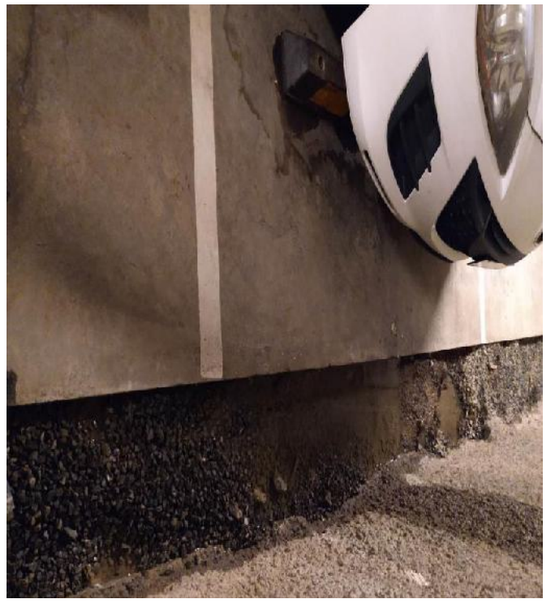


Photo 16: View looking at some water pooled in a gravel-filled drain along the northern face of the B3 car park of the existing Wollongong Private Hospital.

Douglas PARTNERS	CLIENT: AA Crown Holdings Pty Ltd		**Site Photographs 13 to 16**	PROJECT No:	73522.15
	OFFICE: Wollongong	DRAWN BY: ZAK	**Wollongong Private Hospital Expansion**	PLATE No:	4
	SCALE: NTS	DATE: 9 Oct 2025	**366 - 368 Crown Street and 15 - 23 Urunga Parade, Wollongong**	REVISION:	0

Appendix D

Current and Previous Borehole Logs


Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 73522.07
BH ID: 301
Depth: 2.70 – 7.00 m
Core Box No.: 1
73522.07 BH301 Start At 2.7m
CL
CL
CL


Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 73522.07
BH ID: 301
Depth: 7.70 – 12.79 m
Core Box No.: 2
EOH
12.79m

BOREHOLE LOG

CLIENT: Erilyan Pty Ltd
PROJECT: Wollongong Private Hospital Extension
LOCATION: 366-368 Crown Street & 15-21 Urunga Parade, Wollongong

SURFACE LEVEL: 40.8 AHD
EASTING: 305207
NORTHING: 6188645
DIP/AZIMUTH: 90°/--

BORE No: 301
PROJECT No: 73522.07
DATE: 18/2/2022
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
40	0.09	CONCRETE: grey, fine to coarse latitie aggregates, <5% voids							E			PID = 0.5
	0.12	FILL/Gravelly SAND SP: poorly graded, black, fine to coarse grained, with fine angular to subangular gravels, bedding sand, moist							E/D			PID = 1.2
39	1	FILL/Sandy CLAY CL: low plasticity, dark brown, fine to medium sand, with trace fine angular to subrounded gravel, w<PL				08-03-22			E/D			PID = 1.4
	1.6	- with fine to medium subangular to subrounded gravel below 0.7m - sandstone cobble at 1.4m							S			10,9,25/130 refusal
	2								E			PID = 4.0
								Unless otherwise stated, discontinuities comprises rough, planar, iron-stained near-horizontal bedding partings and moderately to steeply dipping joints				
	2.7	Sandy CLAY CL: low plasticity, orange brown mottled grey, fine to medium sand, with silt, w<PL, very stiff, residual							S			6,9,17 N = 26
38	3	Sandy CLAY CI: medium plasticity, red brown mottled pale grey and orange brown, with seams of highly weathered sandstone, w<PL, stiff to very stiff, extremely weathered sandstone										
37	3.93							3.66m: CORE LOSS: 270mm	C	74		
	4							4.23m: CORE LOSS: 330mm				
	4.56								C	84		
36	5											
35	6											
	6.0	SANDSTONE: fine to medium grained, brown, thinly to medium bedded, low strength, highly weathered, fractured to slightly fractured, with extremely weathered seams, Broughton Formation						6.06m: B 0-5° 20mm cly	C	77	29	PL(A) = 0.2
	6.66							6.45m: B 0-5° 100mm cly				
34	6.68							6.5m: CORE LOSS: 160mm				
	7	SANDSTONE: fine to medium grained, orange brown and grey, thickly bedded to massive, medium to high strength, moderately becoming slightly weathered, slightly fractured, trace coaly laminae, Broughton Formation										PL(A) = 0.4
33	8											PL(A) = 0.8
									C	100	93	
	8.71							8.6m: J 60-70°				
32	9	SANDSTONE: fine grained, grey, massive, high strength, slightly weathered becoming fresh, slightly fractured becoming unbroken, trace coaly laminae, Broughton Formation - medium to coarse grained 9.22-9.60m						9.05m: B 0-5° partially healed 9.14m: J 45° healed 9.17m: J 45° healed				PL(A) = 1.7
31									C	100	94	

RIG: Hanjin TD115 **DRILLER:** South Coast Drilling **LOGGED:** ZK/SL **CASING:** HWT to 2.6m

TYPE OF BORING: Concrete coring to 0.09m, SFA (TC bit) to 2m, rotary (water) to 2.7m, coring (NMLC) to 12.79m

WATER OBSERVATIONS: No free groundwater observed during auger drilling

REMARKS: w= moisture content, PL= Plastic Limit
Standpipe installed: screen 0.65-12.65m, sand 0.5-12.65m, bentonite 0.2-0.5m, gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Erilyan Pty Ltd
PROJECT: Wollongong Private Hospital Extension
LOCATION: 366-368 Crown Street & 15-21 Urunga Parade, Wollongong

SURFACE LEVEL: 40.8 AHD
EASTING: 305207
NORTHING: 6188645
DIP/AZIMUTH: 90°/--

BORE No: 301
PROJECT No: 73522.07
DATE: 18/2/2022
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
30	11	SANDSTONE: fine grained, grey, massive, high strength, slightly weathered becoming fresh, slightly fractured becoming unbroken, trace coaly laminae, Broughton Formation *(continued)*						10.87m: J 30-40° 11.1m: J 80-90° irr calcite infill 2-4mm, healed	C	100	94	PL(A) = 1.7
29	12	- medium to coarse grained 11.70-11.80m										PL(A) = 1.1
28	12.79	Bore discontinued at 12.79m Limit of investigation										PL(A) = 1.7
27	13											
26	14											
25	15											
24	16											
23	17											
22	18											
21	19											

RIG: Hanjin TD115 **DRILLER:** South Coast Drilling **LOGGED:** ZK/SL **CASING:** HWT to 2.6m

TYPE OF BORING: Concrete coring to 0.09m, SFA (TC bit) to 2m, rotary (water) to 2.7m, coring (NMLC) to 12.79m

WATER OBSERVATIONS: No free groundwater observed during auger drilling

REMARKS: w= moisture content, PL= Plastic Limit
Standpipe installed: screen 0.65-12.65m, sand 0.5-12.65m, bentonite 0.2-0.5m, gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater


Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 73522.07
BH ID: 302
Depth: 2.70 – 7.00 m
Core Box No.: 1
BH02 73522.07 Start at 2.6m
Core Loss 0.19


Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 73522.07
BH ID: 302
Depth: 7.00 – 12.00 m
Core Box No.: 2


Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 73522.07
BH ID: 302
Depth: 12.00 – 14.61 m
Core Box No.: 3
EOH at 14.61 m

BOREHOLE LOG

CLIENT: Erilyan Pty Ltd
PROJECT: Wollongong Private Hospital Extension
LOCATION: 366-368 Crown Street & 15-21 Urunga Parade, Wollongong

SURFACE LEVEL: 41.7 AHD
EASTING: 305233
NORTHING: 6188645
DIP/AZIMUTH: 90°/--

BORE No: 302
PROJECT No: 73522.07
DATE: 17/2/2022
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
41	0.15	CONCRETE: grey, fine to coarse latitie aggregate, <5% voids							E			PID = 1.6
	0.25	FILL/SAND SP: poorly graded, brown, fine to medium grained, with coarse subrounded gravel, trace brick and plastic, moist							E/D			PID = 2.3
	0.6	FILL/Sandy CLAY CL: low plasticity, brown mottled yellow brown, fine to coarse sand, with fine to medium subangular to subrounded gravel, w<PL							S			5,5,9 N = 14 PID = 2.8
40	1	Silty CLAY CI: medium plasticity, orange brown mottled red brown, with fine to medium sand, trace fine subangular to subrounded gravel, w<PL, stiff, residual						Unless otherwise stated, discontinuities comprises rough, planar, iron-stained near-horizontal bedding partings and moderately to steeply dipping joints	E			
	1.9	- becoming mottled red brown and pale grey below 1m							S			25/50 refusal
	2	- becoming red grey below 1.8m										
39	2.6	SANDSTONE: fine to medium grained, red brown and grey, very low strength to low strength, highly weathered, Broughton Formation						3.15m: B 0-5° cly vnr	C	100	95	PL(A) = 1.4
	3	SANDSTONE: fine to medium grained, grey orange brown and red brown, medium to thickly bedded, high strength, highly to slightly weathered, slightly fractured, Broughton Formation						3.66m: B 5-10° 10mm cly 4.07m: J 70-80°				PL(A) = 2.1
38	4							4.25m: J 50-60° cly				
	4.25							4.35m: CORE LOSS: 190mm		46	0	
	4.54	SANDSTONE: fine to medium grained, grey orange brown and white, thinly to medium bedded, low to medium strength, highly to moderately weathered, slightly fractured, with extremely weathered seams, Broughton Formation						4.88m: B 0-5° 20mm cly 5.08m: B 0-5° 30mm cly 5.31m: B 0-5° 40mm cly 5.61m: J 80-90°		100	56	PL(A) = 0.3
37	5							5.86m: B 5-10° 20mm cly 6m: B 0-5° 20mm cly				PL(A) = 0.6
36	6											
	6.03	SANDSTONE: fine to medium grained, orange brown and pale grey, medium to thickly bedded, medium strength, highly to slightly weathered, slightly fractured, Broughton Formation							C			
35	7							6.82m: J 80-90° 6.9m: J 60-70°		100	94	PL(A) = 0.4
34	8							8.07m: J 60-70° 5mm cly 8.13m: J 40-50° 8.58m: J 60-70°				PL(A) = 0.3
33	8.8	SANDSTONE: fine to medium grained, pale grey, massive, high becoming very high strength, fresh-stained becoming fresh, slightly fractured becoming massive, Broughton Formation							C	100	95	PL(A) = 2.5
32	9	- coarse grain band from 9.49m - 9.60m				08-03-22						PL(A) = 2.4

RIG: Hanjin TD115 **DRILLER:** South Coast Drilling **LOGGED:** ZK/SL **CASING:** HWT to 2.6m

TYPE OF BORING: Concrete Core to 0.15m, SFA (TC bit) to 2m, rotary (water) to 2.6m, coring (NMLC) to 14.55m

WATER OBSERVATIONS: No free groundwater observed during auger drilling

REMARKS: w= moisture content, PL= Plastic Limit
Standpipe installed: screen 2.55-14.55m, sand 1.10-14.55m, bentonite 0.2-1.1m, gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Erilyan Pty Ltd
PROJECT: Wollongong Private Hospital Extension
LOCATION: 366-368 Crown Street & 15-21 Urunga Parade, Wollongong

SURFACE LEVEL: 41.7 AHD
EASTING: 305233
NORTHING: 6188645
DIP/AZIMUTH: 90°/--

BORE No: 302
PROJECT No: 73522.07
DATE: 17/2/2022
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
31	11	SANDSTONE: fine to medium grained, pale grey, massive, high becoming very high strength, fresh-stained becoming fresh, slightly fractured becoming massive, Broughton Formation *(continued)*						11.05m: J 40-50°	C	100	95	PL(A) = 1.8
30								11.35m: J 40-50° irr 11.43m: B 0-5° 10mm cly				
29	12								C	100	99	PL(A) = 3
	13											PL(A) = 3
28	14	- cross bedding below 14.17m							C	100	100	PL(A) = 3.1
27	14.61	Bore discontinued at 14.61m Limit of investigation										PL(A) = 3.1
	15											
26	16											
25	17											
24	18											
23	19											
22												

RIG: Hanjin TD115 **DRILLER:** South Coast Drilling **LOGGED:** ZK/SL **CASING:** HWT to 2.6m

TYPE OF BORING: Concrete Core to 0.15m, SFA (TC bit) to 2m, rotary (water) to 2.6m, coring (NMLC) to 14.55m

WATER OBSERVATIONS: No free groundwater observed during auger drilling

REMARKS: w= moisture content, PL= Plastic Limit
Standpipe installed: screen 2.55-14.55m, sand 1.10-14.55m, bentonite 0.2-1.1m, gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater


Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 73522.07
BH ID: 303
Depth: 4.80 – 16.78 m
Core Box No.: 1
73522.07 BH303 START CORE @ 4.8m
CL
0.02
EOH at 16.78m.

BOREHOLE LOG

CLIENT: Erilyan Pty Ltd
PROJECT: Wollongong Private Hospital Extension
LOCATION: 366-368 Crown Street & 15-21 Urunga Parade, Wollongong

SURFACE LEVEL: 43.0 AHD
EASTING: 305196
NORTHING: 6188604
DIP/AZIMUTH: 90°/--

BORE No: 303
PROJECT No: 73522.07
DATE: 10/2/2022
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
43	0.1	CONCRETE: grey, fine to coarse latitie aggregate, <5% voids										
	0.12								E/D			PID = 0.2
	0.2	ASPHALTIC CONCRETE : dark grey to black, fine to coarse igneous aggregate, bituminous binder							E/D			PID = 0.4
	0.8	CONCRETE: grey, fine to coarse latitie aggregate, <5% voids										
42	1	FILL/Silty CLAY CL: low plasticity, dark brown, with fine to coarse sand and fine to coarse subangular to subrounded gravel, w<PL							E/D			PID = 0.7
	1.6	- becoming brown 0.4m							S			13,11,12 N = 23
41	2	Sandy CLAY CL: low plasticity, orange brown mottled pale grey and red brown, fine to coarse sand, with silt, w<PL, very stiff, residual				08-03-22			S			12,20,24 N = 44
	2.6	Silty CLAY CI: medium plasticity, pale red brown mottled pale grey and brown, with fine to medium sand, w<PL, hard, extremely weathered sandstone										
40	3	Sandy CLAY CL: low plasticity, orange brown mottled pale grey, fine to medium sand, w<PL, hard, extremely weathered sandstone							S			13,22,26 N = 48
39	4							Unless otherwise stated, discontinuities comprises rough, planar, iron-stained near-horizontal bedding partings and moderately to steeply dipping joints				
	4.8	SANDSTONE: fine to medium grained, orange brown, medium to thickly bedded, low to medium and medium strength, highly to moderately weathered, slightly fractured, Broughton Formation										PL(A) = 0.3
38	5							5.15m: J 25-30°	C			
								5.52m: B 0-5° 15mm cly				PL(A) = 0.6
37	6											
	6.03	SANDSTONE: fine to medium grained, orange brown, medium bedded, interbedded extremely low to medium strength, extremely to moderately weathered, fractured, Broughton Formation						6.03m: B 0-5° 140mm cly 6.24m: B 0-5° 130mm cly				
	6.63							6.59m: B 0-10° 30mm cly	C			PL(A) = 0.3
36	7	SANDSTONE: fine to medium grained, orange brown and pale grey, medium to thickly bedded, low to medium strength, moderatly becoming slightly weathered, slightly fractured, with extremely low strength, extremely weathered seams, Broughton Formation						7.1m: J 45° fe stn				
								7.35m: B 0-5° 30mm EW 7.46m: J 20°				
	7.75							7.52m: B 0-10° 30mm EW 7.67m: CORE LOSS: 80mm				PL(A) = 0.4
35	8							8.26m: J 10-15°				
									C			PL(A) = 0.8
34	9							9.38m: B 0-5° 60mm cly 9.48m: B 0-5° 10mm EW				
	9.66											PL(A) = 1.4

RIG: Hanjin TD115 **DRILLER:** South Coast Drilling **LOGGED:** ZK/AM **CASING:** HWT to 4.6m

TYPE OF BORING: Concrete Core to 0.10m, SFA (TC bit) to 2.6m, rotary (water) to 4.8m, coring (NMLC) to 16.78m

WATER OBSERVATIONS: No free groundwater observed during auger drilling

REMARKS: w= moisture content, PL= Plastic Limit
Standpipe installed: screen 1.75-16.75m, sand 1.00-16.75, bentonite 0.3-1.0m, gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Erilyan Pty Ltd
PROJECT: Wollongong Private Hospital Extension
LOCATION: 366-368 Crown Street & 15-21 Urunga Parade, Wollongong

SURFACE LEVEL: 43.0 AHD
EASTING: 305196
NORTHING: 6188604
DIP/AZIMUTH: 90°/--

BORE No: 303
PROJECT No: 73522.07
DATE: 10/2/2022
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
33		SANDSTONE: fine to medium grained, pale grey, massive, high becoming very high strength, slightly weathered becoming fresh stained, slightly fractured becoming unbroken, Broughton Formation *(continued)*							C			
32	11							11.3m: J 10-40°				
31	12								C			PL(A) = 1.3
30	13											
29	14											PL(A) = 2
28	15								C			PL(A) = 4.1
27	16							15.71m: J 70° 1-4mm calcite infill, healed 15.79m: 2J 10° & 20°				
	16.78											PL(A) = 3.4
26	17	Bore discontinued at 16.78m Limit of investigation										
25	18											
24	19											

RIG: Hanjin TD115 **DRILLER:** South Coast Drilling **LOGGED:** ZK/AM **CASING:** HWT to 4.6m

TYPE OF BORING: Concrete Core to 0.10m, SFA (TC bit) to 2.6m, rotary (water) to 4.8m, coring (NMLC) to 16.78m

WATER OBSERVATIONS: No free groundwater observed during auger drilling

REMARKS: w= moisture content, PL= Plastic Limit
Standpipe installed: screen 1.75-16.75m, sand 1.00-16.75, bentonite 0.3-1.0m, gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater


Douglas Partners
Geotechnics / Environment / Groundwater
Project No: 73522.07
BH ID: 304
Depth: 2.60 – 11.7 m
Core Box No.: 1
BH 304 73522.07 Start Core 2.6 m
EOH At 11.76m

BOREHOLE LOG

CLIENT: Erilyan Pty Ltd
PROJECT: Wollongong Private Hospital Extension
LOCATION: 366-368 Crown Street & 15-21 Urunga Parade, Wollongong

SURFACE LEVEL: 43.2 AHD
EASTING: 305206
NORTHING: 6188573
DIP/AZIMUTH: 90°/--

BORE No: 304
PROJECT No: 73522.07
DATE: 11/2/2022
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
43	0.04	ASPHALTIC CONCRETE: dark grey to black, fine to coarse igneous aggregate, bituminous binder, wearing course							E			PID = 1.2
	0.08	FILL/gravelly SAND SP: poorly sorted, fine to medium angular to subangular gravel, fine to coarse sand, damp							E/D			PID = 0.7
42	0.8	FILL/Sandy CLAY CL: low plasticity, dark brown, fine to medium sand, with silt, w<PL						Unless otherwise stated, discontinuities comprises rough, planar, iron-stained near-horizontal bedding partings and moderately to steeply dipping joints	E/D			PID = 0.7
	1	Silty CLAY CI: medium plasticity, orange brown mottled red brown, with trace fine sand, w<PL, stiff, residual							S			4,5,8 N = 13
41	2								S			26 refusal
	2.6	Sandy CLAY CL: low plasticity, orange brown, fine to medium sand, with very low to medium strength semas, w<PL, hard, extremely weathered sandstone						2.64m: B 0-5° 70mm cly 2.75m: B 0-5° 100mm cly 2.8m: CORE LOSS: 150mm	C	77	0	PL(A) = 0.3
	2.8											
	2.95	SANDSTONE: fine to medium grained, orange-brown,thinly bedded, low strength, highly weathered, fractured, with clay seams, Broughton Formation						3.05m: B 0-5° 10mm cly 3.12m: J 85° EW 3.2m: B 0-5° 20mm cly 3.25m: B 0-5° 20mm cly 3.32m: J 70°	C	87	20	PL(A) = 1
40	3											
	3.63	SANDSTONE: fine to medium grained, orange brown and pale grey, medium to thickly bedded, interbedded very low to medium strength, highly to moderately weathered, fractured to slightly fractured, with clay and extremely weathered seams, Broughton Formation						3.4m: CORE LOSS: 230mm 3.72m: J 75° 3.85m: J 70° 2mm cly 3.97m: B 0-5° 10mm cly 4.13m: J 75° 4.25m: J 60° 1mm cly 4.4m: J 60° 4.86m: B 0-5° 5mm cly 4.98m: B 0-5° 40mm cly 5m: CORE LOSS: 100mm 5.4m: J 80° 5.44m: B 0-5° 5mm cly 5.58m: B 0-5° 8mm cly 5.7m: J 80° 5.77m: B 0-5° 5mm EW 5.92m: B 0-5° 8mm EW 6m: J 70° 6.09m: B 0-5° 5mm cly 6.16m: B 0-5° 40mm EW 6.2m: J 85° healed	C	91	37	
39	4											
	5											
	5.1								C	100	30	PL(A) = 0.3
38	6											
	6.79	SANDSTONE: fine to medium grained, pale grey and orange brown, thickly bedded, medium to high strength, slightly weathered to fresh stained, slightly fractured, Broughton Formation							C	100	97	PL(A) = 0.5
37	7											PL(A) = 1.1
	8											
36	9								C	100	93	PL(A) = 0.6
35												
34												

RIG: Hanjin TD115 **DRILLER:** South Coast Drilling **LOGGED:** ZK/AM **CASING:** HWT to 2.6m

TYPE OF BORING: SFA (TC bit) to 2.0m, rotary (water) to 2.6m, coring (NMLC) to 11.76m

WATER OBSERVATIONS: No free groundwater observed during auger drilling

REMARKS: w= moisture content, PL= Plastic Limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Erilyan Pty Ltd
PROJECT: Wollongong Private Hospital Extension
LOCATION: 366-368 Crown Street & 15-21 Urunga Parade, Wollongong

SURFACE LEVEL: 43.2 AHD
EASTING: 305206
NORTHING: 6188573
DIP/AZIMUTH: 90°/--

BORE No: 304
PROJECT No: 73522.07
DATE: 11/2/2022
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
33	10.3	SANDSTONE: fine to medium grained, pale grey and orange brown, thickly bedded, high strength, fresh stained, slightly fractured, Broughton Formation							C	100	93	PL(A) = 2.1
32	11											
	11.76	Bore discontinued at 11.76m Limit of investigation						11.61m: J 70° 11.64m: J 45°				PL(A) = 1.8
31	12											
30	13											
29	14											
28	15											
27	16											
26	17											
25	18											
24	19											

RIG: Hanjin TD115 **DRILLER:** South Coast Drilling **LOGGED:** ZK/AM **CASING:** HWT to 2.6m

TYPE OF BORING: SFA (TC bit) to 2.0m, rotary (water) to 2.6m, coring (NMLC) to 11.76m

WATER OBSERVATIONS: No free groundwater observed during auger drilling

REMARKS: w= moisture content, PL= Plastic Limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: AA Crown Holdings Pty Ltd
PROJECT: Proposed Wollongong Private Hospital Expansion
LOCATION: 366 - 368 Crown Street & 15 - 23 Urunga Parade,, WOLLI
SURFACE LEVEL: 40.1 AHD
COORDINATE: E:305192.3, N:6188644.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°
LOCATION ID: 401
PROJECT No: 73522.11
DATE: 13/02/25
SHEET: 1 of 2

CONDITIONS ENCOUNTERED

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS
	40	0.20	TOPSOIL / Sandy SILT (ML), trace rootlets: dark brown; low plasticity; fine to medium sand.		TOP / FILL		w<PL							
		0.60			FILL		w<PL							
		0.80	FILL / Sandy SILT (ML), with clay, with gravel: dark brown; low plasticity; fine to medium sand; fine to medium, sub-angular gravel.		RS	St	w<PL							
	39	1			RS	St to VSt	w<PL							
		1.50	Sandy CLAY (CI): grey brown; medium plasticity; fine to medium sand.		XWM	H	w<PL							
	38	2												
		2.10	Silty CLAY (CI), trace sand: orange brown mottled red; medium plasticity; fine sand.						2.10					2.30m: , unless stated otherwise, defects are joints 0-10°, PL,RO
			Sandy CLAY (CI), with gravel: orange brown mottled red and white; medium plasticity; fine to medium sand; fine to medium, angular to sub-angular gravel; extremely weathered sandstone.					SW		H				2.80m: JT, 60°, CU, HE 2.93m: JT, 10°, PR, CN, RF 3.06m: JT, 60°, CU, HE 3.15m: B , INF Clay 130mm
								XW	3.15	VL				
								SW	3.29	H				
		3.75							3.75					
	37	3												
			SANDSTONE: pale brown, brown, fine to coarse grained, granular											
▼ 19/02/25		4.70						HW		L				4.70m: B, Clay 120 mm 4.85m: B, Clay 160 mm 5.08m: B , Clay 200mm 5.32m: JT, 0-10°, Clay 20mm 5.40m: B, Clay 200mm 5.60m: JT, 0°, PR, Fe 5.65m: JT, 0°, PR, INF Clay 35mm 5.75m: JT, 10°, PR, TI 5.78m: JT, 20°, CU, INF Clay 20mm 5.80m: JT, Clay 20 mm 5.90m: FC 6.27m: JT, 10°, ST 6.62m: JT, 15°, PR 6.65m: JT, 90°, PR, SN Fe 6.80m: JT x2, 70-90°, PR, SN Fe 7.00m: JT, 90°, PR 7.50m: , 0°, IR, INF 10mm 7.51m: JT, 10°, PR, INF Clay 20mm 7.64m: JT x2, IR 7.70m: JT, 30°, CU, SN Fe 7.85m: JT, 90°, PR, SN Fe 8.00m: JT, 80-90°, PR, TI 8.65m: JT, 10°, PR, SN Fe, RF 9.15m: JT, 0°, PR, Clay 2mm
	35	5	SANDSTONE: pale yellow, pale brown, mottled orange brown 4.70m-5.60m: with 10-50mm bands of HW sandstone											
		5.60						HW	5.60	M				
	34	6	SANDSTONE: pale brown, brown, fine to medium grained, granular						6.00					
	33	7						MW		M				
	32	8												
	31	9												
		9.31	SANDSTONE: grey, fine to medium grained, granular					MW SW	9.31					9.77m: JT, 15°, PR, CN, RF

SAMPLE

SAMPLE REMARKS	TYPE	INTERVAL
	ES	0.10
	ES	0.50 – 0.60
	D/ES	1.00 – 1.10
	SPT/SPT	1.10 – 1.45
	SPT/SPT	2.00 – 2.10

TESTING

DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
0.10	PID	<1ppm
0.50 – 0.60	PID	<1ppm
1.00 – 1.10	PID	<1ppm
1.10 – 1.45	SPT	4,5,7 N=12
2.00 – 2.10	SPT	25/100 (HB)
2.10	PLT	PL(A)=1.6MPa
3	PLT	PL(A)=2.5MPa
3	PLT	PL(A)=2.3MPa
6	PLT	PL(A)=0.42MPa
7	PLT	PL(A)=0.49MPa
8	PLT	PL(A)=0.37MPa
9	PLT	PL(A)=0.95MPa
9	PLT	PL(A)=0.80MPa
9	PLT	PL(A)=0.61MPa

BACKFILL: Concrete; Backfill; Bentonite; Sand; Bentonite
WELL PIPE: 50mm; 50mm

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: Hanjin 8D
OPERATOR: SCD (Craig Martin)
LOGGED: ZAK/AR
METHOD: Auger/SPT to 2.0m. NMLC coring to 15.70m
CASING: HW to 2.1m
REMARKS: BD1 = 0-0.1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Combined Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: AA Crown Holdings Pty Ltd
PROJECT: Proposed Wollongong Private Hospital Expansion
LOCATION: 366 - 368 Crown Street & 15 - 23 Urunga Parade,, WOLLI
SURFACE LEVEL: 40.1 AHD
COORDINATE: E:305192.3, N:6188644.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°
LOCATION ID: 401
PROJECT No: 73522.11
DATE: 13/02/25
SHEET: 2 of 2

CONDITIONS ENCOUNTERED																				SAMPLE					TESTING			
				SOIL				ROCK																				
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	30	10	[CONT] SANDSTONE: grey, fine to medium grained, granular					MW SW	10.13	M				10.10m: JT, 80°, CU, HE				10				
	29	11							10.43					10.35m: JT, 0-10°, PR, SN Fe, RF 10.57m: JT, 80°, PR, TI 10.66m: JT, 10°, ST, CN, RF 10.76m: JT, 30°, CU, RF 10.80m: JT x2, 0°, PR, RF				11	PLT	PL(A)=1.7MPa PL(A)=0.53MPa		
	28	12								M to H								12	PLT	PL(A)=0.66MPa		
	27	13						FR						12.85m: JT, 80°, CU, CN 13.25m: JT, 30°, CU, CN				13				
	26	14							13.30	H								14	PLT PLT	PL(A)=1.5MPa PL(A)=1.1MPa		
	25	15												14.90m: JT, 10°, PR, TI 15.00m: JT, 90°, PR, Clay				15	PLT	PL(A)=2.0MPa		
		16	Borehole discontinued at 15.70m depth. Limit of investigation.																			
		17																				
		18																				
		19																				

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: Hanjin 8D
METHOD: Auger/SPT to 2.0m. NMLC coring to 15.70m
REMARKS: BD1 = 0-0.1m
OPERATOR: SCD (Craig Martin)
LOGGED: ZAK/AR
CASING: HW to 2.1m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: AA Crown Holdings Pty Ltd
PROJECT: Proposed Wollongong Private Hospital Expansion
LOCATION: 366 - 368 Crown Street & 15 - 23 Urunga Parade,, WOLLI

SURFACE LEVEL: 40.1 AHD
COORDINATE: E:305192.3, N:6188644.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 401
PROJECT No: 73522.11
DATE: 13/02/25
SHEET: 1 of 1

2.10-15.70 m depth

Borehole Log Report

Geo Environmental Engineering
275A Stoney Creek Road
Kingsgrove NSW 2208
T 02 9592 0218

geo-environmental ENGINEERING

Hole ID. **BH2**
Hole Depth: **20.55 m**
Sheet: **1 of 4**

Project Name: **Geotechnical Investigation** Project Number: **G10002TPG**
Location / Site: **360-364 Crown Street, Wollongong NSW** Client: **TPG**

Drilling Company: **Macquaire Drilling** Date Started: **4/02/2010** Ground Level: **RL44.0m** approx
Drill Method: **Solid Flight Auger / Diamond Drilling** Date Completed: **4/02/2010** Easting: ----------
Equipment: **Hydropower Scout V** Northing: ----------

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	Moisture	Observations / Comments	Casing & Core Lifts
							Surface: Asphalt			
Solid Flight Auger		0.5	43.5		CL	Residual Soil	**FILL** - Asphalt / Roadbase. **Sandy CLAY** - red / brown, grey mottled, low to medium plasticity, medium to coarse grained sand (EW Sandstone).	M		
		1.0	43.0			Bedrock	**SANDSTONE** - red / brown, grey mottled, medium to coarse grained, very low to low strength.			
		1.5	42.5							
		2.0	42.0							
		2.5	41.5				some bands of low to medium strength Sandstone chips present from 2.5m.			
		3.0	41.0							
		3.5	40.5							
		4.0	40.0							
		4.5	39.5				*BH2 continued as cored hole from 4.5m*			
		5.0	39.0							
		5.5	38.5							
		6.0	38.0							

Moisture	
D	Dry
Dp	Damp
SM	Slightly Moist
M	Moist
VM	Very Moist
W	Wet
Sd	Saturated

Additional Comments

Logged By: **Stephen McCormack** Date: **4/02/2010**
Checked By: **Stephen McCormack** Date: **1/03/2010**

GEE BH LOG G10002TPG WOLLONGONG.GPJ GEE LOG 2.GDT 01/03/10 11:15:28 AM

Borehole Log Report

Geo Environmental Engineering
275A Stoney Creek Road
Kingsgrove NSW 2208
T 02 9592 0218

Hole ID. **BH2**
Hole Depth: **20.55 m**
Sheet: **2 of 4**

Project Name: **Geotechnical Investigation** Project Number: **G10002TPG**
Location / Site: **360-364 Crown Street, Wollongong NSW** Client: **TPG**

Drilling Company: **Macquaire Drilling** Date Started: **4/02/2010** Ground Level: **RL44.0m** approx
Drill Method: **Solid Flight Auger / Diamond Drilling** Date Completed: **4/02/2010** Easting: ----------
Equipment: **Hydropower Scout V** Northing: ----------

Method	Water Level	Depth (m)	RL (m)	Graphic Log	Material Type	Material Description	Weathering	Estimated Strength (MPa)	$Is_{(50)}$ MPa	RQD %	Defect Spacing (mm)	Rock Mass Defects: Defect Description (type, inclination, thickness, shape, roughness, coating) Specific / General	Depth (m)	Core Photo	Casing & Core Lifts
		4.5	39.5			*Continued from non-cored borehole from 4.5m*							4.5		
						CORE LOSS.									
Diamond Drilling		5.0	39.0		Bedrock	**SANDSTONE** - orange / brown, dark grey to black carbonaceous lenses, fine to coarse grained, up to gravel size, laminated, with intermittent and irregular Siltstone lenses / inclusions, occasional clay seams.	DW		D=0.25 A=0.51	84		JT,HZ,IR,CN,RF JT,10°,IRF,FE,RF FZ JT,30°,IR,FE,RF JT,45°,IR,FE,RF JT,10°,IR,FE,RF	5.0		
		5.5	38.5									JT,20°,IR,FE,RF JT,20°,IR,FE,RF JT,HZ,40°,FE,RF JT,20°,PLN,FE,RF JT,45°,PLN,FE,RF JT,HZ,IR,FE,RF SM,CLAY,HZ,5mm JT,10°,IR,FE SM,CLAY,10mm JT,HZ,FE,PLN ST,45°,CLAY,SO.PLN	5.5		5.6
		6.0	38.0										6.0		
		6.5	37.5						D=1.72	100		JT,45°,FE,PLN	6.5		
		7.0	37.0						D=4.58 A=4.1			SM,70°,CLAY JT,HZ,IR,FE,RF JT,HZ,IR,FE,RF SM, CLAY, HZ SM,70°,CLAY JT,70°,PLN,FE,CLAY	7.0		
		7.5	36.5									SM,80°,FE/CLAY,IR	7.5		7.45
		8.0	36.0						D=0.11 A=0.41	100		JT,80°,IR,FE,Closed JT,HZ,IR,CN JT,45°,IR,CN JT,45°,IR,CN JT,HZ,IR,CLAY JT,HZ,IR	8.0		
		8.5	35.5						D=0.18 A=0.39			JT,VT,IR,FE,Closed	8.5		8.65
		9.0	35.0			**SANDSTONE** - orange / brown, with some red lenses / bands throughout, fine to medium grained.				100		JT,45°,PLN,FE JT,10°,CN,IR,RF JT,10°,CN,IR,RF JT,10°,CN,IR,RF JT,HZ,IR,CN JT,10,PLN,FE SM,HZ,CLAY,20mm SM,HZ,CLAY,20mm FZ SM,HZ,CLAY,5mm JT,10°,CLAY,IR SM,HC,CLAY,5mm JT,HZ,IR,CL	9.0		
		9.5	34.5			SILTSTONE band 10mm thick at 9.31m. becoming red / orange / grey from 9.5m.							9.5		
		10.0	34.0						D=0.13 A=0.31				10.0		

Additional Comments

Logged By: **Stephen McCormack** Date: **4/02/2010**
Checked By: **Stephen McCormack** Date: **1/03/2010**

Borehole Log Report

Geo Environmental Engineering
275A Stoney Creek Road
Kingsgrove NSW 2208
T 02 9592 0218

Hole ID. **BH2**
Hole Depth: **20.55 m**
Sheet: **3 of 4**

Project Name: **Geotechnical Investigation** Project Number: **G10002TPG**
Location / Site: **360-364 Crown Street, Wollongong NSW** Client: **TPG**

Drilling Company: **Macquaire Drilling** Date Started: **4/02/2010** Ground Level: **RL44.0m** approx
Drill Method: **Solid Flight Auger / Diamond Drilling** Date Completed: **4/02/2010** Easting: ----------
Equipment: **Hydropower Scout V** Northing: ----------

Method	Water Level	Depth (m)	RL (m)	Graphic Log	Material Type	Material Description	Weathering	Estimated Strength (MPa)	$Is_{(50)}$ MPa	Rock Mass Defects: RQD %	Defect Spacing (mm)	Defect Description (type, inclination, thickness, shape, roughness, coating)	Depth (m)	Core Photo	Casing & Core Lifts
Diamond Drilling		10.5	33.5		Bedrock	**SANDSTONE** - orange / brown, with some red lenses / bands throughout, fine to medium grained.	DW		D=1.38 A=1.39	100		JT,HZ,IR,CN,RF; JT,10°,IR,CN; JT,VT,FE,IR,Closed; JT,10°,IR,FE	10.5		
		11.0	33.0									JT,10°,IR,FE; JT,30°,IR,FE; JT,45°,IR,FE; JT,30°,IR,FE; JT,45°,FE,PLN; JT,45°,CLAY,PLN; JT,45°,FE,PLN; JT,45°,FE,PLN	11.0		
		11.5	32.5									SM,45°,CLAY	11.5		11.65
							DW		D=0.34	100		JT,HZ,PLN,CLAY; FZ; SM,HZ,CLAY,5mm			
		12.0	32.0				SW		A=0.11			JT,HZ,IR,CN	12.0		
							SW								
		12.5	31.5									JT,45°,PLN,FR; JT,20°,PLN,FR; JT,45°,PLN,FE,Closed	12.5		
									D=0.26	100		JT,HZ,IR,FE			
		13.0	31.0				SW		A=0.53			SM,HZ,CLAY,10mm	13.0		
							SW					FZ; JT,HZ,IR,CN			
		13.5	30.5									JT,HZ,IR,CN; JT,10°,PLN,FE; JT,10°,PLN,CN; FZ,IR,FE	13.5		13.7
						predominantly grey with red streaks from 13.7m.			D=4.89 A=4.1						
		14.0	30.0									JT,75°,PLN,white coating,Calcite?	14.0		
										38		JT,50°,PLN,white coating,Calcite?			
		14.5	29.5			**SANDSTONE** - orange / brown, red / brown and grey, highly fractured, some calcite deposits.	SW					JT,60°,PLN,white coating,Calcite? FZ, some FE,white infilling / coating	14.5		14.5
		15.0	29.0			***CORE LOSS.***				0			15.0		15.27
		15.5	28.5			**VESICULAR LATITE** - dark grey to black, with some orange / brown and red staining, highly fractured, cobble size rock recovery, (Volcanic intrusion).	SW			0		FZ	15.5		15.6
						CORE LOSS.	SW			0		FZ			
		16.0	28.0			**VESICULAR LATITE** - dark grey to black, with some orange / brown and red staining, highly fractured, cobble							16.0		16

Additional Comments

Logged By: **Stephen McCormack** Date: **4/02/2010**
Checked By: **Stephen McCormack** Date: **1/03/2010**

Borehole Log Report

Geo Environmental Engineering
275A Stoney Creek Road
Kingsgrove NSW 2208
T 02 9592 0218

Hole ID. **BH2**
Hole Depth: **20.55 m**
Sheet: **4 of 4**

Project Name: **Geotechnical Investigation** Project Number: **G10002TPG**
Location / Site: **360-364 Crown Street, Wollongong NSW** Client: **TPG**

Drilling Company: **Macquaire Drilling** Date Started: **4/02/2010** Ground Level: **RL44.0m** approx
Drill Method: **Solid Flight Auger / Diamond Drilling** Date Completed: **4/02/2010** Easting: ----------
Equipment: **Hydropower Scout V** Northing: ----------

Method	Depth (m)	RL (m)	Material Description	Weathering	Estimated Strength (MPa)	$Is_{(50)}$ MPa	RQD %	Defect Spacing (mm)	Defect Description (Specific / General)	Depth (m)	Core Photo	Casing & Core Lifts
Tricone	16.5	27.5	size rock recovery, (Volcanic intrusion). ***CORE LOSS.*** *Rock drilling using Tri-Cone bit, no recovery*						FZ (?)	16.5		
Diamond Drilling	17.0	27.0	**SANDSTONE / IRONSTONE** - red / brown, with some grey inclusions, fine to medium grained, some calcite deposits present.	SW		D=0.1 A=0.35	100		JT,70°,PLN,CLAY/FE	17.0		
	17.5	26.5				D=0.18			VN,VT,FE,IR,Closed	17.5		17.6
	18.0	26.0	**SANDSTONE** - grey, with minor dark grey / black lenses, fine to medium grained, massive.	SW					JT,45°,IR,CN JT/SM,30°,IR,CLAY	18.0		
	18.5	25.5				D=0.13 A=0.31			SM,CLAY,70°,TI,white coating	18.5		
	19.0	25.0				D=0.68	100		JT,60°,IR,CN JT,45°,IR,CN	19.0		
	19.5	24.5								19.5		
	20.0	24.0		FR		D=2.35 A=3.3				20.0		
	20.5	23.5								20.5		20.55
	21.0	23.0	**Hole Terminated at 20.55 m**							21.0		
	21.5	22.5								21.5		
	22.0	22.0								22.0		

Graphic Log / Material Type: Bedrock

Additional Comments

Logged By: **Stephen McCormack** Date: **4/02/2010**
Checked By: **Stephen McCormack** Date: **1/03/2010**

Borehole BH2: Start of Core (4.5m) to 9.0m

Borehole BH2: 9.0m to 14.0m

Borehole BH2: 14.0m to 20.55m (End)

Borehole Log Report

Geo Environmental Engineering
275A Stoney Creek Road
Kingsgrove NSW 2208
T 02 9592 0218

geo-environmental ENGINEERING

Hole ID. **BH3**
Hole Depth: **18.00 m**
Sheet: **1 of 4**

Project Name: **Geotechnical Investigation** Project Number: **G10002TPG**
Location / Site: **360-364 Crown Street, Wollongong NSW** Client: **TPG**

Drilling Company: **Macquaire Drilling** Date Started: **4/02/2010** Ground Level: **RL45.3m** approx
Drill Method: **Solid Flight Auger / Diamond Drilling** Date Completed: **5/02/2010** Easting: ----------
Equipment: **Hydropower Scout V** Northing: ----------

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	Observations / Comments	Casing & Core Lifts
							Surface: Asphalt		
Solid Flight Auger - TC Bit		0.0	45.3			Fill	**FILL** - Asphalt / Roadbase.		
			45.0				**FILL** - Sandy Gravel / Gravelly Sand, red / brown, medium to coarse grained.		
		0.5	44.5				**FILL** - Clayey Silt (topsoil), dark brown, low plasticity.		
		1.0	44.3		CL	R.Soil	**Silty CLAY** - red / brown, orange / brown and grey mottled, stiff, medium plasticity, with some fine to coarse sandstone gravel.		
			44.0			Bedrock	**SANDSTONE, extremely to highly weathered** - orange / brown, medium to coarse grained.		
		1.5	43.5						
		2.0	43.0				harder from 2.5m.		
		2.5	42.5						
		3.0	42.0						
		3.5	41.5				*BH3 continued as cored hole from 3.5m*		
		4.0	41.0						
		4.5	40.5						
		5.0	40.0						
		5.5	39.5						
		6.0							

Moisture	
D	Dry
Dp	Damp
SM	Slightly Moist
M	Moist
VM	Very Moist
W	Wet
Sd	Saturated

Additional Comments

Logged By: **Stephen McCormack** Date: **4/02/2010**
Checked By: **Stephen McCormack** Date: **24/02/2010**

GEE BH LOG G10002TPG WOLLONGONG.GPJ GEE LOG 2.GDT 24/02/10 2:31:24 PM

Borehole Log Report

Geo Environmental Engineering
275A Stoney Creek Road
Kingsgrove NSW 2208
T 02 9592 0218

Hole ID. **BH3**
Hole Depth: **18.00 m**
Sheet: **2 of 4**

Project Name: **Geotechnical Investigation** Project Number: **G10002TPG**
Location / Site: **360-364 Crown Street, Wollongong NSW** Client: **TPG**

Drilling Company: **Macquaire Drilling** Date Started: **4/02/2010** Ground Level: **RL45.3m** approx
Drill Method: **Solid Flight Auger / Diamond Drilling** Date Completed: **5/02/2010** Easting: ----------
Equipment: **Hydropower Scout V** Northing: ----------

Method: Diamond Drilling
Water Level
Depth (m) / RL (m)
Graphic Log
Material Type: Bedrock
Material Description
Weathering
Estimated Strength (MPa): EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH
$Is_{(50)}$ MPa: D=diametral A=axial
Rock Mass Defects: RQD %; Defect Spacing (mm): 20, 60, 200, 600, 2000
Defect Description: type, inclination, thickness, shape, roughness, coating — Specific / General
Depth (m)
Core Photo
Casing & Core Lifts

3.5 — 42.0 — *Continued from non-cored borehole from 3.5m*

SANDSTONE - orange / brown, fine to medium grained, some dark grey / black lenses and inclusions. — SW — D=1.88, A=2.39, D=3.05, A=2.93 — RQD 92

some grey bands present from.

XW, SW, XW, SW, XW, DW, XW, DW, SW, SW

- JT, HZ, IR, CN
- BP, HZ, PLN, CN
- JT, 70°, PLN, Clay, RF
- JT, HZ, IR, CN
- SM, Clay, 20°, 50mm
- SM, Clay, 80mm, HZ
- SM, Clay
- SM, Clay, HZ

5.4

SANDSTONE - grey, fine to medium grained, dark grey / black inclusions. — SW — D=1.04, A=1.45 — RQD 100

- JT, 10°, IR, CN
- JT, 10°, PLN, CN
- JT, 10°, PLN, FE
- JT, 10°, PLN, FE

D=0.35, A=0.29

- JT, 10°, IR, CN

D=0.93, A=0.95

- JT, HZ, IR, Clay

8.6 — RQD 100

- JT, 20°, FE, PLN

9.0

Additional Comments

Logged By: **Stephen McCormack** Date: **4/02/2010** | Checked By: **Stephen McCormack** Date: **24/02/2010**

GEE CORE LOG G10002TPG WOLLONGONG.GPJ GEE LOG 2.GDT 24/02/10 2:26:35 PM

Borehole Log Report

Geo Environmental Engineering
275A Stoney Creek Road
Kingsgrove NSW 2208
T 02 9592 0218

Hole ID. **BH3**
Hole Depth: **18.00 m**
Sheet: **3 of 4**

Project Name: **Geotechnical Investigation** Project Number: **G10002TPG**
Location / Site: **360-364 Crown Street, Wollongong NSW** Client: **TPG**

Drilling Company: **Macquaire Drilling** Date Started: **4/02/2010** Ground Level: **RL45.3m** approx
Drill Method: **Solid Flight Auger / Diamond Drilling** Date Completed: **5/02/2010** Easting: ----------
Equipment: **Hydropower Scout V** Northing: ----------

Method	Water Level	Depth (m)	RL (m)	Graphic Log	Material Type	Material Description	Weathering	Estimated Strength (MPa) EL 0.03 VL 0.1 L 0.3 M 1 H 3 VH 10 EH	$Is_{(50)}$ MPa D=diametral A=axial	RQD %	Defect Spacing (mm) 20 60 200 600 2000	Defect Description type, inclination, thickness, shape, roughness, coating Specific / General	Depth (m)	Core Photo	Casing & Core Lifts
Diamond Drilling		9.5	36.0		Bedrock	**SANDSTONE** - grey, fine to medium grained, dark grey / black inclusions.	SW		D=2.67 A=2.5	100		JT, HZ, IR, FE	9.5		
		10.0	35.5			some coarse grained sand and fine gravel between 9.55 and 10.0m.							10.0		
		10.5	35.0						D=0.81 A=0.74				10.5		
		11.0	34.5										11.0		11.05
		11.5	34.0			**SILTSTONE** - dark grey.						BP, HZ, IR, CN	11.5		
		12.0	33.5			**SANDSTONE** - grey, with minor dark grey siltstone lenses.			D=1.05 A=1.15	100		BP, 10°, CN	12.0		
		12.5	33.0									JT, HZ, IR, Clay	12.5		
		13.0	32.5						D=0.69 A=0.62				13.0		
		13.5	32.0									BP, HZ, IR, CN	13.5		
		14.0	31.5										14.0		14.1
		14.5	31.0							100			14.5		
		15.0	30.5						D=0.61				15.0		

Additional Comments

Logged By: **Stephen McCormack** Date: **4/02/2010**
Checked By: **Stephen McCormack** Date: **24/02/2010**

GEE CORE LOG G10002TPG WOLLONGONG.GPJ GEE LOG 2.GDT 24/02/10 2:26:35 PM

Borehole Log Report

Geo Environmental Engineering
275A Stoney Creek Road
Kingsgrove NSW 2208
T 02 9592 0218

Hole ID. **BH3**
Hole Depth: **18.00 m**
Sheet: **4 of 4**

Project Name: **Geotechnical Investigation** Project Number: **G10002TPG**
Location / Site: **360-364 Crown Street, Wollongong NSW** Client: **TPG**

Drilling Company: **Macquaire Drilling** Date Started: **4/02/2010** Ground Level: **RL45.3m** approx
Drill Method: **Solid Flight Auger / Diamond Drilling** Date Completed: **5/02/2010** Easting: ----------
Equipment: **Hydropower Scout V** Northing: ----------

Method	Water Level	Depth (m)	RL (m)	Graphic Log	Material Type	Material Description	Weathering	Estimated Strength (MPa) EL 0.03 VL 0.1 L 0.3 M 1 H 3 VH 10 EH	$Is_{(50)}$ MPa D=diametral A=axial	RQD %	Defect Spacing (mm) 20 60 200 600 2000	Defect Description type, inclination, thickness, shape, roughness, coating Specific / General	Depth (m)	Core Photo	Casing & Core Lifts
Diamond Drilling		15.5 16.0 16.5 17.0 17.5 18.0	30.0 29.5 29.0 28.5 28.0 27.5		Bedrock	**SANDSTONE** - grey, with minor dark grey siltstone lenses.	SW		A=1.05 D=1.01 A=1.15 D=1.31 A=1.28	100 100			15.5 16.0 16.5 17.0 17.5 18.0		17.1 18
		18.5 19.0 19.5 20.0 20.5 21.0	27.0 26.5 26.0 25.5 25.0 24.5			**Hole Terminated at 18.00 m**							18.5 19.0 19.5 20.0 20.5 21.0		

Additional Comments

Logged By: **Stephen McCormack** Date: **4/02/2010**
Checked By: **Stephen McCormack** Date: **24/02/2010**

GEE CORE LOG G10002TPG WOLLONGONG.GPJ GEE LOG 2.GDT 24/02/10 2:26:36 PM

Borehole BH3: Start of Core (3.5m) to 8.0m

Borehole BH3: 8.0m to 13.0m

Borehole BH3: 13.0m to 18.0m (End)

ARUP BOREHOLE RECORD

BH101 HOLE

SHEET 1 OF 4

CLIENT	AA Crown Holdings	LOGGED BY	RG / CH / PC
PROJECT	Wollongong Private Hospital	CHECKED BY	MVU
		DRILLED DATE	18-Apr-12 to 19-Apr-12
CONTRACTOR	Terratest	ANGLE	60°
DRILL MODEL	Edson 3000	BEARING	180
DRILLER	Terratest	HOLE DIAMETER	100mm ()
		GROUND LEVEL	~RL 44.50m
		LOCATION	305230 E 6188597 N
		ELEVATION DATUM	Australian Height Datum
		COORDINATE SYSTEM	Australian Map Grid (AMG)

DRILLING	STRATA				MATERIAL DESCRIPTION	CONDITION		OBSERVATION
SAMPLE, TEST, BIT, SUPPORT, ETC.	R.L. mAHD	DEPTH m	GROUP SYMBOL	LEGEND	SOIL TYPE Plasticity / Grain Size, Colour, Minor Components	WATER / MOISTURE	CONSISTENCY: COHESIVE VS S F ST VST H; NON COHESIVE VL L MD D VD	SOIL ORIGIN, STRUCTURE, ETC.
	44.41	0.10	CH		Bitumen.			FILL
					CLAY (CH) highly plasticity, brown mottled dark grey, trace of sand, fine to medium, trace of gravel, fine grained.	M		RES
		1			.... 0.80m - 1.20m sandstone boulder, resistance to auger and silty sand recovered.			
D	43.46	1.20	CH		CLAY (CH) medium plasticity, brown mottled white-grey, trace of sand, fine to medium grained, sub-angular, poorly graded.	D		RES
		2						
		3			.... 3.10m converted to cored hole prior to auger refusal. Borehole continued as a Cored Drillhole			
		4						
		5						
		6						
		7						
		8						
		9						

NOTES Hole Diameter 100mm to 3.10m depth. (Augered, 52mm from 3.1m, NMLC)
Hole cased to 3.10m.

JOB 224118

ARUP CORED BOREHOLE RECORD

BH101 HOLE — SHEET 2 OF 4

CLIENT	AA Crown Holdings	LOGGED BY	RG / CH / PC
PROJECT	Wollongong Private Hospital	CHECKED BY	MVU
		DRILLED DATE	18-Apr-12 to 19-Apr-12
CONTRACTOR	Terratest	ANGLE	60°
DRILL MODEL	Edson 3000	BEARING	180
DRILLER	Terratest	HOLE DIAMETER	100mm ()
		GROUND LEVEL	~RL 44.50m
		LOCATION	305230 E 6188597 N
		ELEVATION DATUM	Australian Height Datum
		COORDINATE SYSTEM	Australian Map Grid (AMG)

DRILLING | STRATA | MATERIAL DESCRIPTION | DISCONTINUITIES

TCR % (Dril rate)	SCR / (RQD)	FLUSH RETURN % (TYPE)	SAMPLES ($CaCO_3$, SPT, UCS, etc)	R.L. mAHD	DEPTH m	GRAPHIC LOG	ROCK TYPE Grain Size, Texture/Fabric, Colour, Minor Components	WEATHERING	ESTIMATED ROCK STRENGTH	Is 50 (MPa)	FREQUENCY (per m)	SPECIFIC TYPE	SPECIFIC ANGLE	SPECIFIC THICKNESS (mm)	GENERAL DESCRIPTION Planarity, Roughness, Coating, Infill
				41.82	3.10		Continued from Borehole								
							CORE LOSS.								
				41.38	3.60		Sandy CLAY, medium plasticity, brown mottled grey, firm.								
				41.17	3.85		SANDSTONE, fine to coarse grained, thinly bedded, well developed bedding, brown mottled grey,.	DW/XW	EL VL L M H VH EH		30 10 3 1	Be	0	1	PL Ro4 m+C
							.... 3.85m - 7.55m white clay infill within fractures.					Jo	20	2	UN Ro4 m+C
												Be	0	1	PL Ro4 FE
												Jo	40	1	PL Ro4 FE
												Jo	30	20	PL Ro4 s+m+C
										D0.02		Jo	40	40	PL Ro4 C
										A0.02		Jo	60	2	PL Ro4 s+C
												Jo	50	2	PL Ro4 s+C
												Jo	40	2	UN Ro4 s+C
				40.26	4.90		.... 4.86m - 4.90m no intact rock recovery, recovered as clayey gravel					Be	5	20	IR Ro4 C
							CORELOSS.					Be	0	30	PL Ro4 C
				39.82	5.40		SANDSTONE, fine to coarse grained, thinly bedded, well developed bedding, brown mottled grey,.					Be	0	2	PL Ro4 s+C
							.... 5.70m - 5.80m no intact rock recovery, recovered as gravel.	DW				Be	5	2	PL Ro4 s+C
												Jo	20	50	PL Ro4 C
												Be	5	5	IR Ro4 s+C
										A0.02					
										D0.02		Jo	50	2	CU Ro4 s+C
										A0.14					
												Jo	20	2	PL Ro4 s+C
										D0.29		Jo	20	20	CU Ro4 S
												Jo	20	20	CU Ro4 C
							.... 7.00m - 12.50m banded in colour, dark brown to pale brown, orientated in line with fractures.					Jo	10	20	CU Ro4 C
			UCS=0.0MPa							A0.15					
										D0.09		Jo	50	2	PL Ro4 s+C
												Jo	45	2	PL Ro4 CL
				37.70	7.85		CORE LOSS.								
				37.50	8.08		SANDSTONE, fine to coarse grain, thinly bedded, well developed bedding, brown mottled grey,.					Jo	35	1	PL Ro3 M
												Jo	35	2	UN Ro3 M
												Jo	35	5	UN Ro3 C
												Jo	30	3	UN Ro3 C
										A0.30		Jo	30	2	UN Ro3 FE
										D0.12		Be	30	2	UN Ro3 FE
												Jo	20	2	UN Ro4 FE+M
							.... 9.20m - 9.22m 2mm thick laminated iron deposit on 90 degrees fracture.					Jo	90	2	UN Ro5 FE
												Jo	5	3	UN Ro3 C
										A0.10					
										D0.07		Jo	5	3	UN Ro3 C
												Jo	20	3	PL Ro3 M
72()	56/(20)	100 %													
50()	46/(11)	100 %													
100()	100/(85)	100 %													
92()	92/(77)	100 %													

NOTES

Hole Diameter 100mm to 3.10m depth. (Augered, 52mm from 3.1m, NMLC)
Hole cased to 3.10m.

See explanatory notes for details of abbreviations and basis of descriptions

JOB 224118

ARUP — CORED BOREHOLE RECORD

BH101 HOLE — SHEET 3 OF 4

CLIENT	AA Crown Holdings	LOGGED BY	RG / CH / PC
PROJECT	Wollongong Private Hospital	CHECKED BY	MVU
		DRILLED DATE	18-Apr-12 to 19-Apr-12
CONTRACTOR	Terratest	ANGLE	60°
DRILL MODEL	Edson 3000	BEARING	180
DRILLER	Terratest	HOLE DIAMETER	100mm ()
		GROUND LEVEL	~RL 44.50m
		LOCATION	305230 E 6188597 N
		ELEVATION DATUM	Australian Height Datum
		COORDINATE SYSTEM	Australian Map Grid (AMG)

DRILLING				STRATA			MATERIAL DESCRIPTION	DISCONTINUITIES						
TCR % (Drill rate)	SCR / (RQD)	FLUSH RETURN % (TYPE)	SAMPLES ($CaCO_3$, SPT, UCS, etc)	R.L. mAHD	DEPTH m	GRAPHIC LOG	ROCK TYPE Grain Size, Texture/Fabric, Colour, Minor Components	WEATHERING	ESTIMATED ROCK STRENGTH	Is 50 (MPa)	FREQUENCY (per m)	SPECIFIC TYPE	SPECIFIC ANGLE	SPECIFIC THICKNESS (mm)	GENERAL DESCRIPTION Planarity, Roughness, Coating, Infill
92()	92/(77)	100 %	UCS=2.0MPa C C				SANDSTONE, fine to coarse grain, thinly bedded, well developed bedding, brown mottled grey,. *(continued)*	DW	EL VL L M H VH EH	A0.06 D0.13	30 10 3 1	Jo	20	1	PL Ro3 M
												Jo	0	3	UN Ro3 FE+M
												Jo	0	5	PL Ro3 C+S
								SW/DW				Jo	0	5	PL Ro3 C+S
												Jo	0	2	PL Ro4 M+RF
												Jo	0	2	PL Ro4 M+S
					11							Jo	35	2	UN Ro4 S+FE
												Jo	20	2	UN Ro4 FE
												Jo	5	2	PL Ro4 FE
			C							A0.30 D0.56					
					12							Jo	50	2	PL Ro5 FE
100()	100/(97)	100 %										Jo	55	1	PL Ro3 M
							.... 12.50m becoming fine to medium grained	FR/SW							
							.... 12.50m - 12.52m become pale grey in colour								
							.... 12.65m dark grey, fine grained carbonaceous inclusions/lamination.					Jo	5	1	PL Ro3 M
			C									Be	5	1	PL Ro3 M
			C C		13					A1.18 D2.00					
												Jo	35	1	PL Ro4 M+S
												Jo	50	1	PL Ro3 C
												Jo	20	1	UN Ro3 C
												Jo	20	1	UN Ro3 M+S
			C		14					A1.27 D1.77		Jo	50	1	UN Ro3 M+S
							.... 14.60m - 16.40m white calcite veins and irregular shape inclusion from 1 to 5mm thick								
			C							A0.64 D0.99		Jo	20	2	PL Ro4 S
					15										
100()	100/(100)	100 %	C							A1.72 D2.88		Jo	5	1	UN Ro3 M+S
												Jo	40	1	PL Ro4 M
			C		16					D1.43		Jo	50	1	UN Ro3 M+S
							.... 16.45m - 17.20m 80 degrees undulating seam of clay with root fragments, weathered zone > 30mm thick					Jo	50	1	UN Ro3 M+S
												We	90	1	PL Ro2 C
					17										
			C C				.... 17.20m - 18.10m microfractures, irregularly orientated.			D0.17					
												Jo	90	1	IR Ro3 M+S
					18										
100()	100/(100)	100 %										Jo	60	1	PL Ro3 M+S
												Jo	20	1	PL Ro4 FE
			C		19		.... 19.00m - 20.35m irregular shape calcite inclusions.			A1.51 D1.57		Jo	20	1	PL Ro3 M+S
			C C							D3.35					

NOTES

Hole Diameter 100mm to 3.10m depth. (Augered, 52mm from 3.1m, NMLC)
Hole cased to 3.10m.

See explanatory notes for details of abbreviations and basis of descriptions

JOB 224118

ARUP — CORED BOREHOLE RECORD

BH101 HOLE — SHEET 4 OF 4

CLIENT	AA Crown Holdings	LOGGED BY	RG / CH / PC
PROJECT	Wollongong Private Hospital	CHECKED BY	MVU
		DRILLED DATE	18-Apr-12 to 19-Apr-12
CONTRACTOR	Terratest	ANGLE	60°
DRILL MODEL	Edson 3000	BEARING	180
DRILLER	Terratest	HOLE DIAMETER	100mm ()
		GROUND LEVEL	~RL 44.50m
		LOCATION	305230 E 6188597 N
		ELEVATION DATUM	Australian Height Datum
		COORDINATE SYSTEM	Australian Map Grid (AMG)

DRILLING | STRATA | MATERIAL DESCRIPTION | DISCONTINUITIES

TCR % (Drill rate)	SCR / (RQD)	FLUSH RETURN % (TYPE)	SAMPLES ($CaCO_3$, SPT, UCS, etc)	R.L. (mAHD)	DEPTH (m)	GRAPHIC LOG	ROCK TYPE Grain Size, Texture/Fabric, Colour, Minor Components	WEATHERING	ESTIMATED ROCK STRENGTH	Is 50 (MPa)	FREQUENCY (per m)	SPECIFIC: TYPE	SPECIFIC: ANGLE	SPECIFIC: THICKNESS (mm)	GENERAL DESCRIPTION: Planarity, Roughness, Coating, Infill
							SANDSTONE, fine to coarse grain, thinly bedded, well developed bedding, brown mottled grey,. *(continued)*	FR/SW		A4.60		Jo	20	2	UN R64 FE
							.... 20.35m - 20.65m fine to coarse grained					Jo	40	3	UN Ro4 FE+S
							.... 20.65m - 20.80m high percentage of fine grained carbonaceous lenses, dipping approx 10 degrees					Jo	20	3	PL Ro3 FE+M
100()	100/(99)	100 %	UCS=25.1MPa C C C		21					A2.03 D1.76					
							.... 21.40m - 21.80m high percentage of fine grained carbonaceous lenses, dipping approx 10 degrees			A1.44 D2.12					
			C		22					A1.86 D1.75					
								FR							
100()	100/(100)	100 %	C		23		.... 23.20m dark grey, carbonaceous inclusions, irregular shapes.			A0.84 D1.63					
			C		24					A2.07 D1.75					
100()	100/(100)	100 %	C		25		.... 24.50m white calcite veins, 1 to 3 mm thick dipping 35 degree, 1 per mm.			A1.85 D1.31					
			UCS=18.6MPa C C C		26		.... 26.00m sandstone is becoming thinly to medium bedded.			A4.29 A0.62 D0.91					
100()	100/(100)	100 %	C		27					A0.98 D1.35					
			C	19.56	28.80		End of Borehole at 28.80m			A1.34 D0.09					
					28										
					29										

NOTES: Hole Diameter 100mm to 3.10m depth. (Augered, 52mm from 3.1m, NMLC)
Hole cased to 3.10m.

See explanatory notes for details of abbreviations and basis of descriptions

JOB 224118

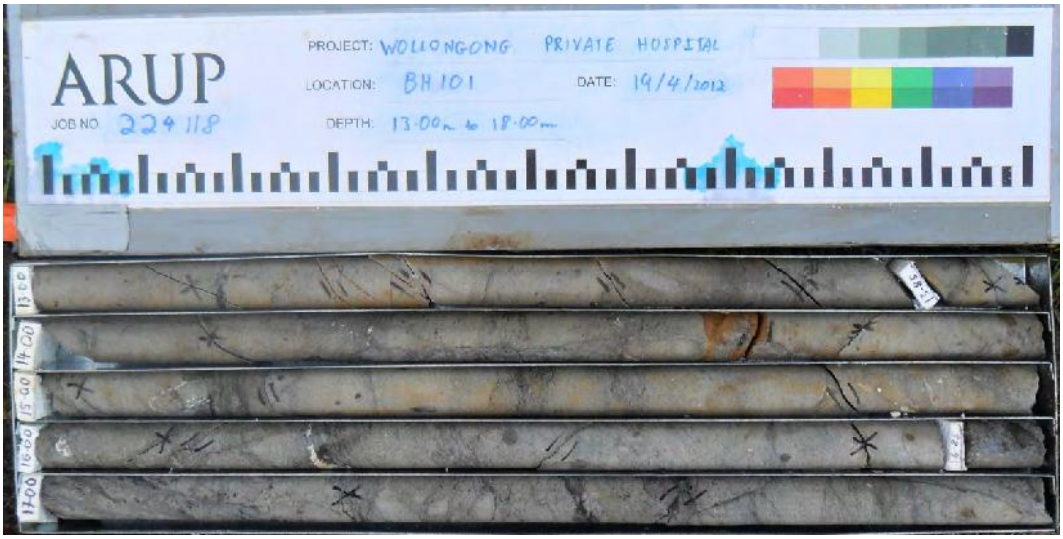
ARUP	Core Photographs	BH101

3.10m to 8.00m

ARUP	Core Photographs	BH101

8.00m to 13.00m

ARUP	Core Photographs	BH101



13.00m to 17.00m

ARUP	Core Photographs	BH101

18.00m to 23.00m

ARUP	Core Photographs	BH101

23.00m to 28.00m

ARUP	Core Photographs	BH101

28.00m to 28.80m

DOUGLAS PARTNERS PTY LTD

WOLLONGONG PRIVATE HOSPITAL
360 – 364 CROWN STREET, WOLLONGONG

BORE: 201 DEPTH: 2.20m – 15.00m PROJECT: 73522 JUL 2013

BOREHOLE LOG

CLIENT: A W Edwards
PROJECT: Wollongong Private Hospital
LOCATION: 360 - 364 Crown Street, Wollongong

SURFACE LEVEL: 42.6 AHD
EASTING: 305258
NORTHING: 6188644
DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 73522
DATE: 3/7/2013
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
42	0.02	BITUMINOUS CONCRETE							A			
	0.4	FILLING - dark grey, sandy, fine to medium gravel with trace silt, damp							A			
		TUFFACEOUS SANDSTONE - very low strength, highly weathered, orange brown, tuffaceous sandstone							A			
41	1							Unless otherwise stated, rock is fractured along, smooth, planar, ironstained, sub-vertical ironstained joints				
	2	- becoming low strength below 2.0m							A			
40	2.2	TUFFACEOUS SANDSTONE - extremely low strength, extremely weathered, slightly fractured, orange brown, fine to coarse grained, tuffaceous sandstone with some very low to high strength, highly to moderately weathered bands						2.38m: B, 80mm clay 2.6m: 220mm silty clay 2.76m: B 0°, ironstained 2.85m: 60mm clay	C	100	26	
	3							3.15m: B 10°, 2mm clay				PL(A) = 1.9
39	3.03	TUFFACEOUS SANDSTONE - high strength, highly weathered becoming slightly weathered, slightly fractured, orange brown and grey, fine to coarse, tuffaceous sandstone						3.39m: J 40° 3.8m: , rough, undulating 3.91m: rough 4.14m: rough 4.28m: J 40°, rough				
	4											
38	4.9	TUFFACEOUS SANDSTONE - interbedded extremely low to low strength, extremely to highly weathered, slightly fractured, white, orange brown and grey, fine to medium grained, tuffaceous sandstone with some medium strength bands							C	85	54	
	5							5.2m: B 20° 5.23m: B 30°, 10mm clay 5.28m: B 20°, 10mm clay 5.35m: B, 10 - 20mm clay				PL(A) = 0.1
37	6.05							5.65m: CORE LOSS: 400mm 6.08m: J 30°				PL(A) = 0.1
	6											
36	7							6.7m: 170mm clay 6.78m: J 45°				
35								7.45m: J 30°, rough	C	100	34	
	8							7.86m: B 10° rough 8m: rough 8.14m: J 20°				PL(A) = 0.1
34	9							8.88m: J 30° 9.09m: J 70°, rough				
33		- grading into medium strength, fresh stained, tuffaceous sandstone						9.51m: B 20° 9.61m: J 10 - 40°, rough	C	100	94	PL(A) = 0.1
	10.0											

RIG: Scout 4 **DRILLER:** Gound Test **LOGGED:** BNG/RJH **CASING:** HW to 2.2m

TYPE OF BORING: SFA (TC bit) to 2.2m, coring (NMLC) to 15.0m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Standpipe installed: Solid casing to 3.0m, screen casing to 15.0m. Backfill to 2.5m, bentonite to 3.0m, gravel to 15m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: A W Edwards
PROJECT: Wollongong Private Hospital
LOCATION: 360 - 364 Crown Street, Wollongong

SURFACE LEVEL: 42.6 AHD
EASTING: 305258
NORTHING: 6188644
DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 73522
DATE: 3/7/2013
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
32	11	below 9.63m TUFFACEOUS SANDSTONE - high becoming very high strength, fresh stained becoming fresh, slightly fractured becoming unbroken, grey, fine to medium grained, tuffaceous sandstone						10.12m: rough 11.05m: rough 11.19m: J 50° 11.25m: J 50°	C	100	94	PL(A) = 1.2 UCS = 52.4
31	12							12.11m: J 20°				PL(A) = 3.4
30	13								C	100	100	
29	14											PL(A) = 2.0 UCS = 42.1
28	15 15.0	Bore discontinued at 15.0m Limit of Investigation										
27	16											
26	17											
25	18											
24	19											
23												

RIG: Scout 4 **DRILLER:** Gound Test **LOGGED:** BNG/RJH **CASING:** HW to 2.2m

TYPE OF BORING: SFA (TC bit) to 2.2m, coring (NMLC) to 15.0m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Standpipe installed: Solid casing to 3.0m, screen casing to 15.0m. Backfill to 2.5m, bentonite to 3.0m, gravel to 15m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

DOUGLAS PARTNERS PTY LTD

WOLLONGONG PRIVATE HOSPITAL
360 – 364 CROWN STREET, WOLLONGONG

BORE: 202 DEPTH: 2.20m – 15.20m PROJECT: 73522 JUL 2013

BOREHOLE LOG

CLIENT: A W Edwards
PROJECT: Wollongong Private Hospital
LOCATION: 360 - 364 Crown Street, Wollongong

SURFACE LEVEL: 43.6 AHD
EASTING: 305225
NORTHING: 6188586
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 73522
DATE: 2/7/2013
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
43	0.5	FILLING - grey, fine to coarse gravel (sandstone) with some clay and sand, damp							A			
	0.7	CLAY - light orange brown, slightly silty, slightly sandy clay							A			
42	1	SANDY CLAY - light orange brown, slightly silty, sandy clay with some extremely low to very low strength, extremely to highly weathered, sandstone bands, damp						Unless otherwise stated, rock is fractured along, smooth, planar, ironstained, sub-horizontal joints	S			20/100mm
	2								A			
41	2.2	TUFFACEOUS SANDSTONE - interbedded extremely low to medium strength, extremely to highly weathered, slightly fractured, white, orange brown and grey, fine to medium grained, tuffaceous sandstone						2.59m: 140mm silty clay 2.75m: 40mm silty clay 2.81m: J 60° 3m: B 20°, rough	C	100	22	
	3							3.07m: CORE LOSS: 100mm 3.35m: B 10°, rough 3.52m: B 10 - 30°, rough 3.76m: B 20mm clay 3.85m: rough 3.9m: J 10 - 40°, clay veneer 4.11m: CORE LOSS: 100mm 4.54m: 30mm clay 4.61m: rough, undulating				PL(A) = 0.3
40	3.17								C	89	5	
	4											
	4.21											
39	5							4.85m: 290mm silty clay 5.06m: rough 5.11m: CORE LOSS: 40mm 5.27-6.53m: brecciated 5.29m: J 40°, rough 5.68m: J 60°, rough				PL(A) = 0.9 UCS = 7.3
	5.15	TUFFACEOUS SANDSTONE - low to medium strength, moderately to slightly weathered, slightly fractured/faulted, orange brown and grey, fine to medium grained, tuffaceous sandstone										
38	6							6.3m: J 50°, rough 6.49m: J 20°, rough 6.59m: J 50°, rough, undulating, 6.62m: J 60°, rough 6.82m: J 60° 7.15m: J 30°, undulating	C	100	98	PL(A) = 1.4
37	7											
	7.08	TUFFACEOUS SANDSTONE - low to medium strength, highly weathered, fractured to slightly fractured, orange brown, fine to medium grained, tuffaceous sandstone with some extremely low strength, extremely weathered bands						7.36m: 10mm clay 7.4m: J 60°, clay veneer 7.44m: J 40° 7.63m: 10mm clay 7.67m: J 70°				PL(A) = 0.2
36	8											
	8.53	TUFFACEOUS SANDSTONE - high strength, moderately weathered becoming fresh, slightly fractured, grey and grey brown, fine to medium grained, tuffaceous sandstone						8.53m: B10°	C	100	98	PL(A) = 1.2
35	9							9.32m: B 10°				
34												PL(A) = 2.2

RIG: Scout 4 **DRILLER:** Gound Test **LOGGED:** BNG/RJH **CASING:** HW to 2.2m

TYPE OF BORING: SFA (TC bit) to 2.2m, coring (NMLC) to 15.20m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: A W Edwards
PROJECT: Wollongong Private Hospital
LOCATION: 360 - 364 Crown Street, Wollongong

SURFACE LEVEL: 43.6 AHD
EASTING: 305225
NORTHING: 6188586
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 73522
DATE: 2/7/2013
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
33	11	TUFFACEOUS SANDSTONE - high strength, moderately weathered becoming fresh, slightly fractured, grey and grey brown, fine to medium grained, tuffaceous sandstone *(continued)*						10.09m: J 40°, rough 10.22m: J 40°, rough 10.35m: J 40°, rough	C	100	98	
32	12								C	100	99	PL(A) = 3.2
31	13	- becoming very high strength below 13.0m						12.52m: 10mm highly weathered 12.68m: rough, undulating				PL(A) = 4.5
30	14								C	100	100	UCS = 46.4
29	15											
	15.2	Bore discontinued at 15.2m Limit of Investigation										
28	16											
27	17											
26	18											
25	19											
24												

RIG: Scout 4 **DRILLER:** Gound Test **LOGGED:** BNG/RJH **CASING:** HW to 2.2m
TYPE OF BORING: SFA (TC bit) to 2.2m, coring (NMLC) to 15.20m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

DOUGLAS PARTNERS PTY LTD

WOLLONGONG PRIVATE HOSPITAL
360 – 364 CROWN STREET, WOLLONGONG

BORE: 203 DEPTH: 2.20m – 15.00m PROJECT: 73522 JUL 2013

BOREHOLE LOG

CLIENT: A W Edwards
PROJECT: Wollongong Private Hospital
LOCATION: 360 - 364 Crown Street, Wollongong

SURFACE LEVEL: 43.2 AHD
EASTING: 305242
NORTHING: 6188569
DIP/AZIMUTH: 90°/--

BORE No: 203
PROJECT No: 73522
DATE: 4/7/2013
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
43	0.1	FILLING - orange brown, slightly silty, sandy, gravelly (fine to coarse sandstone) clay, damp							A			
		CLAY - mottled grey, orange brown, slightly silty, slightly sandy, slightly gravelly (fine to medium sandstone) clay, damp							A			
42	0.9	SILTY CLAY - light grey and orange brown, silty clay with some extremely low to very low strength, extremely to highly weathered sandstone bands						Unless otherwise stated, rock is fractured along smooth, planar, ironstained, sub-horizontal joints	A S			23/100mm
41	2.2	CLAY - orange brown, slightly gravelly, (fine sandstone, siltstone) clay, moist										
	2.47	TUFFACEOUS SANDSTONE - low strength, highly becoming moderately weathered, slightly fractured, orange brown, fine to medium grained, tuffaceous sandstone with some extremely low strength, extremely weathered and medium strength, highly to moderately weathered bands						2.8m: 70mm fragmented 3.06m: B 10° 3.33m: J 60°, 30m clay	C	100	41	PL(A) = 0.5
40								4.82m: J 80 - 90°, rough, undulating 4.98m: rough	C	100	93	PL(A) = 0.2
39								5.85m: J 40°, rough, clay veneer				
38								6.31m: 30mm clay 6.57m: J 10 - 40°, stepped 6.64m: rough 6.71m: J 70°				PL(A) = 0.5
37	7.3	TUFFACEOUS SANDSTONE - high strength, slightly weathered to fresh stained, slightly fractured, orange brown and grey, fine to medium grained, tuffaceous sandstone with some extremely low strength, extremely weathered bands						7.29m: stepped	C	100	92	PL(A) = 1.4
36												
35												
34									C	100	100	PL(A) = 1.4

RIG: Scout 4 **DRILLER:** Gound Test **LOGGED:** BNG/RJH **CASING:** HW to 2.2m

TYPE OF BORING: SFA (TC bit) to 2.2m, coring (NMLC) to 15.28m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Standpipe installed: Solid casing to 3.0m, screen casing to 6.0m. Backfill to 1.5m, bentonite to 2.5m, gravel to 6.0m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: A W Edwards
PROJECT: Wollongong Private Hospital
LOCATION: 360 - 364 Crown Street, Wollongong

SURFACE LEVEL: 43.2 AHD
EASTING: 305242
NORTHING: 6188569
DIP/AZIMUTH: 90°/--

BORE No: 203
PROJECT No: 73522
DATE: 4/7/2013
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
33	11	TUFFACEOUS SANDSTONE - high strength, slightly weathered to fresh stained, slightly fractured, orange brown and grey, fine to medium grained, tuffaceous sandstone with some extremely low strength, extremely weathered bands *(continued)*							C	100	100	
32	11.36	TUFFACEOUS SANDSTONE - medium to high strength, moderately weathered to fresh stained, slightly fractured, orange brown and grey, fine to medium grained, tuffaceous sandstone with some extremely low to low strength, extremely to highly weathered bands						11.5m: J 60°, rough 11.64m: J 50°, stepped 11.75m: J 50°, undulating				
31	12											
30	13											PL(A) = 0.2
29	14							13.96m: 150mm clay	C	100	91	PL(A) = 1.5 UCS = 13.7
28	15							14.91m: J 20°, clay veneer 14.93m: J 45° 15.07m: J 10 - 20°, rough, stepped				
	15.28	Bore discontinued at 15.28m Limit of Investigation										
27	16											
26	17											
25	18											
24	19											

RIG: Scout 4 **DRILLER:** Gound Test **LOGGED:** BNG/RJH **CASING:** HW to 2.2m

TYPE OF BORING: SFA (TC bit) to 2.2m, coring (NMLC) to 15.28m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Standpipe installed: Solid casing to 3.0m, screen casing to 6.0m. Backfill to 1.5m, bentonite to 2.5m, gravel to 6.0m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
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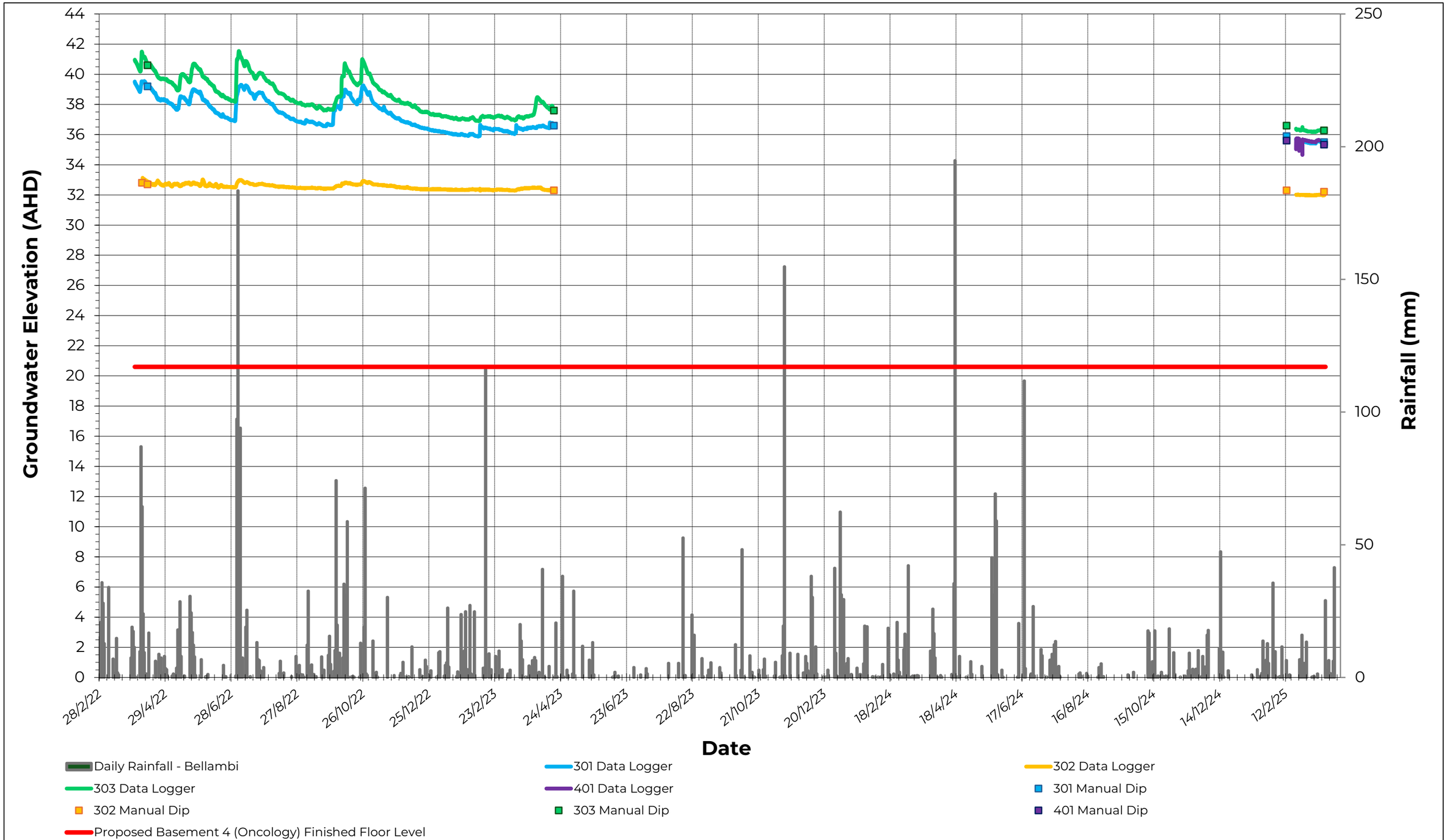
Appendix E

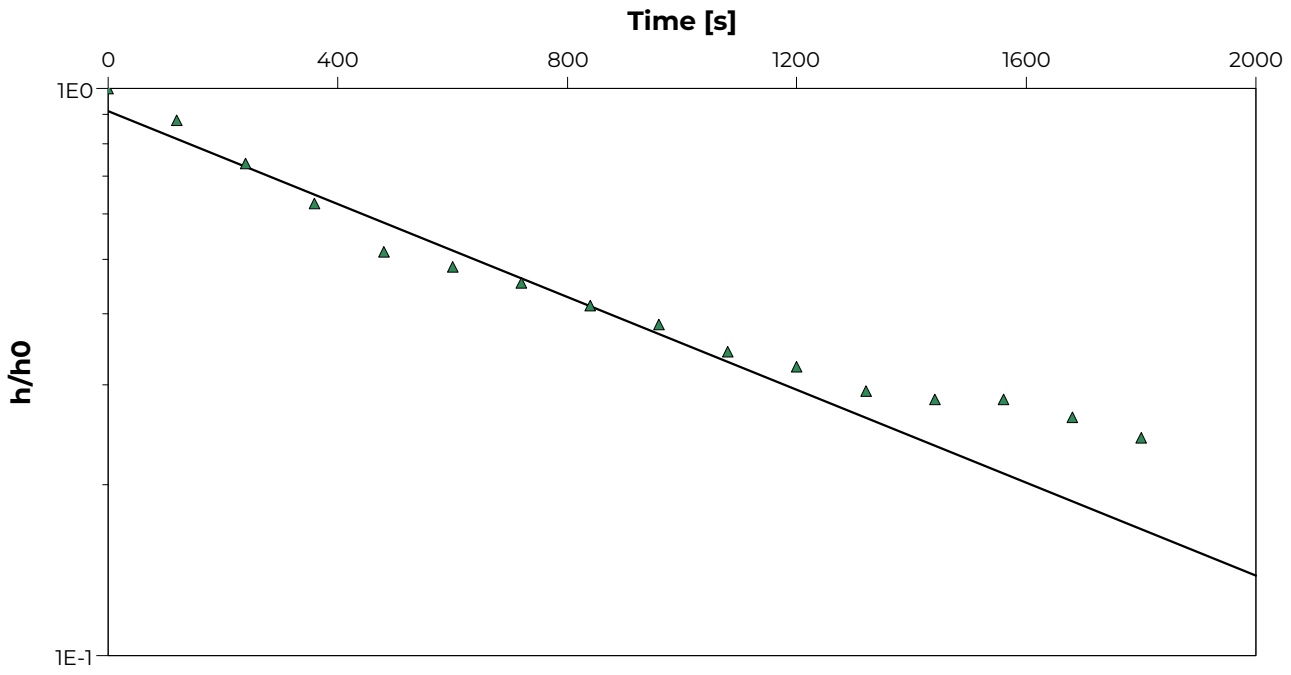
Results of Hydraulic Testing



Douglas PARTNERS	CLIENT: AA Crown Holdings Pty Ltd		**Groundwater Level vs Rainfall (Apr 2022 to Mar 2025)**	PROJECT NO: 73522.13
	OFFICE: Wollongong	DRAWN BY: ZAK	**Proposed Wollongong Private Hospital Expansion**	FIGURE NO: E1
	SCALE: N/A	DATE: 20 March 2025	**366 - 368 Crown Street & 15 - 23 Urunga Parade, Wollongong**	REVISION: 0

Douglas PARTNERS GROUNDED EXPERTISE	**Slug Test Analysis Report**
	Project: Proposed Wollongong Private Hospital Expansion
	Project Number: 73522.13
	Client: AA Crown Holdings Pty Ltd

Location: 366 - 368 Crown Street & 15 - 23 Urunga Parade, Wollongong NSW		Test Well: 301-1
Test Conducted by: ZAK		Test Date: 29/03/2022
Analysis Performed by: ZAK	301-1	Analysis Date: 19/03/2025
Aquifer Thickness:		



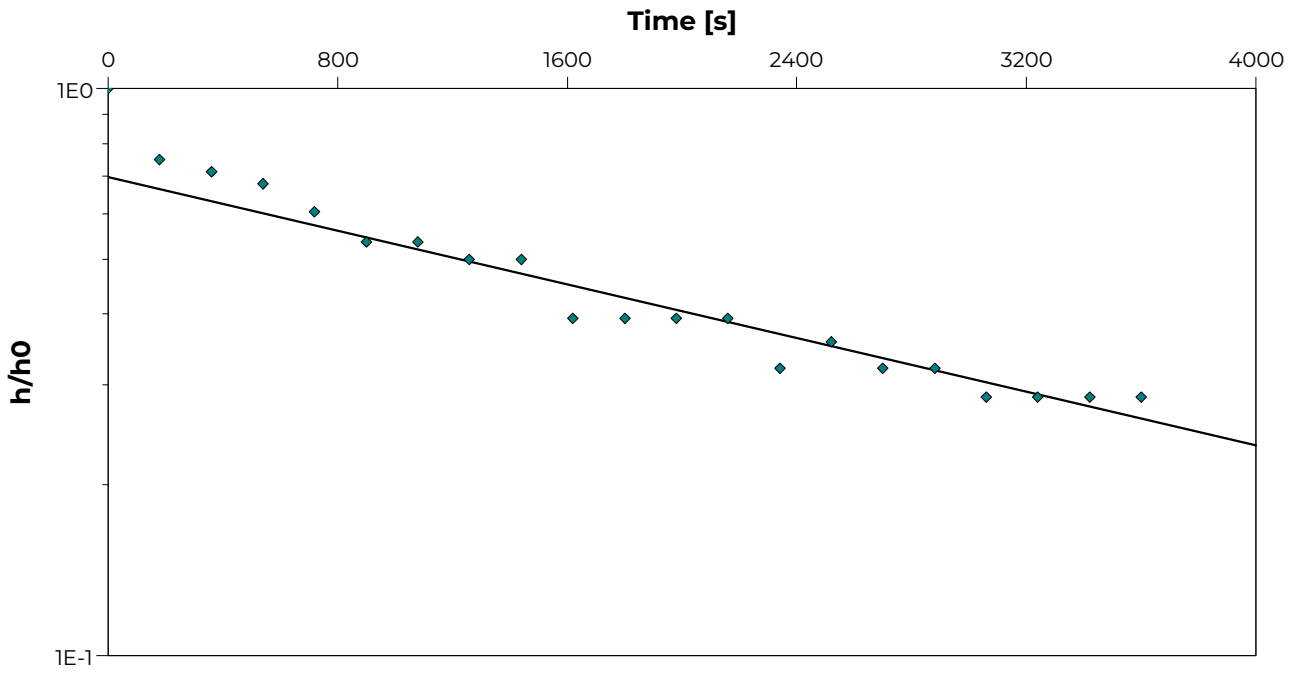
Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
301-1	1.60×10^{-7}	

Well Depth:	12.65 m
Screened Interval:	0.65 - 12.65 m
Diameter:	50 mm
Bore Diameter	125 mm

Douglas PARTNERS GROUNDED EXPERTISE	**Slug Test Analysis Report**
	Project [illegible]
	[illegible]

		[illegible]
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		

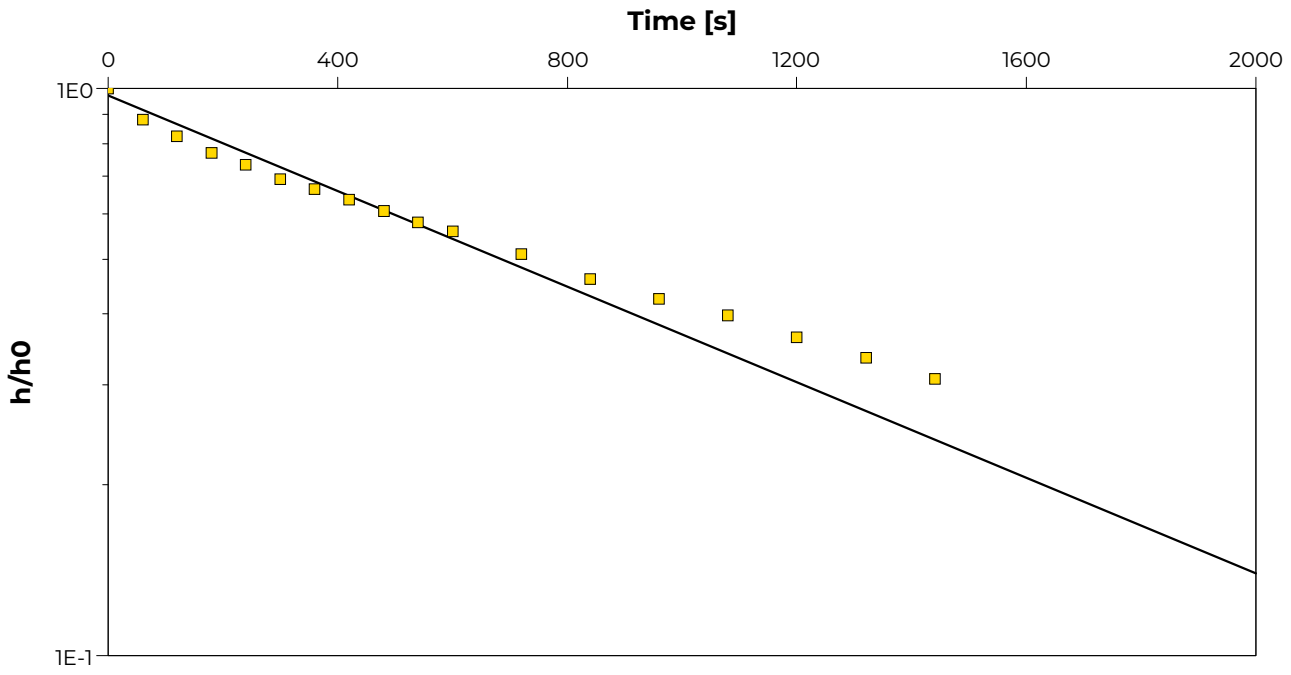


[illegible]		
[illegible]	[illegible]	
[illegible]	[illegible]	

Well Depth:	14.55 m
Screened Interval:	2.55 - 14.55 m
[illegible] Diameter:	50 mm
Bore Diameter [illegible]	125 mm

Douglas PARTNERS GROUNDED EXPERTISE	**Slug Test Analysis Report**
	Project [illegible]
	[illegible]

[illegible]		[illegible]
[illegible]		[illegible]8/04/2022
[illegible]	[illegible]	[illegible]
[illegible]		



[illegible]		
[illegible]	[illegible]	
[illegible]	[illegible]	

Well Depth:	14.55 m
Screened Interval:	2.55 - 14.55 m
[illegible] Diameter:	50 mm
Bore Diameter [illegible]	125 mm

Douglas Partners — Grounded Expertise	**Slug Test Analysis Report**
	[illegible] Expansion
	Project [illegible]
	[illegible]

[illegible]		[illegible]
[illegible]		[illegible]/04/2022
[illegible]	[illegible]	[illegible]
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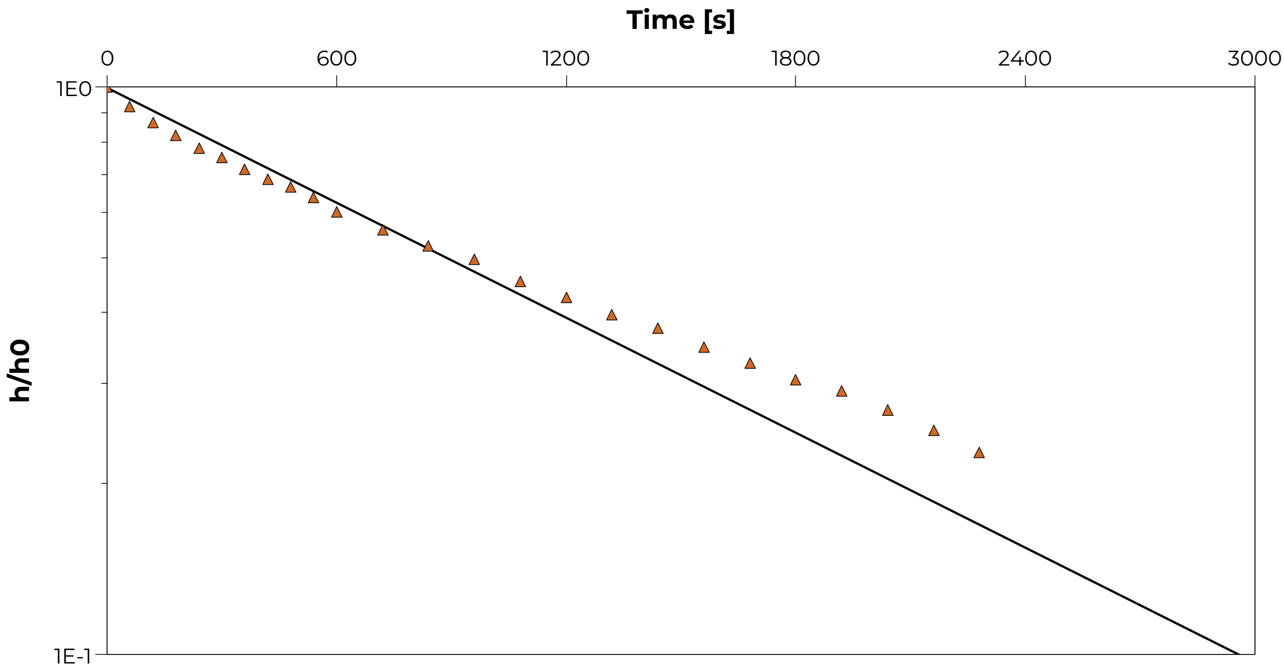
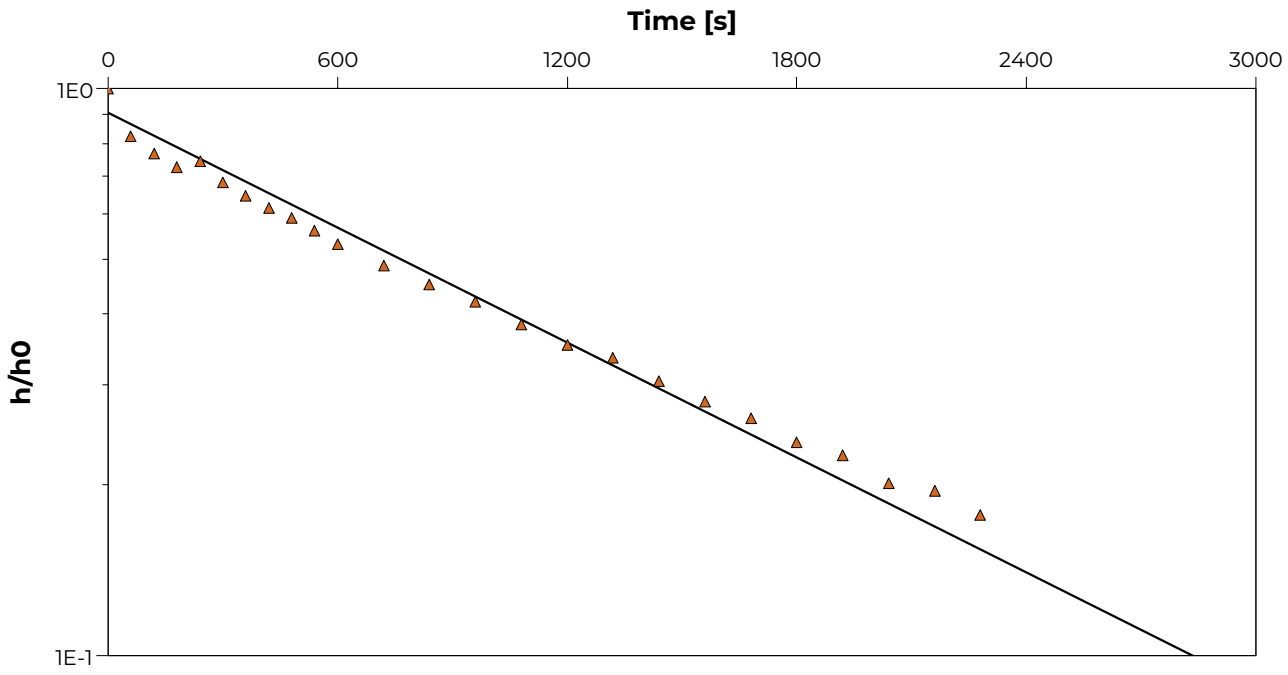


[illegible]		
[illegible]	[illegible]	
[illegible]	[illegible]	

Well Depth:	14.55 m
Screened Interval:	2.55 - 14.55 m
[illegible] Diameter:	50 mm
Bore Diameter	125 mm

Douglas PARTNERS GROUNDED EXPERTISE	**Slug Test Analysis Report**
	Project: Proposed Wollongong Private Hospital Expansion
	Project Number: 73522.13
	Client: AA Crown Holdings Pty Ltd

Location: 366 - 368 Crown Street & 15 - 23 Urunga Parade, Wollongong NSW		Test Well: 302-4
Test Conducted by: ZAK		Test Date: 8/04/2022
Analysis Performed by: ZAK	302-4	Analysis Date: 19/03/2025
Aquifer Thickness:		



Calculation using Hvorslev

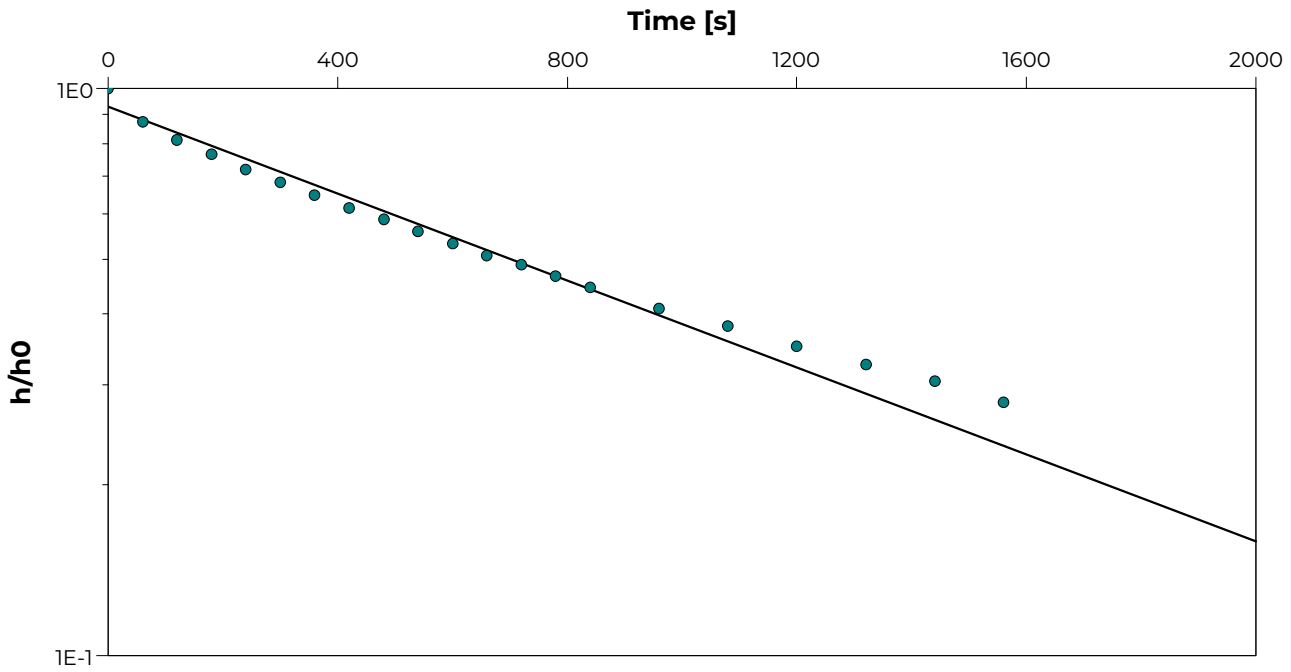
Observation Well	Hydraulic Conductivity [m/s]	
302-4	2.40×10^{-7}	

Well Depth:	14.55 m
Screened Interval:	2.55 - 14.55 m
□ □□□Diameter:	50 mm
Bore Diameter□	125 mm

Slug Test Analysis Report

Project

		08/04/2022



Well Depth:	14.55 m
Screened Interval:	2.55 - 14.55 m
Diameter:	50 mm
Bore Diameter	125 mm

	Slug Test Analysis Report
	[illegible] Expansion
	Project [illegible]
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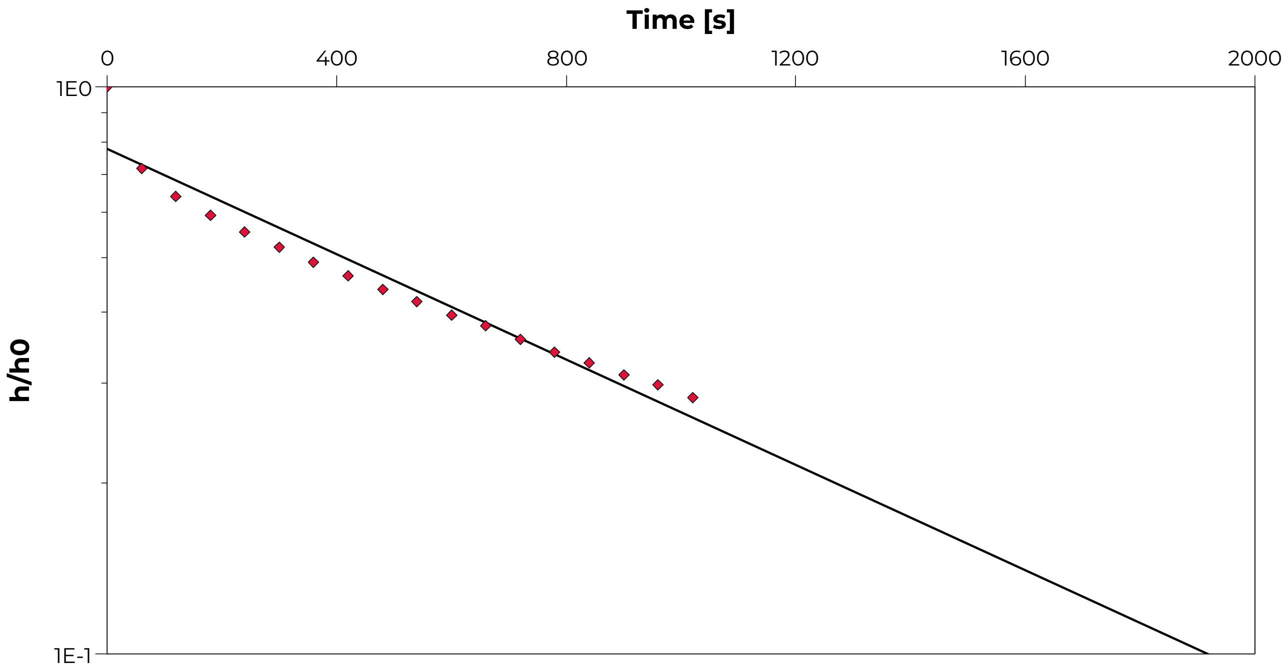

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Well Depth:	14.55 m
Screened Interval:	2.55 - 14.55 m
[illegible] Diameter:	50 mm
Bore Diameter[illegible]	125 mm

	Slug Test Analysis Report
	[illegible] Expansion
	Project [illegible]
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[illegible]		[illegible]
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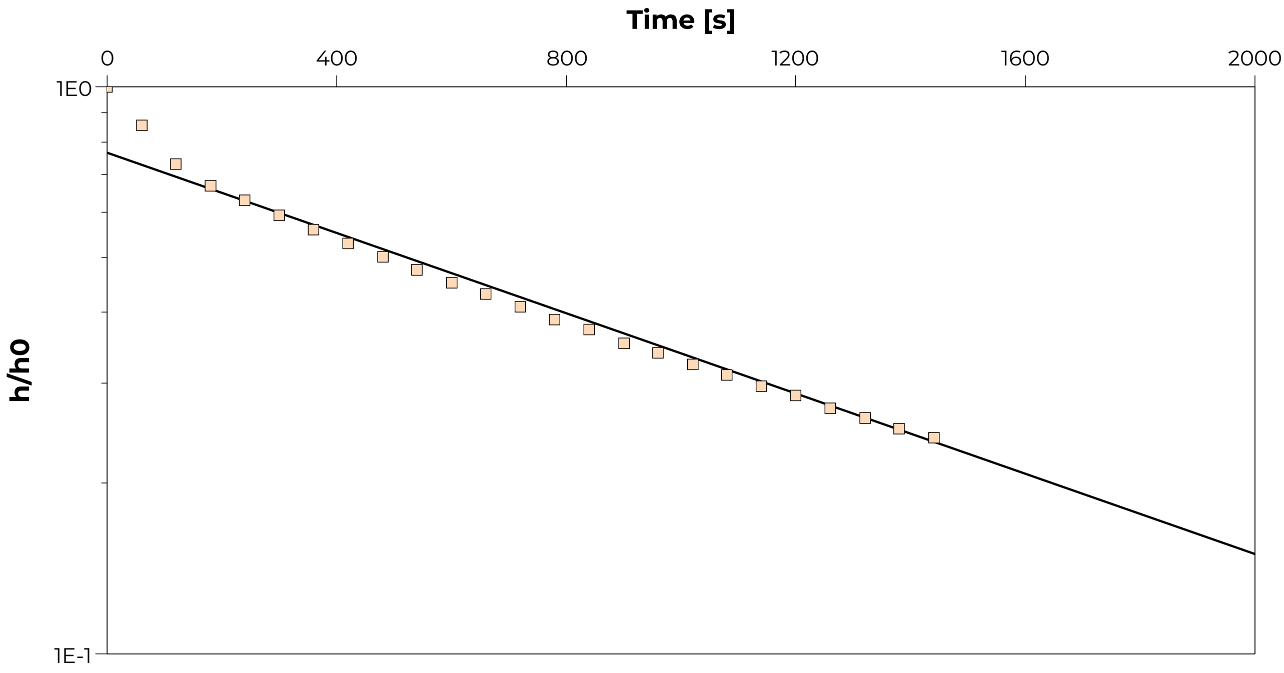

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Well Depth:	14.55 m
Screened Interval:	2.55 - 14.55 m
[illegible] Diameter:	50 mm
Bore Diameter[illegible]	125 mm

Slug Test Analysis Report

[illegible] Expansion[illegible]

Project [illegible] 22[illegible]

[illegible]

[illegible]		[illegible] 2[illegible]
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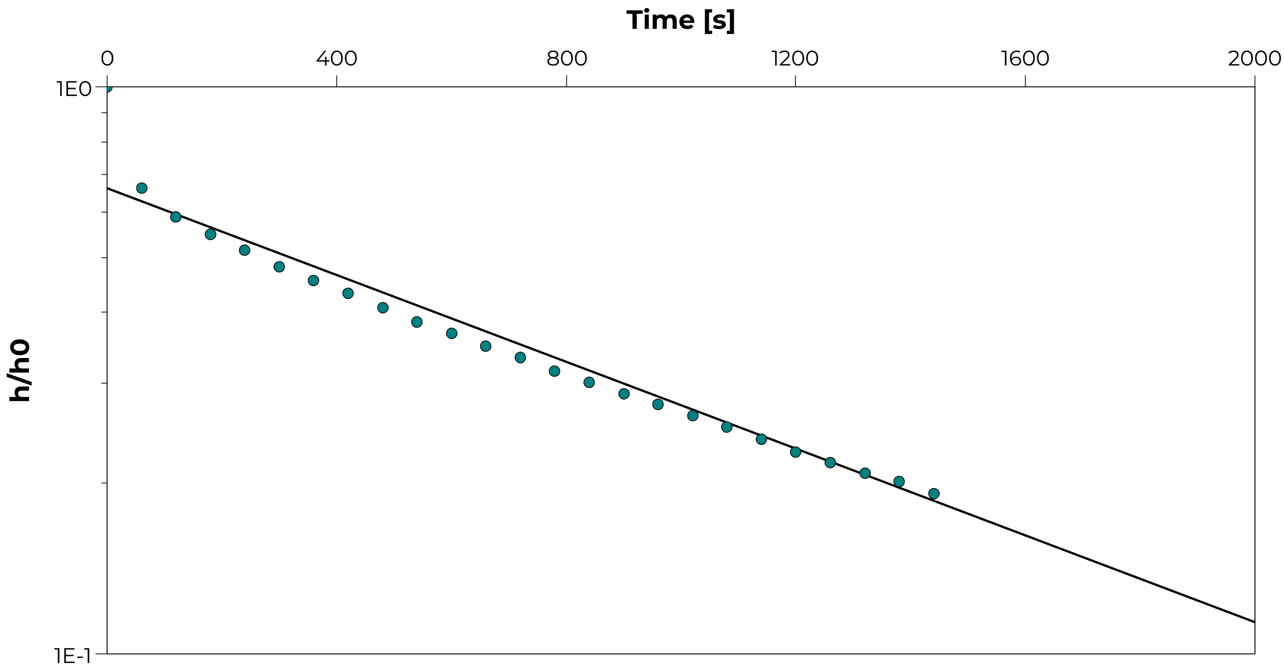
A[illegible]		



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Well Depth:	14.55 m
Screened Interval:	2.55 - 14.55 m
[illegible] Diameter:	50 mm
Bore Diameter[illegible]	125 mm

Douglas PARTNERS GROUNDED EXPERTISE	**Slug Test Analysis Report**
	Project [illegible]
	[illegible]

[illegible]		[illegible]
[illegible]		[illegible]
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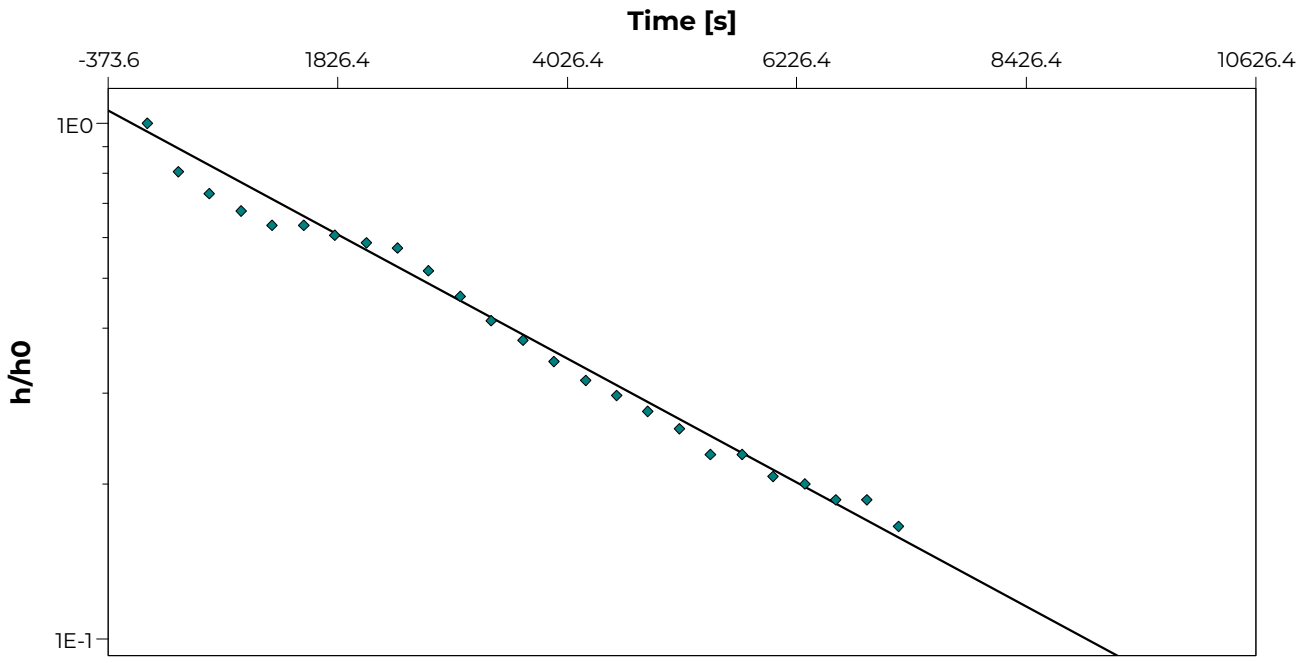
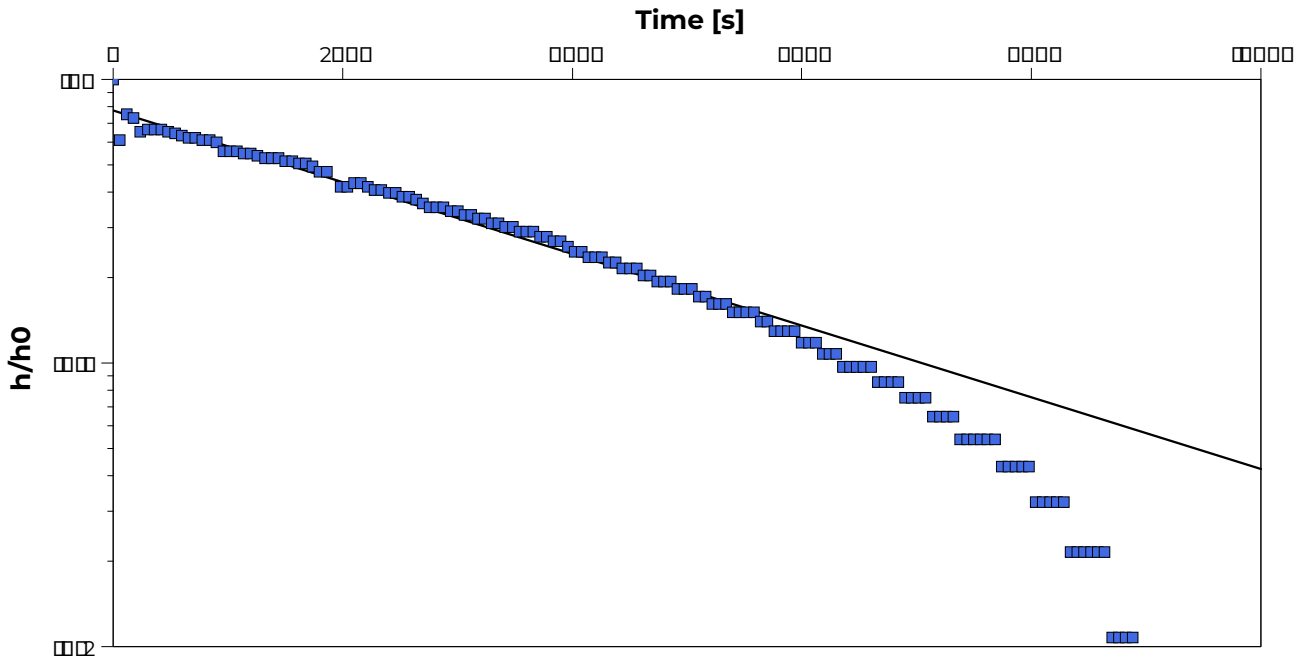


[illegible]		
[illegible]	[illegible]	
[illegible]	[illegible]	

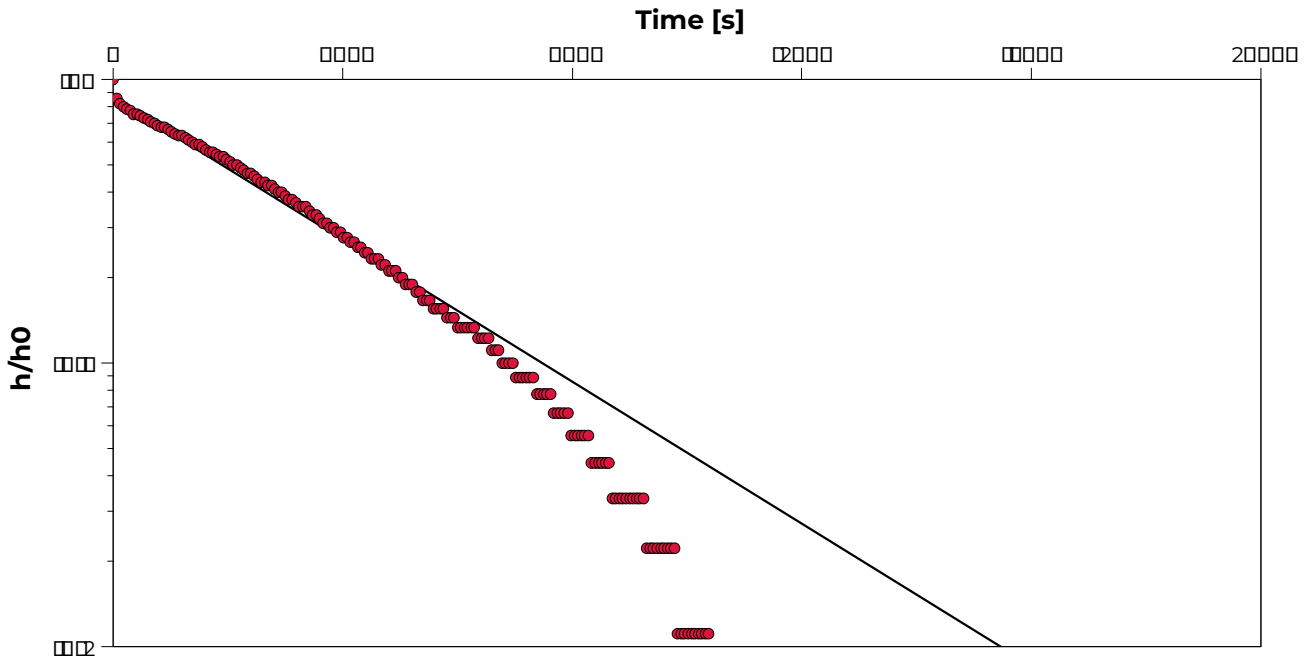
Well Depth:	16.75 m
Screened Interval:	1.75 - 16.75 m
[illegible] Diameter:	50 mm
Bore Diameter [illegible]	125 mm

Douglas PARTNERS GROUNDED EXPERTISE	**Slug Test Analysis Report**



Well Depth:	5.48 m
Screened Interval:	2.6 - 5.48 m
Diameter:	50 mm
Bore Diameter	125 mm

Slug Test Analysis Report



Well Depth:	m
Screened Interval:	- m
Diameter:	50 mm
Bore Diameter	125 mm

Appendix F

Results of Laboratory Testing

Table F1: Results of Laboratory Testing - Groundwater					Field ID	301	302	303	401
					Date	29 Mar 2022	29 Mar 2022	29 Mar 2022	20 Feb 2025
Analytes	Unit	PQL	ANZG (2018) Freshwater Slightly to Moderately Disturbed Systems DGVs	ANZECC 2000 SE Aust Triggers - Lowland River	Sydney Water Trade Wastewater Standard, 2023				
Field Parameters									
pH	pH	-		6.5-8	7 - 10	6.3	6.7	6.0	5.5
Electrical Conductivity	uS/cm	-		125 - 2,200		293.2	567	264.9	93.7
Temperature	C	-			<38	22.8	21.1	21.2	20.7
Redox	mV	-				140.9	143.3	183.4	-11.8
Dissolved Oxygen	mg/L	-				1.08	0.71	1.64	1.1
Metals									
Arsenic (filtered)	µg/L	1	13		1000	<1	<1	<1	<1
Cadmium (filtered)	µg/L	0.1	0.2		1000	<0.1	<0.1	<0.1	<0.1
Calcium (filtered)	mg/L	1				16	10	13	59
Chromium (III+VI) (filtered)	µg/L	1	1		3000	<1	<1	<1	<1
Copper (filtered)	µg/L	1	1.4		5000	<1	<1	2	1
Lead (filtered)	µg/L	1	3.4		2000	<1	<1	<1	<1
Mercury (filtered)	µg/L	0.05	0.06		30	<0.05	<0.05	<0.05	<0.05
Nickel (filtered)	µg/L	1	11		3000	21	<1	5	150
Potassium (filtered)	mg/L	500				2	0.7	3	12
Zinc (filtered)	µg/L	1	8			120	<1	77	24
Inorganics									
Hardness (filtered)	mgCaCO3/L					77	78	66	230
Alkalinity (Bicarbonate as CaCO3)	mg/L	5				110	240	63	830
Alkalinity (Carbonate as CaCO3)	mg/L	5				<5	<5	<5	<5
Alkalinity (Hydroxide) as CaCO3	mg/L	5				<5	<5	<5	<5
Alkalinity (total) as CaCO3	mg/L	5				110	240	63	830
Ammonia as N (filtered)	mg/L	0.005	0.9		100	0.023	<0.005	0.03	0.072
Chloride	mg/L	1				73	97	58	25
Ionic Balance	%					-2	-1	-2	-27
Kjeldahl Nitrogen Total	mg/L	0.1			250	0.2	0.8	0.5	2
Nitrate (as N) (filtered)	mg/L	0.005				1.8	3.3	1.6	0.008
Nitrite (as N) (filtered)	mg/L	0.005				0.007	0.011	<0.005	0.006
Organic Nitrogen as N	mg/L	0.2				<0.2	0.8	0.5	0.01
Nitrogen (Total Oxidised)	mg/L	0.005		0.04		1.9	3.3	1.7	0.01
Nitrogen (Total)	mg/L	0.1		0.35		2	4.1	2.2	2
Total Phosphorus (Organic Phosphate)	mg/L	0.05		0.025	50	0.5	<0.05	0.2	15
Reactive Phosphorus as P (Orthophosphate as P) (filtered)	mg/L	0.005		0.02		<0.005	0.03	<0.005	<0.005
Sodium (filtered)	mg/L	0.5				88	170	55	140
Sodium Absorption Ratio	-	0.01				4.3	8.1	2.1	3.9
Sulphate	mg/L	1			2,000	63	66	51	69
Total Suspended Solids (Lab)	mg/L	5			600	840	13	200	14,000
Organic									
Total Organic Carbon	mg/L	1			1,200	3	1	5	22
TRH									
C6-C10 Fraction (F1)	µg/L	10			Total TPH 10,000	<10	<10	<10	<10
C6-C10 (F1 minus BTEX)	µg/L	10				<10	<10	<10	<10
>C10-C16 Fraction (F2)	µg/L	50				<50	<50	<50	110
>C10-C16 Fraction (F2 minus Naphthalene)	µg/L	50				<50	<50	<50	110
>C16-C34 Fraction (F3)	µg/L	100				<100	<100	<100	220
>C34-C40 Fraction (F4)	µg/L	100				<100	<100	<100	<100
>C10-C40 Fraction (Sum)	µg/L	50				<50	<50	<50	340
TRH									
C6-C9 Fraction	µg/L	10				<10	<10	<10	<10
C10-C14 Fraction	µg/L	50				<50	<50	<50	110
C15-C28 Fraction	µg/L	100				<100	<100	<100	150
C29-C36 Fraction	µg/L	50				<100	<100	<100	100
BTEX									
Naphthalene (VOC)	µg/L	1	16			<1	<1	<1	<1
Benzene	µg/L	1	950		100	<1	<1	<1	<1
Toluene	µg/L	1	180		500	<1	<1	<1	<1
Ethylbenzene	µg/L	1	80		1,000	<1	<1	<1	<1
Xylene (m & p)	µg/L	2	75		1,000	<2	<2	<2	<2
Xylene (o)	µg/L	1	350		1,000	<1	<1	<1	<1
PAH									
Acenaphthene	µg/L	0.1			5,000	<1	<1	<1	<0.1
Acenaphthylene	µg/L	0.1				<1	<1	<1	<0.1
Anthracene	µg/L	0.1	0.01			<1	<1	<1	<0.1
Benzo(a)anthracene	µg/L	0.1				<1	<1	<1	<0.1
Benzo(a) pyrene	µg/L	0.1	0.1			<1	<1	<1	<0.1
Benzo(b+j+k)fluoranthene	mg/L	0.2				<2	<2	<2	<0.2
Benzo(g,h,i)perylene	µg/L	0.1				<1	<1	<1	<0.1
Chrysene	µg/L	0.1				<1	<1	<1	<0.1
Dibenz(a,h)anthracene	µg/L	0.1				<1	<1	<1	<0.1
Fluoranthene	µg/L	0.1	1			<1	<1	<1	<0.1
Fluorene	µg/L	0.1				<1	<1	<1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	0.1				<1	<1	<1	<0.1
Naphthalene	µg/L	0.2	16			<1	<1	<1	0.1
Phenanthrene	µg/L	0.1	0.6			<1	<1	<1	0.2
Pyrene	µg/L	0.1				<1	<1	<1	<0.1
Benzo(a)pyrene TEQ	µg/L	0.5				<5	<5	<5	<0.5
PAHs (Sum of positives)	µg/L	0.1				NIL	NIL	NIL	0.34

Environmental Standards
ANZG (DP Updated), August 2023, ANZG (2018) Freshwater Slightly to Moderately Disturbed Systems DGVs
DoE, 2000, ANZECC 2000 SE Aust Triggers - Lowland River
Sydney Water (2023) Trade Wastewater Acceptance Standarc

Notes
Xylene (m and p) critera adopting critera for xylene (m) (conservative)
Total Chromium critera adopting critera for CrVI (conservative)
Arsenic critera adopting critera for AsV (conservative)
*Freshwater criteria is 0.8ug/L fo Aluminium when pH<6.5 unknown LOP and 55ug/L when pH>6.5

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CERTIFICATE OF ANALYSIS 292244

Client Details

Client	Douglas Partners Unanderra
Attention	Roderick Haselden, Zachariah Kraich
Address	Unit 1, 1 Luso Drive, Unanderra, NSW, 2526

Sample Details

Your Reference	**73522.09, Wollongong**
Number of Samples	4 Water
Date samples received	30/03/2022
Date completed instructions received	31/03/2022

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	01/04/2022
Date of Issue	01/04/2022

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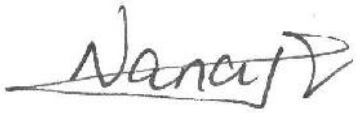
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Greta Petzold, Senior Report Coordinator
Hannah Nguyen, Metals Supervisor
Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water				
Our Reference		292244-1	292244-2	292244-3
Your Reference	UNITS	301	302	303
Date Sampled		29/03/2022	29/03/2022	29/03/2022
Type of sample		Water	Water	Water
Date extracted	-	01/04/2022	01/04/2022	01/04/2022
Date analysed	-	01/04/2022	01/04/2022	01/04/2022
TRH C_6 - C_9	µg/L	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10
Benzene	µg/L	<1	<1	<1
Toluene	µg/L	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
o-xylene	µg/L	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	104	108	106
Surrogate toluene-d8	%	107	110	108
Surrogate 4-BFB	%	88	88	88

svTRH (C10-C40) in Water				
Our Reference		292244-1	292244-2	292244-3
Your Reference	UNITS	301	302	303
Date Sampled		29/03/2022	29/03/2022	29/03/2022
Type of sample		Water	Water	Water
Date extracted	-	01/04/2022	01/04/2022	01/04/2022
Date analysed	-	01/04/2022	01/04/2022	01/04/2022
TRH C_{10} - C_{14}	µg/L	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50
Surrogate o-Terphenyl	%	91	93	92

PAHs in Water				
Our Reference		292244-1	292244-2	292244-3
Your Reference	UNITS	301	302	303
Date Sampled		29/03/2022	29/03/2022	29/03/2022
Type of sample		Water	Water	Water
Date extracted	-	01/04/2022	01/04/2022	01/04/2022
Date analysed	-	01/04/2022	01/04/2022	01/04/2022
Naphthalene	µg/L	<1	<1	<1
Acenaphthylene	µg/L	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1
Fluorene	µg/L	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1
Anthracene	µg/L	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1
Pyrene	µg/L	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1
Chrysene	µg/L	<1	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	80	77	80

HM in water - dissolved				
Our Reference		292244-1	292244-2	292244-3
Your Reference	UNITS	301	302	303
Date Sampled		29/03/2022	29/03/2022	29/03/2022
Type of sample		Water	Water	Water
Date prepared	-	01/04/2022	01/04/2022	01/04/2022
Date analysed	-	01/04/2022	01/04/2022	01/04/2022
Arsenic-Dissolved	µg/L	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	2
Lead-Dissolved	µg/L	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	21	<1	5
Zinc-Dissolved	µg/L	120	<1	77

Ion Balance				
Our Reference	UNITS	292244-1	292244-2	292244-3
Your Reference		301	302	303
Date Sampled		29/03/2022	29/03/2022	29/03/2022
Type of sample		Water	Water	Water
Date prepared	-	01/04/2022	01/04/2022	01/04/2022
Date analysed	-	01/01/2022	01/01/2022	01/01/2022
Calcium - Dissolved	mg/L	16	10	13
Potassium - Dissolved	mg/L	2	0.7	3
Sodium - Dissolved	mg/L	88	170	55
Magnesium - Dissolved	mg/L	8.7	13	8.2
Hardness	mgCaCO 3 /L	77	78	66
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	110	240	63
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	110	240	63
Sulphate, SO4	mg/L	63	66	51
Chloride, Cl	mg/L	73	97	58
Ionic Balance	%	-2.0	-1.0	-2.0

Miscellaneous Inorganics				
Our Reference	UNITS	292244-1	292244-2	292244-3
Your Reference		301	302	303
Date Sampled		29/03/2022	29/03/2022	29/03/2022
Type of sample		Water	Water	Water
Date prepared	-	31/03/2022	31/03/2022	31/03/2022
Date analysed	-	31/03/2022	31/03/2022	31/03/2022
Total Suspended Solids	mg/L	840	13	200
Total Organic Carbon	mg/L	3	1	5
Sodium Adsorption Ratio		4.3	8.1	2.1
Total Nitrogen in water	mg/L	2.0	4.1	2.2
TKN in water	mg/L	0.2	0.8	0.5
Nitrate as N in water	mg/L	1.8	3.3	1.6
Nitrite as N in water	mg/L	0.007	0.011	<0.005
NOx as N in water	mg/L	1.9	3.3	1.7
Ammonia as N in water	mg/L	0.023	<0.005	0.030
Organic Nitrogen as N	mg/L	<0.2	0.8	0.5
Phosphate as P in water	mg/L	<0.005	0.03	<0.005

Metals in Waters - Acid extractable				
Our Reference		292244-1	292244-2	292244-3
Your Reference	UNITS	301	302	303
Date Sampled		29/03/2022	29/03/2022	29/03/2022
Type of sample		Water	Water	Water
Date prepared	-	01/04/2022	01/04/2022	01/04/2022
Date analysed	-	01/04/2022	01/04/2022	01/04/2022
Phosphorus - Total	mg/L	0.5	<0.05	0.2

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-020	Calcium and Magnesium analysed by ICP-AES and SAR calculated.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
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-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: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			01/04/2022	[NT]	[NT]	[NT]	[NT]	01/04/2022	[NT]
Date analysed	-			01/04/2022	[NT]	[NT]	[NT]	[NT]	01/04/2022	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	114	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	122	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	125	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	108	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	106	[NT]	[NT]	[NT]	[NT]	104	[NT]
Surrogate toluene-d8	%		Org-023	109	[NT]	[NT]	[NT]	[NT]	109	[NT]
Surrogate 4-BFB	%		Org-023	89	[NT]	[NT]	[NT]	[NT]	106	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			01/04/2022	[NT]	[NT]	[NT]	[NT]	01/04/2022	[NT]
Date analysed	-			01/04/2022	[NT]	[NT]	[NT]	[NT]	01/04/2022	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	89	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	85	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	94	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	89	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	85	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	94	[NT]
Surrogate o-Terphenyl	%		Org-020	94	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			01/04/2022	[NT]	[NT]	[NT]	[NT]	01/04/2022	[NT]
Date analysed	-			01/04/2022	[NT]	[NT]	[NT]	[NT]	01/04/2022	[NT]
Naphthalene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	76	[NT]
Acenaphthylene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Fluorene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	76	[NT]
Phenanthrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Anthracene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Pyrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	79	[NT]
Benzo(a)anthracene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	81	[NT]
Benzo(b,j+k)fluoranthene	µg/L	2	Org-022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	70	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	73	[NT]	[NT]	[NT]	[NT]	82	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	292244-2
Date prepared	-			01/04/2022	1	01/04/2022	01/04/2022		01/04/2022	01/04/2022
Date analysed	-			01/04/2022	1	01/04/2022	01/04/2022		01/04/2022	01/04/2022
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	97	97
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	96	97
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	96	87
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	97	85
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	95	86
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	102	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	21	21	0	96	87
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	120	120	0	97	103

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	292244-2
Date prepared	-			01/04/2022	1	01/04/2022	01/04/2022		01/04/2022	01/04/2022
Date analysed	-			01/04/2022	1	01/01/2022	01/01/2022		01/04/2022	01/04/2022
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	16	16	0	93	102
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	2	2	0	91	89
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	88	89	1	116	#
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	8.7	8.8	1	93	95
Hardness	mgCaCO 3 /L	3		<3	1	77	77	0	[NT]	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	110	110	0	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	110	110	0	103	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	63	[NT]		98	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	1	73	[NT]		100	[NT]
Ionic Balance	%		Inorg-040	[NT]	1	-2.0	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			31/03/2022	1	31/03/2022	31/03/2022		31/03/2022	[NT]
Date analysed	-			31/03/2022	1	31/03/2022	31/03/2022		31/03/2022	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	840	860	2	95	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	3	[NT]		100	[NT]
Sodium Adsorption Ratio		0.01	Metals-020	<0.01	1	4.3	4.4	2	100	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	2.0	[NT]		104	[NT]
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	0.2	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	1.8	[NT]		97	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.007	[NT]		89	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	1.9	[NT]		97	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.023	[NT]		118	[NT]
Organic Nitrogen as N	mg/L	0.2		<0.2	1	<0.2	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	[NT]		97	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	292244-2
Date prepared	-			01/04/2022	1	01/04/2022	01/04/2022		01/04/2022	01/04/2022
Date analysed	-			01/04/2022	1	01/04/2022	01/04/2022		01/04/2022	01/04/2022
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	1	0.5	0.5	0	83	94

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

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

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Ion Balance - # 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.

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12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
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www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Unanderra
Attention	Roderick Haselden, Zachariah Kraich

Sample Login Details

Your reference	73522.09, Wollongong
Envirolab Reference	292244
Date Sample Received	30/03/2022
Date Instructions Received	30/03/2022
Date Results Expected to be Reported	On Hold

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	4 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	19
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHsin Water	Organochlorine Pesticides in Water	OP Pesticides in Water	PCBs in Water	Total Phenolicsin Water	HM in water - dissolved	pH	Electrical Conductivity	Total Suspended Solids	Total Dissolved Solids(grav)	Oil & Grease (LLE)	Total Cyanide	Turbidity	On Hold
301																✓
302																✓
303																✓
BD1																✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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CERTIFICATE OF ANALYSIS 373666

Client Details

Client	Douglas Partners Unanderra
Attention	Zachariah Kraich
Address	Unit 1, 1 Luso Drive, Unanderra, NSW, 2526

Sample Details

Your Reference	**73522.13 Wollongong**
Number of Samples	1 Water
Date samples received	21/02/2025
Date completed instructions received	21/02/2025

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	28/02/2025
Date of Issue	28/02/2025

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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
Jack Wallis, Senior Chemist
Liam Timmins, Organics Supervisor
Priya Samarawickrama, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water		
Our Reference		373666-1
Your Reference	UNITS	401
Date Sampled		20/02/2025
Type of sample		Water
Date extracted	-	24/02/2025
Date analysed	-	24/02/2025
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	104
Surrogate Toluene-d8	%	97
Surrogate 4-Bromofluorobenzene	%	104

svTRH (C10-C40) in Water		
Our Reference		373666-1
Your Reference	UNITS	401
Date Sampled		20/02/2025
Type of sample		Water
Date extracted	-	25/02/2025
Date analysed	-	26/02/2025
TRH C_{10} - C_{14}	µg/L	110
TRH C_{15} - C_{28}	µg/L	150
TRH C_{29} - C_{36}	µg/L	100
Total +ve TRH (C10-C36)	µg/L	360
TRH >C_{10} - C_{16}	µg/L	110
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	110
TRH >C_{16} - C_{34}	µg/L	220
TRH >C_{34} - C_{40}	µg/L	<100
Total +ve TRH (>C10-C40)	µg/L	340
Surrogate o-Terphenyl	%	87

PAHs in Water		
Our Reference		373666-1
Your Reference	UNITS	401
Date Sampled		20/02/2025
Type of sample		Water
Date extracted	-	25/02/2025
Date analysed	-	26/02/2025
Naphthalene	µg/L	0.1
Acenaphthylene	µg/L	<0.1
Acenaphthene	µg/L	<0.1
Fluorene	µg/L	<0.1
Phenanthrene	µg/L	0.2
Anthracene	µg/L	<0.1
Fluoranthene	µg/L	<0.1
Pyrene	µg/L	<0.1
Benzo(a)anthracene	µg/L	<0.1
Chrysene	µg/L	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2
Benzo(a)pyrene	µg/L	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5
Total +ve PAH's	µg/L	0.34
Surrogate p-Terphenyl-d14	%	92

HM in water - dissolved		
Our Reference		373666-1
Your Reference	UNITS	401
Date Sampled		20/02/2025
Type of sample		Water
Date prepared	-	26/02/2025
Date analysed	-	26/02/2025
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	<1
Copper-Dissolved	µg/L	1
Lead-Dissolved	µg/L	<1
Mercury-Dissolved	µg/L	<0.05
Nickel-Dissolved	µg/L	150
Zinc-Dissolved	µg/L	24

Miscellaneous Inorganics		
Our Reference		373666-1
Your Reference	UNITS	401
Date Sampled		20/02/2025
Type of sample		Water
Date prepared	-	24/02/2025
Date analysed	-	24/02/2025
Total Suspended Solids	mg/L	14,000
Total Organic Carbon	mg/L	22
Sodium Adsorption Ratio	-	3.9
Nitrate as N in water	mg/L	0.008
Nitrite as N in water	mg/L	0.006
Ammonia as N in water	mg/L	0.072
NOx as N in water	mg/L	0.01
Total Nitrogen in water	mg/L	2.0
Phosphate as P in water	mg/L	<0.005
TKN in water	mg/L	2.0
Organic Nitrogen as N	mg/L	1.9

Ion Balance		
Our Reference		373666-1
Your Reference	UNITS	401
Date Sampled		20/02/2025
Type of sample		Water
Date prepared	-	21/02/2025
Date analysed	-	21/02/2025
Calcium - Dissolved	mg/L	59
Potassium - Dissolved	mg/L	12
Sodium - Dissolved	mg/L	140
Magnesium - Dissolved	mg/L	19
Hardness (calc) equivalent $CaCO_3$	mg/L	230
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	830
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	830
Sulphate, SO4	mg/L	69
Chloride, Cl	mg/L	25
Ionic Balance	%	-27

Metals in Waters - Acid extractable		
Our Reference		373666-1
Your Reference	UNITS	401
Date Sampled		20/02/2025
Type of sample		Water
Date prepared	-	25/02/2025
Date analysed	-	26/02/2025
Phosphorus - Total	mg/L	15

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES. Total Phosphate determined stochiometrically from Phosphorus (assumed to be present as Phosphate). Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.
Metals-020	Calcium and Magnesium analysed by ICP-AES and SAR calculated.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-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: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			24/02/2025	[NT]	[NT]	[NT]	[NT]	24/02/2025	[NT]
Date analysed	-			24/02/2025	[NT]	[NT]	[NT]	[NT]	24/02/2025	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	107	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	107	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	108	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	109	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	85	[NT]	[NT]	[NT]	[NT]	91	[NT]
Surrogate Toluene-d8	%		Org-023	98	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	103	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			25/02/2025	1	25/02/2025	25/02/2025		25/02/2025	[NT]
Date analysed	-			26/02/2025	1	26/02/2025	26/02/2025		26/02/2025	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	110	110	0	124	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	150	160	6	127	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	100	190	62	129	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	1	110	110	0	124	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	1	220	290	27	127	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	129	[NT]
Surrogate o-Terphenyl	%		Org-020	92	1	87	81	7	137	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			25/02/2025	1	25/02/2025	25/02/2025		25/02/2025	[NT]
Date analysed	-			26/02/2025	1	26/02/2025	26/02/2025		26/02/2025	[NT]
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	0.1	0.2	67	82	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	83	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	0.2	67	87	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	0.2	0.4	67	80	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	75	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	83	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	91	1	92	88	4	91	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W5	[NT]
Date prepared	-			26/02/2025	[NT]	[NT]	[NT]	[NT]	26/02/2025	[NT]
Date analysed	-			26/02/2025	[NT]	[NT]	[NT]	[NT]	26/02/2025	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	117	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			24/02/2025	1	24/02/2025	24/02/2025		24/02/2025	[NT]
Date analysed	-			24/02/2025	1	24/02/2025	24/02/2025		24/02/2025	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	14000	14000	0	97	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	22	[NT]		102	[NT]
Sodium Adsorption Ratio	-	0.01	Metals-020	<0.01	1	3.9	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.008	[NT]		99	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.006	[NT]		96	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.072	[NT]		88	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.01	[NT]		99	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	2.0	[NT]		115	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	[NT]		87	[NT]
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	2.0	[NT]		[NT]	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	1	1.9	[NT]		[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			21/02/2025	[NT]	[NT]	[NT]	[NT]	21/02/2025	[NT]
Date analysed	-			21/02/2025	[NT]	[NT]	[NT]	[NT]	21/02/2025	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	90	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	86	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	88	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	110	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			26/02/2025	[NT]	[NT]	[NT]	[NT]	26/02/2025	[NT]
Date analysed	-			26/02/2025	[NT]	[NT]	[NT]	[NT]	26/02/2025	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	99	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

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

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

vTRH & BTEXN in Water NEPM - Sample(s) 373666-1 was received with headspace, analytical results may be affected.

Dissolved Metals: no filtered, preserved sample was received, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.
Note: there is a possibility some elements may be underestimated.

The mass inbalance may be caused by other ions that have not been measured.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Unanderra
Attention	Zachariah Kraich

Sample Login Details

Your reference	73522.13 Wollongong
Envirolab Reference	373666
Date Sample Received	21/02/2025
Date Instructions Received	21/02/2025
Date Results Expected to be Reported	28/02/2025

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	10
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Sediment + headspace in vials

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
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Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	HM in water - dissolved	Total Suspended Solids	Total Organic Carbon	Sodium Adsorption Ratio	Nitrate as N in water	Nitrite as N in water	Ammonia as N in water	NOx as N in water	Total Nitrogen in water	Phosphate as P in water	TKN in water	Organic Nitrogen as N	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hardness (calc) equivalent CaCO3	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	Metals in Waters -Acid extractable
401	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Douglas PARTNERS | GROUNDED EXPERTISE

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	73522.13	**Suburb:**	Wollongong	**To:**	Envirolab Services
Project Manager:	Zachariah Kraich	**Order Number:**		**Sampler:** EB	12 Ashley St, Chatswood NSW 2067
Email:	zachariah.kraich@douglaspartners.com.au			**Attn:**	Sample Receipt
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				(02) 9910 6200 samplereceipt@envirolab.com
Prior Storage:	☑ Fridge ☐ Freezer ☐ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☑ No ☐ Yes (If YES, then handle, transport and store in accordance with FPM HAZID)		

Lab ID	Sample ID: Location / Other ID	Sample ID: Depth From	Sample ID: Depth To	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Combo 3 (dissolved)	TSS, TOC & major anions	SAR & major cations	Reactive phosphorous	Nutrient Suite	Total N, Total P & PO4	Ionic Balance				Notes/ Preservation/ Additional Requirements
1	401			20/02/25	W	G&P	X	X	X	X	X	X	X				please filter

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

ENVIROLAB

Job No: 373660
Date Received: 21/2/25
Time Received: 1050
Received By: CW
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse:	(As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)		
Number of samples in esky:	1 (8 bottles)	**Transported to laboratory by:**	First Choice
Send results to:	Douglas Partners Pty Ltd		
Address:	1/1 Luso Drive, Unanderra NSW 2526	**Phone:**	(02) 4271 1836
Relinquished by:	EB	**Date:**	20/02/2025 **Signed:**

LAB RECEIPT

Lab Ref. No:	
Received by:	C.W 21/2/25
Date & Tim	21/2/25 1050
Signed:	CW

Appendix G

Water NSW Water License Fact Sheet

Fact sheet

Exemptions

Construction dewatering

This fact sheet provides information to local authorities and applicants seeking development consent that may involve dewatering activities. It outlines exemptions from the need to obtain certain approvals/licences under the *Water Management Act 2000* (WMA). This fact sheet should be read in conjunction with the Dewatering information for councils and applicants fact sheet.

If intending to rely on one of the exemptions below, it is necessary to understand requirements that may involve recording water extraction and the time limits that apply to the exemption. **It is important to obtain any further advice before commencing the development application process.**

Note that as part of dewatering works you may need other approvals included under the *Local Government Act 1993* or *Roads Act 1993* to dispose of the water into council drains, use any part of the public footpath or carriageway or undertake any work within the public road.

There are two exemptions that apply from 6 December 2019.

Exemption 1: For extraction of less than 3 ML of water per year

When water extraction is taken as part of approved development (or exempt development), up to 3 ML of water may be taken in any one year (commencing on 1 July each year) without the need for:

- a water access licence (WAL)
- a water use approval.

A water supply work approval will be required for any works that are to be constructed or used to drain or pump the water.

To rely on this exemption, certain requirements must be met to record the water extraction and ensure that less than 3 ML of water is taken.

These requirements are set out in clause 21(6) of the *Water Management (General) Regulation 2018* and include requirements to:

- record the water take within 24 hours in the approved form and manner (see the Completion report fact sheet)
- keep the water take records for a period of five years
- provide the water take records to the Minister (or WaterNSW) by no later than 28 July for the year ending 1 July during which the water was taken.

Exemptions
Construction dewatering

Exemption 2: For construction activities that take water from the Botany Sands Groundwater Source only

When water extraction is taken as part of construction activities for a building, road or other infrastructure from the Botany Sands Groundwater Source, it may not require:

- a water access licence (WAL) or
- a water use approval

if a water supply work approval (e.g. for a pump) has already been obtained.

The water supply work approval is required to specify the maximum amount of water that can be taken during a year.

This exemption is only applicable until the earlier of:

- a controlled allocation of the water in the water source is opened by the Department of Industry, Planning and Environment (DPIE)
- 1 July 2021.

This exemption cannot be relied upon if construction activity is likely to continue beyond 1 July 2021 (unless the law changes).

In order to take water after 1 July 2021, the required water allocation must be purchased in the water market from that water source (or a transferable water source allocation).

To rely on the exemption, the conditions of the water supply work approval must be met and may require metering of the water take.

A water supply work approval will still need to be obtained for any works that are to be constructed or used to drain or pump the water.

Currently, the exemption only applies to the Botany Sands Groundwater Source, but other sources may be added and it is best to check with WaterNSW for the latest information.

More information

If you have any questions, please contact one of our friendly Customer Service team on 1300 662 077 or email Customer.Helpdesk@waternsw.com.au