
Specialist Advice

Report on Geotechnical Investigation

**Flide Street, Caringbah, Affordable
Housing**

2 Flide Street, Caringbah NSW

Prepared for Homes NSW

Project 233414.03

26 September 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		26 September 2025
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Executive Summary

This report has been prepared by Douglas Partners Pty Ltd (Douglas) on behalf of Homes NSW for a concurrent State Significant Development Application (SSD-84862461) and Planning Proposal for the redevelopment of existing social housing (the Project) at 2 Flide Street, Caringbah (the Site). The Project involves the construction of two residential flat buildings, 14 storeys and 8 storeys in height, to accommodate 164 social and affordable housing apartments, a communal room, plus a basement car park over two levels.

To support the Proposal, adjustments to the permissible height and floor space (FSR) ratio increase via an amendment to the Sutherland Shire Local Environment Plan 2015 are required.

The purpose of this Geotechnical Investigation Report is to provide geotechnical due-diligence comments, and together with a separate Groundwater Impact Assessment, address the Secretary's Environmental Assessment Requirements (SEARs) for the project issued on 6 June 2025 which identified the specific assessment requirements given below.

Item	Description of Requirement
12. Ground and Groundwater Conditions	Where required provide a Groundwater Impact Assessment in accordance with relevant Groundwater Guidelines. If the proposed development is on land identified as having high salinity or acid sulfate soil potential in an EPI provide a Salinity Management Plan or Acid Sulfate Soil Management Plan that includes appropriate management measures and strategies.

The investigation included the drilling of three deep geotechnical boreholes, and ten shallow boreholes for contamination assessment purposes. The details of the field work are presented in this report, together with comments and recommendations on geotechnical issues including excavations, shoring, foundations, groundwater, and aggressivity.

From a geotechnical perspective the site conditions are generally considered suitable for the proposed development. Established methods of design and construction, in common use in the Sydney area are likely to be appropriate to manage any potential geotechnical impacts within and beyond the site – as outlined within this report.

Based on published mapping and result of the current investigation, an Acid Sulfate Soils Management Plan (ASSMP) and Salinity Management Plan (SMP) are not considered to be required for the project.

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Report on Geotechnical Investigation

Flide Street, Caringbah, Affordable Housing

2 Flide Street, Caringbah NSW

1. Introduction

1.1 Overview

This report has been prepared by Douglas Partners Pty Ltd (Douglas) on behalf of Homes NSW for a concurrent State Significant Development Application (SSD-84862461) and Planning Proposal for the redevelopment of existing social housing (the Project) at 2 Flide Street, Caringbah (the Site). The Project involves the construction of two residential flat buildings, 14 storeys and 8 storeys in height, to accommodate 164 social and affordable housing apartments, a communal room, plus a basement car park over two levels.

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Based on published mapping an Acid Sulfate Soils Management Plan (ASSMP) and Salinity Management Plan (SMP) are not considered to be required for the project.

The investigation was undertaken in accordance with Douglas' proposal 233414.00.P.001.Rev3 dated 21 March 2025, based on the award of Contract LAHC 2024/622 Geotechnical Services Due Diligence – HAFF by Homes NSW; and including the approved variation dated 3 April 2025.

The aim of the investigation was to provide information on subsurface soil and groundwater conditions across the site in order to support response to geotechnical assessment element of the SEARS and provide due-diligence level geotechnical advice in relation to the proposed redevelopment, including the following:

- An assessment of the geotechnical suitability of the site for the proposed development; and
- Comment on geotechnical issues, including excavations, shoring, foundations, groundwater, and aggressivity.

The investigation included the drilling of three deep geotechnical boreholes, and ten shallow boreholes for contamination assessment purposes. The details of the field work are presented in this report, together with comments and recommendations on the items listed above.

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

1.2 Report context

The investigation works outlined in this report were undertaken in conjunction with investigation for contamination assessment purposes. Selected, geotechnically relevant information from the contamination investigation (particularly borehole logs) have been integrated into this report. Reference should be made to the Detailed Site (Contamination) Investigation (DSI) by Douglas for further details (report reference 233414.04.R.002).

The geotechnical investigation and reporting have been informed by the following information provided by Homes NSW:

- Survey drawings by Norton Survey Partners dated 20 May 2025;
- Architectural drawings by Bates Smart dated 19 September 2025; and
- Initial feedback (high level advice) from TfNSW in relation to development at the site (email from Ethan Chau of TfNSW, dated 26 May 2025).

2. Site description

2.1 General

The Site is located within the Sutherland Shire local government area (LGA) and is zoned R4 High Density Residential under the *Sutherland Shire Local Environmental Plan (SLEP) 2015*.

The Site has a total area of approximately 3 596 square metres (sqm) and is bounded by Flide Street to the north, Gardere Street to the west, Willawong Road to the east and the rail corridor for the Eastern Suburbs & Illawarra Line to the south.

The site is accessible by public transport, being within 400 m of the entrance to Caringbah Station and bus stops on The Kingsway which have frequent services to Sutherland, Miranda and Cronulla.

The Site currently comprises 38 social housing units within two 3 storey buildings with a single level basement car park. An aerial image of the Site is shown in Figure 1.



Figure 1: Aerial image of the site location

2.2 Topography

Reference to the provided survey drawings indicates that ground surface levels around the perimeter of the site generally slope gently down from approximately RL 35.5 (reduced level, in metres, to Australian Height Datum, AHD) at the north-eastern boundary to approximately RL 32 at the south-western site boundary.

In landscaped areas above the footprint of the existing basement, which occupies the majority of the site, ground surface levels are more typically at approximately RL 33.8 to RL 33.9, and are separated from the surrounding ground levels by block walls, basement ventilation structures, and the building superstructure. The underlying basement floor level is at approximately RL 30.2 to RL 30.8.

More broadly, the site is located in the upper parts of a hillside slope, with ground levels generally sloping down to the south-west, towards a gully feeding Kareena Creek.

Survey levels of the nearby T4 Eastern Suburbs & Illawarra rail line, located further down the slope, indicate that the rail level is at approximately RL 31.5 in the areas south of the site.

3. Published data

3.1 Geology

Reference to NSW Seamless geology indicates the site is mapped as being underlain by predominantly 'Hawkesbury Sandstone – mudstone' and some 'Hawkesbury Sandstone' in the south, as shown in Figure 2.

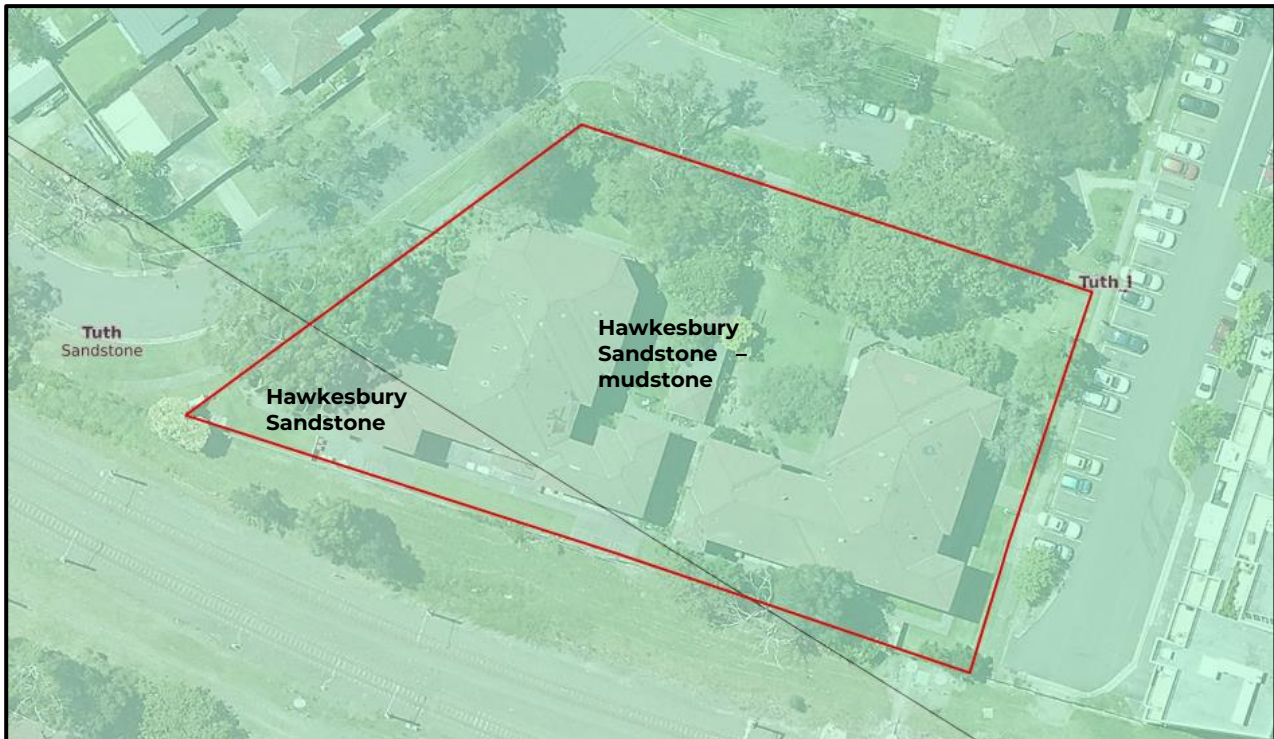


Figure 2: NSW Seamless Geology Map with Approximate Site Location (Red Outline)

The Hawkesbury Sandstone units comprise medium to coarse grained quartz sandstone, with minor shale and laminite lenses, aging from the Middle Triassic period. The mapped mudstone lens across the majority of the site typically comprises laminated mudstone and siltstone.

The results of the investigation are generally consistent with Hawkesbury Sandstone, but do include some siltstone beds and laminations.

3.2 Other mapping

A summary of selected other, relevant geotechnical mapping for the site is included in Table 1.

Table 1: Summary of Mapping

Map type	Site Conditions	Reference
Soil Landscape	Blacktown – residual soil landscape, typically red and brown podzolic soils in well drained areas.	Sydney 1:100 000 Soils Landscape sheet, (NSW DECC, 2008)

Map type	Site Conditions	Reference
Acid Sulfate Soil	No known risk – site is located outside of areas of known acid sulfate risk and outside of the EPI – Acid Sulfate Soil Class mapping.	Acid Sulfate Soil Risk, (NSW DECC, 1994-1998); Environmental Planning Instrument – Acid Sulfate Soils (NSW DPHI, 2019)
Salinity	No known risk – the site is located outside of the salinity potential zones identified in the Environmental Planning Instrument - salinity mapping and outside of the Western Sydney mapping.	Western Sydney Salinity Risk Mapping (NSW DPIE, 2002) Environmental Planning Instrument – Salinity (State of NSW & NSW DPHI, 2017)

Notes: * The results of field work indicate a geology of Hawkesbury Sandstone.

Based on the published mapping summarised in Table 1, an Acid Sulfate Soils Management Plan (ASSMP) and Salinity Management Plan (SMP) are not considered to be required for the project.

3.3 Surface water and groundwater

A search of the publicly available registered groundwater bore database indicated that there are four registered groundwater bores within 500 m of the site, summarised as follows:

- GW024170 – domestic bore installed in 1966, 250 m to the south-west, with a standing water level recorded at 1.2 m; and
- GW114287, GW114288, GW114289 – monitoring bores installed in 2012, 150 m to the north. No standing water levels are recorded.

Reference to the Greater Metropolitan Region Groundwater Sharing Plan (2023) indicates that underlying aquifers are of the Sydney Basin Central Groundwater Source.

4. Field work

4.1 Field work methods

The field work for the geotechnical investigation included three (3) deep boreholes across the site drilled using a DT250 geotechnical drilling rig operated by Ground Test. The field work was undertaken on 30 April 2025 to 2 May 2025. Shallow boreholes were drilled at a further 10 locations across the site for the purpose of contamination assessment, between 30 April 2025 and 9 May 2025. Both investigations were logged by an experienced geotechnical or environmental professional.

The deep boreholes (BH03, BH08 and BH11) were initially drilled using a hand auger, then 110 mm diameter solid flight auger and rotary drilling methods to advance to depths of between 1.0 m and 2.5 m. Regular standard penetration tests (SPTs) were undertaken within the soils in order to provide information on the engineering properties of the soils and to obtain soil samples for visual and tactile assessment and for laboratory testing. The boreholes were then continued into the underlying bedrock using diamond core drilling techniques to final depths of between 13.4 m

and 15.0 m. The strength of the recovered rock core was assessed by examination of the recovered rock cores and correlations with Point Load Strength Index ($IS_{(50)}$) tests.

The shallow boreholes (BH01, BH02, BH04, BH05, BH06, BH07, BH09, BH10, BH12B and BH13B) were augered to depths of 0.3 m to 1.4 m using a hand auger. BH12B and BH13B were located in the basement area. A supplementary bore (BH04A) was augered adjacent to BH04, due to shallow refusal of that bore in fill. Regular disturbed samples were taken while augering, for visual and tactile assessment and for laboratory testing.

Supplementary, dynamic cone penetrometer tests (DCP) were undertaken at BH09 and BH10, to assess the potential variability of soil conditions between (deep, geotechnical) bores BH08 and BH11.

Coordinates and surface levels for all borehole locations were recorded using a differential Global Positioning System (dGPS) receiver, to GDA2020 / MGA Zone 56 format (Geocentric Datum of Australia 2020 base with Map Grid of Australia projection), with levels relative to AHD, and are generally expected to be within approximately 0.1 m but can vary due to satellite coverage and other factors. A surveyor (Crux Surveying Australia Pty Ltd) was engaged to provide the location and levels of test locations, where locations could not be 'fixed' by the dGPS.

A summary of the spatial and termination depth information is given in Table 2. Borehole locations are shown on Drawing 1 in Appendix B.

Table 2: Summary of Boreholes

Bore	Purpose ²	Surface RL (m AHD)	Easting (m) ¹	Northing (m) ¹	Final Depth (m)
BH01	Contamination	35.1	326408	6231743	1
BH02	Contamination	35.5	326424	6231739	1.2
BH03	Geotechnical & Well	35.2	326452	6231726	14.5
BH04	Contamination	32.8	326381	6231730	0.4
BH04A	Contamination	32.8	326381	6231730	1
BH05	Contamination	33.3	326407	6231722	0.4
BH06	Contamination	33.8	326427	6231723	0.4
BH07	Contamination	34.1	326450	6231709	0.8
BH08	Geotechnical & Well	31.9	326364	6231713	15.0
BH09	Contamination	32.2	326393	6231703	1.4
BH10	Contamination	32.6	326410	6231698	1.3
BH11	Geotechnical & Well	33.3	326443	6231690	13.4
BH12B	Contamination	30.3	326391	6231719	0.3
BH13B	Contamination	30.7	326425	6231722	0.3

Note: 1. MGA2020 Zone 56

2. Purpose reflects whether the borehole was drilled and located for primarily geotechnical purposes, or contamination assessment purposes. The purpose influenced the drilling method, testing, sampling and depth of investigation.

Following the completion of drilling of the geotechnical boreholes, piezometer standpipes were installed in the boreholes to obtain information on hydrogeological conditions and allow sampling of groundwater. The standpipes were generally installed using the following methodology:

- Boreholes were reamed to HQ-size (96 mm diameter) for the length of the proposed standpipe to facilitate installation;
- 'Blank' and 'slotted' PVC pipe was installed in the borehole, with a gravel pack backfilled around the 'slotted' PVC pipe at the target depth;
- The 'slotted length' and gravel pack was isolated from the overlying and (where relevant) underlying backfill by bentonite plugs; and
- The surface was finished by a shallow bentonite plug, and a gatic cover concreted in at ground surface.

A summary of the standpipe installation details is provided in Table 3.

Table 3: Summary of Standpipe Installation Details

Borehole	Screened interval ¹ (m)	Material ²
BH03	3.5-9.0	Clay (XWM) and Weathered Sandstone
BH08	6.0-9.5	Sandstone
BH11	7.5-14.0 ³	Sandstone

Notes:

1. refers to depth interval of both slotted screen and surrounding gravel pack
2. refers to lithology in which the standpipe is screened
3. Standpipe reamed and installed to greater depth than cored borehole (14.0 m vs 13.4 m)

4.2 Field work results

4.2.1 Geotechnical conditions

The subsurface conditions encountered in the boreholes are presented on the engineering logs in Appendix C, along with standard notes defining the descriptive terms and the classification methods used. The typical subsurface strata encountered at the test locations may be broadly summarised as follows:

- **Fill** – dark brown and brown, highly variable, silty sand, sand, silty and sandy clay, clay and sandy silt, to depths of 0.2 m to 0.9 m below ground surface; although at BH05 and BH06, where underlain by the basement structure the fill comprised sandy silt then silty sand at both locations;
- **Residual Soil** – Very stiff and hard, low to medium plasticity, grey and mottled red brown, silty clay and silty sandy clay with ironstone gravel, including some extremely weathered material; to depths of 0.3 m to 2.0 m; underlain by,
- **Sandstone and Clay** – Interbedded clay (extremely weathered sandstone), and moderately weathered sandstone, with ironstone and iron-cemented bands of low, medium and high

strength, grey and pale grey, orange, orange-brown and red-brown; to depths of 5.5 m to 5.8 m; underlain by, and

- **Sandstone** – low and medium, moderately weathered with clay seams, becoming medium and high strength, slightly weathered and fresh sandstone, orange-brown and grey, with some siltstone beds and laminations at BH03.

4.2.2 Hydrogeological conditions

During hand auger drilling of the boreholes in garden areas above the basement (BH05 and BH06), water was observed to rise to 0.05 m from ground surface.

At other locations, no groundwater seepage was generally observed whilst augering. The necessary introduction of water to deeper boreholes while wash boring or rock coring precluded further groundwater observations during drilling.

Supplementary groundwater observations made at the site during the geotechnical investigation works are summarised in Table 4.

Table 4: Summary of Groundwater Observations

Bore	Ground Level (m AHD)	Measured Depth to Groundwater (m) [Groundwater Level (mAHD)]			
		9/5/25	6/6/25	7/7/25	5/8/25
BH03	35.2	5.3 [29.9]	4.9 [30.3]	5.2 [30.0]	5.0 [30.2]
BH08	31.9	2.5 [29.4]	2.2 [29.7]	2.3 [29.6]	2.0 [29.9]
BH11	33.3	8.5 [24.8]	8.3 [25.0]	8.5 [24.8]	8.3 [25.0]

Dataloggers were installed in the geotechnical standpipes on 5 May 2025, immediately following development of the wells, to allow continuous groundwater level monitoring.

The above groundwater levels correspond to groundwater levels within the bedrock, and groundwater flow towards the south-east, with perched water levels present in the garden areas overlying the basement (presumably sealed, with ineffective drainage). Further discussion is provided in Section 7.1.

5. Laboratory testing

Soil aggressivity laboratory testing was performed on four selected soil samples at a NATA registered laboratory in Sydney. The results of the laboratory testing are provided in detail in the test report sheets in Appendix D and are summarised in Table 5.

Table 5: Summary of Soil Aggressivity Test Results

Bore	Depth (m)	Material	pH	Sulfate (mg/kg)	Chloride (mg/kg)	Electrical conductivity (µS/cm)
BH03	0.8-1	Clay	6.8	<10	<10	19
BH08	1.3-1.5	Clay	7.3	30	10	32
BH08	2.5-2.6	Sandstone	6.4	25	10	29
BH11	1-1.45	Clay	5.2	32	<10	26

Groundwater laboratory testing was undertaken to support contamination assessment at the site, including some testing relevant to aggressivity. The results of the laboratory testing are provided in detail in the test report sheets in Appendix D and selected results are summarised in Table 6.

Table 6: Summary of Groundwater Test Results

Bore	pH	Sulfate (mg/kg)	Chloride (mg/kg)	Electrical conductivity (µS/cm)
BH03	5.6	48	56	370
BH08	5.4	88	99	710
BH11	6.1	40	230	1100

Comparison of the above results to Tables 6.4.2(C) and Table 6.5.2(C) of AS2159 indicate that conditions are:

- Generally consistent with a 'mild' exposure classification, for concrete piles; and,
- Generally consistent with a 'non-aggressive' exposure classification for steel piles.

6. Proposed development

The proposed development comprises the construction of two residential flat buildings, one rising to part 13 and part 14 storeys and the other to 8 storeys, comprising a total of 164 social and affordable housing apartments. The development also includes a communal room and a two-level basement car park.

The proposal includes bulk earthworks, tree removal and associated landscaping and public domain works.

Based on the architectural plans produced by Bates Smart (drawing reference DA03.001 revision 3, dated 19 September 2025) it is understood that Basement Level 01 will have a finished floor level at RL 28.8. Hence, it is assumed that bulk excavation level will be at RL 28.3.

7. Comments

7.1 Geotechnical and hydrogeological model

Based on the results of the geotechnical investigation, and information on groundwater levels at the site, a geotechnical model has been developed for the site, summarised in Table 7.

Table 7: Summary of the Geotechnical Model

Unit	Summary	Typical Description
1	Fill	Uncontrolled, variably compacted and highly variable fill, including silty sands, silty and sandy clays and silts. Outside of the basement footprint, fill is typically present to depths of up to 0.8 m. Within the basement footprint, fill is present in garden beds overlying the basement structure and typically to approximately 0.2 m below the basement floor level. In all cases, fill is potentially locally deeper in the vicinity of services and structures, including sub-basement services, and areas surrounding the existing basement, where temporary batters or stepped excavations may have been backfilled during construction.*
2	Residual Clay	Stiff to hard, grey, orange grey mottled red brown, residual clay and extremely weathered sandstone, typically to depths of up to 2 m, though previously largely excavated in the existing basement areas.
3a	Sandstone and Clay	Interbedded sandstone and extremely weathered material (clay), including ironstone, with moderately and highly weathered, low, medium and high strength (iron-cemented) sandstone bands.
3b	Sandstone - Variable	Typically low and medium strength, moderately and slightly weathered sandstone with some very low strength beds and clay seams, with some siltstone beds. Fractured and slightly fractured.
3c	Sandstone – Medium and High Strength	Typically fresh, pale grey and orange brown, medium and high strength sandstone, slightly fractured and unbroken.

The above units are shown in relation to the boreholes and site levels on the interpreted geotechnical cross-sections, presented in Drawing 2 and 3, in Appendix B. It should be noted that the subsurface profile is accurate only at the borehole locations and that substantial variation can occur in between and away from the boreholes. The interpreted geotechnical boundaries are for illustrative purposes only and should not be relied upon. It is noted, however, that DCP results at BH09 and BH10 are consistent with the top of Unit 3a, indicated in the plans. The approximate groundwater level is shown for illustrative purposes.

The groundwater levels measured in the wells during the monitoring period typically ranged between about RL 25.0 to RL 30.2. Despite the change in surface level, the groundwater elevation observed in boreholes BH03 and BH08 were similar, however the groundwater level observed in borehole BH11 was observed to be significantly lower than other locations.

The hydrogeology at the site is considered to be defined by unconfined aquifer conditions within the sandstone bedrock. It would be expected that groundwater levels would approximately follow the broader hillside topography, falling towards the south-west, and ultimately draining to Kareena Creek, however the lower groundwater level observed in borehole BH11 suggests groundwater flow towards south-east. This difference between the expected south-west flow direction, and observed south-east flow direction is likely due to the presence of a drained basement at 178-186 Willarong Road (about 50 m south-east of the site).

While ephemeral seepage or 'perched' groundwater may occur within the fill, along the top of higher permeability layers within the natural soils and along the top of rock, typical groundwater seepage is expected to largely occur through fractures within the underlying bedrock. It should be noted that groundwater levels are transient and fluctuate with climatic conditions and other factors (e.g. adjacent basements).

Water within the fill overlying the basement is likely due to drainage issues relating to the garden beds, noting that the work was undertaken during a period of rainfall. Given the depth to water, it is likely that the water is sourced from rainfall or services (e.g. stormwater). This water may remain ponded (if drainage is wholly blocked) or will drain over a longer time frame.

7.2 Geotechnical suitability

Noting the ground conditions outlined above, from a geotechnical perspective the site conditions are generally considered suitable for the proposed development outlined in Section 6, including variations thereof.

Established methods of design and construction, in common use in the Sydney area are likely to be appropriate to manage any potential geotechnical impacts within and beyond the site – as outlined within this report.

7.3 Groundwater and dewatering

7.3.1 General

The results of the investigation and estimated bulk excavation level suggest that groundwater will be intercepted by the proposed basement excavation, and therefore that groundwater must be managed during the proposed works.

It is noted, however, that the estimated bulk excavation level (and Interpreted Sections in Drawings 2 and 3) suggest that only partial penetration of the aquifer is expected, with the resulting groundwater inflows generally through Unit 3a and Unit 3b sandstone. In this case, it is likely that any groundwater inflows may be limited to seepage along bedding planes and joints exposed in the excavation face. Variable permeability may be expected in such weathered materials as Unit 3a and Unit 3b.

7.3.2 Groundwater management

It is considered likely that relatively limited seepage could occur (i.e. less than 3ML/year) based on the estimated bulk excavation level and the hydrogeological model. It is expected that groundwater inflows can be readily managed during construction by sump-and-pump management methods.

Long-term groundwater management would generally include the selection of a tanked or drained basement for the final structure, noting the following:

- The use of a **tanked basement** would limit groundwater management requirements to the construction stage – but would require design of the basement for significant uplift forces, generally adding significant costs at construction stage. A fully tanked basement would generally require tanking to ground surface, and to design flood levels where relevant;
- A **drained basement**, by contrast, would require ongoing management of any groundwater inflow to the basement for the life of the building (including potential changes in conditions, as may arise from offsite contamination or climate change); and
- A **partially-tanked** basement may allow the basement to be designed for lower uplift pressures than a fully tanked basement. The design should include drainage to prevent uplift pressures exceeding the design levels. Accordingly, some long-term or periodic groundwater inflows may still occur, depending on the design tanking level and variability in groundwater. Long-term groundwater management measures and reporting would still need to be implemented for these potential inflows.

A drained basement is considered appropriate for the proposed development, although it is noted that the regulatory environment has changed significantly over the last 10 years, and that 'typical' design decisions are often made by the developer rather than the long-term owner or operator of the site. Homes NSW should consider their preferred approach to groundwater management for this development.

Appropriate management is generally required to ensure that groundwater inflow volumes ("take") and impacts remain consistent with the expected impacts and SSD approval conditions, and for groundwater treatment to a quality consistent with disposal requirements.

The disposal of groundwater inflows to the proposed basement would generally require groundwater treatment, to ensure that the quality at disposal is consistent with the requirements of the relevant disposal authority (e.g. Council or Sydney Water). Where groundwater treatment costs or requirements are considered prohibitive, then a tanked basement may be the preferred approach for long-term management.

Previous experience in Sydney is that seepage will likely contain relatively high levels of soluble iron that will form a precipitate in the form of a gelatinous 'sludge' when exposed to oxygen. This 'sludge' has the potential to block-up subsoil (gravel) drains and 'seize-up' pumps. Therefore, detailing of subfloor drains, sumps and pumps should incorporate provision for regular maintenance such as flushing and 'rodding' of drains and/or "baffle" pits.

7.3.3 Regulatory context

For SSDA projects, most regulation of groundwater impacts, inflow and disposal is generally managed through the SSDA process, including the SSDA conditions. A Groundwater Impact Assessment, including relevant dewatering management specific to the development, including the final basement geometry, design and construction approaches and groundwater management measures, is generally suitable for submission for the SSDA assessment. After approval, further development of the Dewatering Management Plan (DMP) and/or associated monitoring plans is generally appropriate to incorporate the conditions arising from SSDA, and allow ready implementation during construction.

Separate approvals (e.g. for Water Supply Works or Water Use) are not generally required for works under SSDA, provided that inflow volumes remain within, and impacts are consistent with, the SEARs submissions and SSD approval conditions.

A Water Access Licence (WAL) and appropriate entitlements will be required for the works if groundwater inflows may exceed 3ML / year, for a water year from July to June. A WAL exemption applies for inflows of less than 3ML / year. Ongoing monitoring and reporting of inflows would be required to claim the exemption, including in the long-term (unless the basement is fully tanked). It is considered likely that the exemption will apply to the construction and operational phases of this development, given the existing information and estimated basement excavation levels.

Written authorisation for (temporary or long-term) disposal of groundwater to stormwater or sewer would be required from the relevant authority, with appropriate treatment and testing to ensure that water quality requirements are being met.

A completion report, including the results of ongoing inflow volumes, monitoring, treatment and quality testing would generally need to be provided at the completion of construction to support an occupancy certificate.

An operational DMP would then be implemented to manage ongoing dewatering, unless a tanked basement has been constructed. For a tanked basement, dewatering may only be of concern if temporary penetrations of the tanking are required for maintenance and upgrades.

7.4 Excavation stability and shoring

7.4.1 General

Based on an estimated bulk excavation level of RL 28.3, excavation depths of 4 m to 7 m are anticipated. This corresponds to excavation through the fill, residual soils and weathered sandstone (Units 1, 2, 3a and 3b). Some limited excavation into fresh sandstone (Unit 3c) may be required for deep footing excavations, dewatering tanks and the lift core.

The existing basement is offset by approximately 4.5 m from the site boundaries, and temporary batters would likely be appropriate to allow for the demolition and removal of the existing basement, including walls.

If the existing basement walls are to be retained as part of the temporary support measures for the site (e.g. to limit earthworks), more detailed works staging would be appropriate. As the existing basement retention is likely given lateral support by the existing structure, temporary lateral support measures would likely be required if the structure is to be demolished. These temporary lateral support measures may have their own limitations (e.g. due to obstructions from props within the basement, or subsurface anchors).

As level working platforms will generally be required for the installation of new shoring walls, any batters would likely need to be expanded to provided working platform 'berms' whilst shoring is installed around the site.

7.4.2 Batters and excavation stability

The use of batters at this site may be limited to initial excavation and demolition works, due to the proximity of site boundaries and neighbouring assets.

Preliminary temporary safe batter slopes are provided in Table 8 for units above the groundwater table, based on batter slopes no greater than 3 m in height, and subject to the limitations given in the table notes. Ground movements may still occur behind such batters and batters may impose greater loads on adjacent retaining structures, which would generally require specific assessment during design.

Table 8: Preliminary Safe Temporary Batter Slopes for Batter Slopes $\leq$ 3 m Total Height*

Unit	Material	Maximum Temporary Safe Batter Slope (Horizontal:Vertical)**
1	Fill	1.5:1
2	Residual Clay	1.25:1
3a	Sandstone and Clay	1:1
3b	Sandstone – Variable***	0.75:1

Note: * For batters wholly above the groundwater table, with horizontal ground beyond the crest and below the toe of the slope, no deflection-sensitive structures or services above or behind the crest, no surcharges above the crest and no seepage from the face, and maximum depths consistent with the model.

** Subject to geotechnical inspection and review at maximum 1.5 m drops.

*** But may not be encountered by excavations within the limiting batter slope height of 3 m, depending on variability around the site.

Batters higher than 3 m, steeper batters, batters in weaker materials, or batters subject to surcharges behind the crest (within an exclusion zone equal to the height of the batter, extending back from the crest), adjacent sloping ground or seepage would generally require specific analysis.

Any batter slopes should be subject to inspection by an experienced geotechnical professional at maximum 1.5 m drops. Flatter or steeper slopes may be required, depending on the results of assessment. Protection for the (cut) face of the batter slope may also be required to reduce the risk of loose materials falling into the excavation below.

7.4.3 Shoring

Shoring will be required to achieve the deeper excavation levels expected for the proposed basement, and/or where conditions are unsuitable for excavation with batters.

Based on the anticipated excavation level, soldier piles socketed below the bulk and local excavation levels, are expected to be suitable at this site, with infill shotcrete panels constructed between the piles as excavation proceeds, and temporary anchors installed to provide lateral support.

For a drained basement wall, typical soldier pile spacings of 2.5 m to 3 m are likely to be suitable, although tighter spacings may be required to manage deflections near sensitive assets, or if deeper fill may be present. For drained basement walls, appropriate drainage (e.g. strip drains against the excavation face) should be incorporated into the design and construction of the infill panels.

Bored, concrete piles would generally be suitable for the construction of soldier piles at this site, although casing may be required for drilling through Unit 1. Rig selection should consider the presence of medium and possibly high strength bands within Unit 3a rock. It is recommended that the borehole logs are provided to the contractor so that they can review.

Working platforms may be required to support piling works on the site.

Given the depth of excavation, 'tie-back' ground anchors would generally be required to provide temporary lateral support to the shoring wall, with final support provided by the basement structure.

It is likely that one or two levels of anchors will generally be required for the proposed basement, but depending on the excavation depth, offset from site boundaries and the presence of deflection-sensitive services or assets beyond the wall.

The following comments are provided in relation to preliminary shoring design, only:

- For a shoring wall supported by multiple rows of anchors or props, preliminary design may be based on a uniform rectangular earth pressure distribution of $4H$ (where H is the wall height in metres, and pressure is in kPa), provided that deflections are not a concern. Where walls are constructed close to existing deflection-sensitive structures or utilities, a (uniform) lateral pressure of between $6H$ and $8H$ should be considered, depending on the sensitivity of the utilities and the soil profile to be retained. Higher pressures would be appropriate where batters (i.e. sloping ground) are present above the wall, or where concentrated loads are proposed behind the wall, either during construction (e.g. plant) or in the permanent case (e.g. elevated garden beds or roads).
- For a shoring wall supported by a single row of anchors or props, preliminary design may be based on triangular pressure distributions, based on lateral earth pressure coefficients given in Table 9. Appropriate values will depend on the proposed excavation depth and geometry.

Table 9: Preliminary Lateral Earth Coefficients and Pressures

Unit	Material	Active lateral earth pressure coefficient (Ka)**	Ultimate Passive Pressure (Pp) (temporary wall loading, only)*
1 & 2	Fill	0.4	-
2	Residual Clay	0.3	-
3a	Sandstone and Clay	0.3	-
3b	Sandstone – Variable***	0.25	400
3c	Sandstone – Medium to High Strength	0	6000

Note: * Ultimate passive pressures may only develop at large displacements, which should be considered in the context of the 'ultimate' performance permitted for the structure. A factor of safety of 3 is often applied to these values, which are provided for preliminary purposes only and also may be influenced by jointing, particularly where sockets are shallow.

** For preliminary design purposes a K_0 value at least 50% higher than the K_a values could be considered. These coefficients assume that the ground surface is level behind the wall. Batters will result in increased K_a values.

Hydrostatic loading would be additional to the preliminary design inputs given above.

Inspections during piling works, and inspection of the exposed rock face between soldier piles during excavation is also recommended at 1.5 m drops, prior to placement of mesh and shotcrete, to review ground conditions in relation to design, and determine whether additional support may be required.

If anchors are required to provide support against uplift (tanked basement option), then design should also consider potential cone failure modes, allowing for an apex angle of no greater than 90 degrees for anchors socketed into the Unit 3c bedrock underlying the proposed basement excavation.

The detailed design of shoring / retaining walls is nowadays normally undertaken using software that can account for the soil-structure interaction during the progressive excavation and support installation sequence (e.g. Wallap, FLAC, Plaxis.), with finite difference or finite element software better suited for the estimation of shoring wall movements and structural forces arising due to stress relief of the bedrock.

7.4.4 Movements associated with excavation

Typical horizontal movements in the order of 0.15 % of the wall height would be expected to arise from earth pressures for a well-constructed and designed, high stiffness shoring wall (i.e. with multiple rows of anchors), but depending on the excavation and support sequence and support provided.

For a basement retaining wall supporting a 4 m to 7 m deep excavation, this corresponds to approximately 6 mm to 11 mm movement due to earth pressures.

If deeper excavations are proposed, then in addition to retaining wall movements due to lateral earth pressures, basement excavations in medium and high strength sandstone bedrock (Unit 3c) may result in additional lateral movement of the sandstone faces due to stress relief effects. No such excavation is anticipated based on the current development proposals for the site, but if deeper excavation is proposed then such movements could be estimated as 0.5 mm to 2 mm movement per metre depth into Unit 3c, at the midpoint of the excavation. It is not practical to provide restraint against these stress relief movements.

Survey monitoring of the excavation and retaining walls would generally be appropriate to assess movement of any shoring walls during excavation, particularly if any deflection-sensitive structures or services are present behind the walls.

7.4.5 Sydney Trains Requirements

Additional constraints to excavation shoring are expected to apply along the southern boundary, where the site boundary is shared with Sydney Trains. These include that:

- Sydney Trains have indicated that temporary rock anchors will not be permitted within its land or easements;
- Where excavation of more than 2 m is proposed within 25 m of the rail corridor, impact assessment will be required to determine the effect of the proposed development on existing rail infrastructure (ASA: T HR CI 12090 ST, 2021); and
- Additional investigation, assessment and monitoring requirements may arise in relation to the work, depending on the proposed works and influence zones, as per ASA TS 02715_0.00 Excavation adjacent to Transport for NSW Infrastructure (also known as GTD 2020/001).

Noting that shoring walls supporting excavation for 2 basement levels will require anchors, the above would generally be addressed by offsetting the shoring walls from the site boundary, and allowing for steeper anchors to socket within the site. Greater offsets would generally also reduce impacts on the rail corridor. Alternatively internal bracing and/or some form of top down construction could be considered to eliminate anchors, but this generally creates difficulty for construction access.

Options allowing for a 'stepped' basement profile parallel to the rail corridor, with the basement increasing in depth with distance from the rail corridor, could also be considered, to manage anchor requirements and rail impacts. Pile foundations founded in Unit 3c material would likely be required in the 'stepped' area, given the high-rise nature of the building.

It is noted that the geotechnical investigation has indicated relatively similar ground conditions between BH08 and BH11, closest to the rail corridor. Shallower investigation by hand-held equipment at BH09 and BH10, including DCPs to refusal, indicated conditions appear to remain consistent along the alignment.

Additional investigation would best be undertaken following the demolition of the existing structures and decommissioning of on-site services – due to access and investigation limitations arising from the combined influence of existing fencing, trees, structures and underground services along the southern side of the site.

Given the estimated basement excavation level, it is likely that inclinometer installation will be required parallel to the rail corridor, to allow monitoring of deflections along the boundary during excavation works. Inclinometer installation could be undertaken at the same time at the investigation works (i.e. installed in geotechnical boreholes) if appropriate.

7.4.6 Design regulation

The advice included within this report should be considered specialist advice and does not comprise design.

Noting the residential use of the proposed building, the detailed design of the shoring walls and anchors for the basement will need to be prepared in accordance with the Design and Building Practitioners Act, including meeting the regulated design requirements for shoring and ground anchors given in the Ministerial Order (Government Gazette 78, 2022). This includes the need for 'reasonable steps' to be taken to assess the footings of structures within the zone of influence of the designed excavation, which may include investigation.

Broadly speaking, a preliminary 'zone of influence' for basement shoring wall design could be taken as the zone of soil above a line drawn from the base of excavation depth, at 1(Horizontal):1(Vertical) above the horizontal to the top of rock, then at 2(H):1(V) in soils to the ground surface. This 'zone' should be evaluated by the designers once the shoring and excavation geometry is known.

Appropriate permissions from adjacent landowners will be required where support measures (e.g. anchors) are proposed across site boundaries. Anchors should also be de-stressed following the provision of permanent lateral support, usually by the basement structure.

Maximum allowable wall movements and/or movements beyond the wall, arising from structural requirements of neighbouring buildings and services, may be a key performance requirement influencing the design of shoring walls and anchors at this site.

7.5 Excavation conditions

7.5.1 Excavatability

Based on an estimated bulk excavation level of RL 28.3, excavation depths of 4 m to 7 m are anticipated. This corresponds to excavation through fill, residual soil and weathered sandstone (Units 1, 2, 3a and 3b). Some limited excavation into fresh sandstone (Unit 3c) may be required for deep footing excavations, dewatering tanks and the lift core.

Excavation is generally expected to require the following:

- Units 1 and 2 are likely to be readily excavated using conventional earthmoving equipment;
- While extremely weathered, very low and low strength materials within Unit 3a and Unit 3b may be readily excavatable with conventional earthmoving equipment with some rock hammering of thin bands of higher strength, the medium and high strength sandstone in Unit 3b, and possibly higher-strength iron-cemented bands (not proven, but possible) within Unit 3a and Unit 3b, may require excavation by ripping tynes mounted on large bulldozers (e.g. D12 or larger), heavy rock hammers (>900 kg), rock saws and milling heads; and

- Excavation into Unit 3c, may be of only limited depth, but is likely to require ripping, heavy rock hammers, rock saws and milling heads, as noted above.

The excavatability of medium and high strength sandstone will be governed by the defects within the rock mass. Based on the rock cores, the rock in this unit frequently includes relatively thick beds. In general, the excavation of high strength sandstone (in Unit 3c) may be difficult and slow, with low productivity and high hammer / tyne wear expected. It is recommended that tenderers review the detailed logs and photographs to assess conditions based on their plant and experience.

7.5.2 Vibrations

Ground vibration can be strongly perceptible to humans at levels above 2.5 mm / s vector sum peak particle velocity (VSPPV). This is generally much lower than the vibration levels required to cause structural damage to buildings. The Australian Standard AS2631.2-2014 "Evaluation of human exposure to whole-body vibrations – continuous and shock induced vibrations in buildings (1-80 Hz)" indicates an acceptable day time limit of 8 mm/s VSPPV for human comfort.

Based on the experience of Douglas and with reference to AS2631.2, it is suggested that an initial VSPPV limit of 8 mm / s applicable at the foundation level of existing adjacent buildings be provisionally adopted for this site for both architectural and human comfort considerations. Appropriate enquiries should be made to neighbouring property (and utility) owners to check if the presence of sensitive equipment or structures may require a lower vibration limit.

The limit, and locations of vibration monitors, may need to be adjusted to reflect asset requirements, response of neighbouring structures during excavation and vibration dosage for neighbouring occupants. It is noted that lower vibration limits may slow works and result in a longer duration of vibrations.

A vibration trial may be required to size equipment at the commencement of excavation into rock. The trial may indicate that minimum offset distances are required from vibration-sensitive assets for the preferred plant, or that alternative excavation methods or equipment are required (e.g. pre-sawing along excavation faces).

Where a vibration trial indicates that the equipment may potentially exceed vibration levels, or where buildings or occupants are otherwise sensitive to vibration levels, consideration could be given to continuous vibration monitoring during the works. These monitors may be set up to activate a flashing 'alarm' light, or send text messages, if pre-set vibration levels are exceeded during the work.

7.5.3 Waste classification

All excavated materials will need to be disposed of in accordance with the provisions of the current legislation and guidelines including the Waste Classification Guidelines (EPA, 2014). This includes fill and natural materials that may be removed from the site.

7.6 Foundations

Based on the conditions encountered during the investigation, it is likely that the estimated bulk excavation level at RL 28.3 will be within the weathered sandstone (Unit 3a and 3b). Fresh sandstone (Unit 3c) was present at relatively consistent elevations during the investigation, and it is likely this strata will be encountered about 1.0 m to 2.0 m below bulk level.

The performance of the footings will depend on a combination of rock strength and defects, both at the base of the footing excavation and below, and may not neatly match the geotechnical model units in all locations. Given the likely footings loads from the proposed high-rise development, the weathered sandstone (Unit 3a and 3b) may not be sufficient to support the footing loads. Considering the variability and significant clay-strength seams present in the weathered sandstone, the fresh sandstone (Unit 3c) is a more appropriate bearing stratum for the development.

In general terms, the material encountered in the investigation is expected to correspond to the classes and corresponding foundation parameters given in Table 10, based on the Pells et al (1998) classification system.

Table 10: Foundation Design Parameters

Unit	Sandstone Class	Allowable Bearing Pressure ^{1,2} (MPa)	Ultimate Bearing Pressure ^{2,3} (MPa)	Typical Youngs Modulus (MPa)	Minimum Additional Testing / Requirements ⁴
Unit 3a/3b	V	1	3	50	NA
Unit 3c	III	6	20	900	Spoon testing of 33% of footings
	II	10	40	1500	Spoon testing of all shallow footings Additional boreholes required if pile foundations are proposed.

Note: 1. Allowable pressures assume a confined state, and allowable settlements of less than 1% of the minimum footing plan dimension. Alternatively, settlements can be estimated for the proposed load based on the typical Youngs Modulus.

2. All bearing pressures may be limited by defects, or lack of confinement, subject to inspection of the excavation and possible spoon testing, which may require the bearing pressure to be downgraded. Bearing pressures assume that the bedrock is in a confined state, and that no nearby current or future excavations are present below an imaginary 'influence' line drawn at 1H:1V down from the edge of the footing. Such excavations would require inspection to confirm that adverse jointing is not present, and reduced values may apply.

3. Ultimate values assume settlement of more than 5% to 10% of the minimum footing plan dimension.

4. Geotechnical inspection of all footing excavations is recommended to confirm that the material is consistent with the design requirements; the minimum testing is to provide additional information on defects to confirm that foundation performance is as expected. Additional or lesser testing may be warranted, subject to the results of initial foundation testing and depending on the design bearing pressures.

The higher bearing pressures given in Table 10 require the additional testing outlined in that table and may be associated with a higher risk of inspection 'failures'. For example, spoon testing should be carried out in at least one third of all footings that are designed for an allowable end bearing capacity of more than 3.5 MPa. Spoon testing involves drilling a 50 mm diameter hole below the base of the footing, to a depth of at least 1.5 times the footing width, with the hole left full of water for 24 hours prior to testing to check for the presence of weak / clay bands. If excessive weak seams are detected then the foundation capacity may need to be downgraded, or the footings taken deeper to reach suitable foundation material. The rate of testing would then also need to be increased in the area of spoon test failures.

All foundations should be inspected by a geotechnical professional following excavation and cleaning, to confirm that the foundation material is consistent with the design requirements.

7.7 Further assessment

Sydney Water assets are also located outside the site boundaries. It is possible that these assets may require specialist engineering assessment (SEA) by Sydney Water, in advance of construction, to assess whether their assets may be adversely affected by the works, but depending on the sensitivity of the asset. This may include assets that are replaced as part of the works, but then subject to construction loading (e.g. from construction plant or affected by shoring excavations).

Sydney Water will generally nominate their services of concern once the proposed works are known.

Geotechnical investigation and assessment, in conjunction with a broader SEA consulting team, is generally required as part of the SEA submission. The subsequent evaluation by Sydney Water can be slow, and it is generally recommended that this process be started as early as practicable. It is noted, however, that subsequent changes to design or construction may require the SEA process to be repeated.

Further assessment will be required to assess and respond to TfNSW interests in relation to potential impacts on rail infrastructure on the adjoining site. Geotechnical components of the assessment would require additional information on the proposed development, support measures and works sequence and information from other disciplines, including detailed survey including relevant rail infrastructure and assets.

Further geotechnical reporting to support assessments, preliminary and/or detailed design may be appropriate. This may include review of the investigation results (and advice within this report) and consideration of potential additional investigation requirements, if appropriate.

8. Conclusion

A geotechnical investigation was undertaken at the site in April and May 2025. The investigation included the drilling of three deep geotechnical boreholes, and ten shallow boreholes for contamination assessment purposes. The results of the investigation indicate the site is underlain by fill and residual soils over Hawkesbury Sandstone bedrock.

The results of the investigation and estimated bulk excavation level at RL 28.3 suggest that groundwater will be intercepted by the proposed basement excavation, and therefore that groundwater must be managed during the proposed works.

From a geotechnical perspective the site conditions are generally considered suitable for the proposed development. Established methods of design and construction commonly used in the Sydney area are likely to be appropriate to manage any potential geotechnical impacts within and beyond the site – as outlined within this report.

Based on published mapping and result of the current investigation, an Acid Sulfate Soils Management Plan (ASSMP) and Salinity Management Plan (SMP) are not considered to be required for the project.

Further geotechnical investigation and assessment will likely be required to

- Assess the impact of the proposed basement on any Sydney Water assets nearby;
- Assess and respond to TfNSW interests in relation to potential impacts on rail infrastructure on the adjoining site; and
- Support any additional assessments and detailed design.

9. References

Pells, P. J., Mostyn, G., & Walker, B. F. (1998). Foundations on Sandstone and Shale in the Sydney Region. Australian Geomechanics, No 33 Part 3, 17-29.

T HR CI 12090 ST, *Airspace and External Developments*, Asset Standards Authority, State of NSW through Transport for NSW, v1.0, 2021.

10. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report (or services) for this project at 2 Flide Street, Caringbah NSW in line with Douglas' proposal dated 21 March 2025 based on the award of Contract LAHC 2024/622 Geotechnical Services Due Diligence – HAFF by Homes NSW; and including the approved variation dated 3 April 2025. This report is provided for the exclusive use of Homes NSW for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

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

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

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

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

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

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

Appendix A

About this Report

Introduction

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

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

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Engagement Terms for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

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

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

Groundwater

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

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather

changes. They may not be the same at the time of construction as are indicated in the report; and

- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

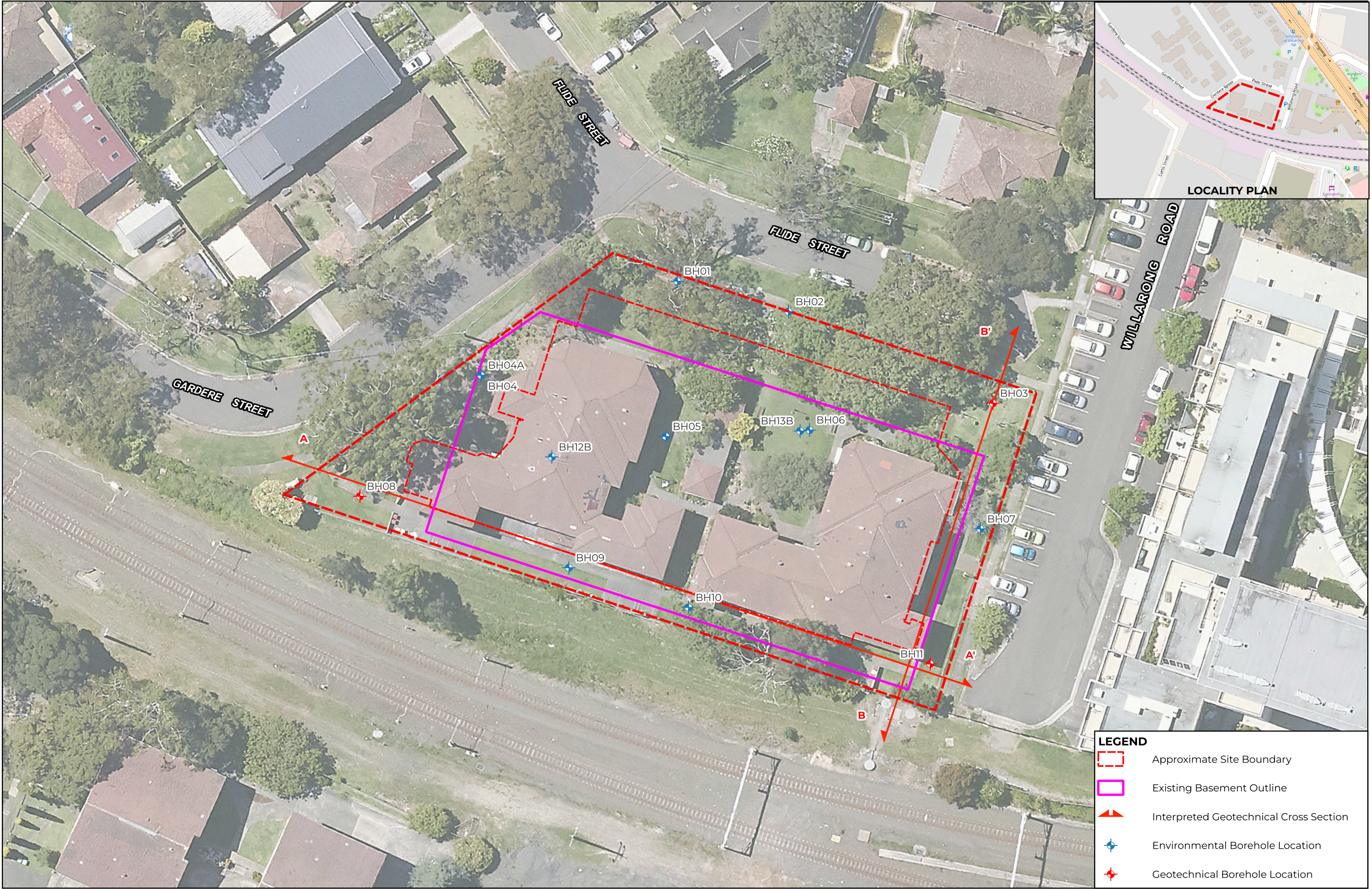
Site Inspection

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

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Appendix B

Drawings



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	29.08.2025	EC

SCALE: 0 5 10 15 20 25 m
1:500 @ A3

Douglas
PARTNERS

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

CLIENT:
Homes NSW

NOTE:
1: Basemap from Metromap (Dated 15.12.2024)
2: Basement Outline from Norton Survey Partners, Reference 36313, Revision 1 (Dated 20.05.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
**Flide Street, Caringbah,
Affordable Housing**

PROJECT ADDRESS:
2 Flide Street, Caringbah

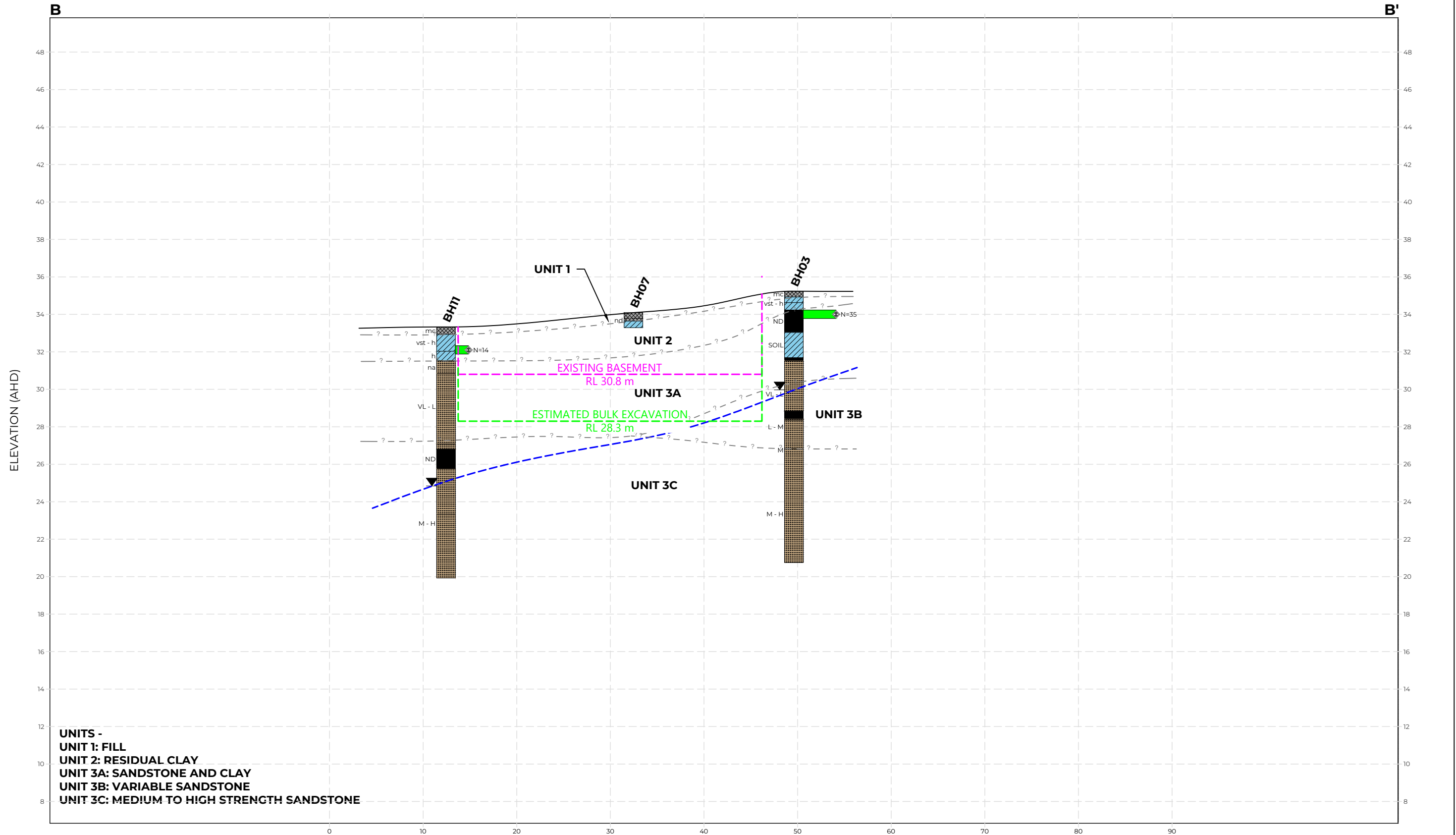
DRAWING TITLE:
Test Location Plan

PROJECT NO:
233414.03

DRAWING NO:
1

REVISION:
0

\\dps\pns02\Projects\233414_03 - CARRINGBAH, 2 Flide St, Ceo\7.0 Drawings\7.2 Out\233414_03.D002-003.Rev0_Cross Sections A-B.dwg



LEGEND

CLAY SANDSTONE Water Level

NO CORE SPT

FILL SPT - Symbol

TESTS / OTHER

N - Standard penetration test value

- ? - - Interpreted geotechnical boundary

- - - Groundwater Level

ROCK STRENGTH

VL- Very Low

L - Low

M - Medium

H - High

SOIL CONSISTENCY

vs - Very Soft

s - Soft

f - Firm

st - Stiff

vst - Very Stiff

h - Hard

SOIL CONSISTENCY (Cont.)

na - Not applicable

nd - No data

pc - Poorly compacted

mc - Mostly compacted

wc - Well compacted

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	26.09.2025	EC
SCALE:			
</			

Appendix C

Result of Field Work

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

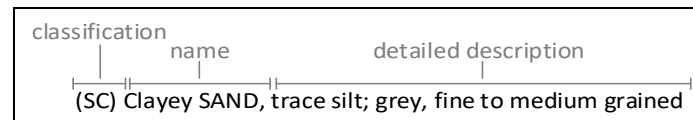
Graphic Symbols

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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Introduction

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



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

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

Particle size designation and Behaviour Model

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

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

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

¹ – refer grain size subdivision descriptions below

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

Component proportions

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

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

¹ As defined in AS1726-2017 6.1.4.4

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

Composite Materials

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

Classification

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

Soil Name

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

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

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

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

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

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

Identification of minor components

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

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

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

Soil Composition

Plasticity

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

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

Grain Size

Type	Particle size (mm)	
	Gravel	Sand
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:

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

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

Rock Descriptions

Terminology
Symbols
Abbreviations

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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BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 35.1 AHD
COORDINATE: E:326408.2, N:6231743.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 233414.04
DATE: 30/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	SAMPLE		DEPTH (m)	TEST TYPE	RESULTS AND REMARKS			
										TYPE	INTERVAL						
30/04/25 No free groundwater observed whilst augering	35	0.05	FILL / MULCH: orange-brown; woodchips and organics.		FILL			W		ES	0.05	PID	<1ppm				
		0.20	FILL / Silty SAND: dark brown; fine to coarse; trace rootlets.		FILL					ES	0.10	PID	<1ppm				
			FILL / Silty SAND trace gravel: dark brown to brown; fine to medium; sandstone gravel; with roots and rootlets.		FILL					* ES	0.20	PID	<1ppm				
					FILL	ND				ES	0.30	PID	<1ppm				
			FILL	w<PL				ES	0.40	PID	<1ppm						
			FILL	ND				ES	0.60	PID	<1ppm						
			FILL	ND				ES	0.70	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
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			FILL	ND				ES	0.90	PID	<1ppm						
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			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES	0.90	PID	<1ppm						
			FILL	ND				ES									

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools

OPERATOR: (S. Ferguson)

LOGGED: SAF

METHOD: Hand auger to 0.55m

CASING: Uncased

REMARKS: *Blind replicate BD1/20250430 taken at 0.3 m to 0.4 m
 Coordinates and levels surveyed by Crux

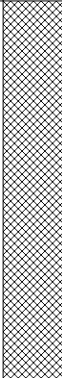
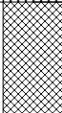
Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 35.5 AHD
COORDINATE: E:326423.6, N:6231739.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 233414.04
DATE: 05/05/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS					
05/05/25 No free groundwater observed whilst augering	35		FILL / SAND: brown to dark brown.		FILL	ND		M			ES								
											0.20								
		0.50		FILL / Clayey SAND: brown to dark brown; fine to medium; low plasticity clay.		FILL	ND	M			ES				0.50	0.60			
		0.65		FILL / Silty CLAY with gravel: brown; medium plasticity; fine to medium, ironstone gravel; possibly reworked natural.							ES				0.70	0.80			
0.80		CLAY (CL-Cl) with gravel: orange-brown and red-brown; low to medium plasticity; ironstone gravel.		RS	ND	w<PL	ES		0.90	1	1.10								
1		Borehole discontinued at 1.20m depth. Target depth reached.																	
	34																		

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.

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Hand auger to 1.2m
REMARKS: Coordinates and levels surveyed by Crux

OPERATOR: (J. Jeffcoat)

LOGGED: JH
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 32.8 AHD
COORDINATE: E:326380.9, N:6231730.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 233414.04
DATE: 30/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED													SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS			
30/04/25 No free groundwater observed whilst augering		0.05	FILL / MULCH trace sand: dark brown; fine to medium sand; wood chips and organics.		FILL	ND	ND	ND		ES	0.05	0.05	PID	<1ppm			
		FILL / CLAY trace rootlets: dark brown to brown; low to medium plasticity.	FILL		ES												
		0.20	FILL / Sandy CLAY trace gravel: brown; low to medium plasticity; fine to medium sand; fine to medium, sandstone gravel.		FILL			ND		w=PL				0.20	PID	<1ppm	
			Borehole discontinued at 0.40m depth. Refusal in fill.		FILL							ES	0.30	0.40			

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Hand auger to 0.4m
REMARKS: Coordinates and levels surveyed by Crux

OPERATOR: (S. Ferguson)

LOGGED: SAF
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 32.8 AHD
COORDINATE: E:326380.9, N:6231730.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04A
PROJECT No: 233414.04
DATE: 09/05/25
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	CONDITIONS ENCOUNTERED				SAMPLE			TESTING AND REMARKS				
			DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾	DENSITY. ⁽¹⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
09/05/25 No free groundwater observed while augering		0.20	FILL / Sandy SILT with mulch cover: dark brown; fine to medium sand; trace glass.		FILL									
			Silty CLAY (CI-CH): orange-brown; trace ironstone.			ND	w<PL							
			0.60m: Becoming red-brown with ironstone		RS									
			Borehole discontinued at 1.00m depth. Target depth reached.											
NOTES: ⁽¹⁾Soil origin is "probable" unless otherwise stated. ⁽²⁾Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.														

PLANT: Hand Tools
METHOD: Hand auger to 1 m
REMARKS: Coordinates and levels surveyed by Crux

OPERATOR: (N. Woodward)

LOGGED: NW
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 33.3 AHD
COORDINATE: E:326406.6, N:6231721.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 233414.04
DATE: 30/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
▼ 30/04/25 35 Pooled water at 0.15m		0.10	FILL / Sandy SILT trace rootlets: dark brown; low to medium plasticity; fine to medium sand.		FILL	 ND	w<PL		ES		0.10	PID	<1ppm
			FILL / Silty SAND with roots: brown; fine to medium; trace siltstone.		FILL		W		ES		0.20	PID	<1ppm
											0.30		
			Borehole discontinued at 0.35m depth. Refusal on concrete slab (basement ceiling).										

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Hand auger to 0.3m
REMARKS: Coordinates and levels surveyed by Crux

OPERATOR: (S. Ferguson)

LOGGED: SAF
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 33.8 AHD
COORDINATE: E:326426.6, N:6231722.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 233414.04
DATE: 30/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS				
Pooled water while hand auguring at 0.05m	30/04/25	0.10	FILL / Sandy SILT trace rootlets: dark brown; low to medium plasticity.		FILL			w>PL		ES		0.10	PID	<1ppm				
			FILL / Silty SAND: dark brown to brown; fine to coarse.		ND			W		ES					0.20			
		Borehole discontinued at 0.35m depth. Refusal on concrete slab (basement ceiling).	FILL												ES	0.30	PID	<1ppm

33

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.

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Hand auger to 0.35m
REMARKS: Coordinates and levels surveyed by Crux

OPERATOR: (S. Ferguson)

LOGGED: SAF
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 34.1 AHD
COORDINATE: E:326450.3, N:6231708.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH07
PROJECT No: 233414.04
DATE: 05/05/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS						
05/05/25 No free groundwater observed	34		FILL / Clayey Silty SAND: dark brown; fine to medium; trace rootlets.		FILL			M			ES	0.20								
		0.30	FILL / Silty CLAY: orange-brown; low to medium plasticity; trace roots, possible reworked.		FILL			ND							w=PL	ES	0.30	0.40		
0.45	CLAY (CL-CI): orange-brown; low to medium plasticity.		RS			ES	0.50	0.70												
			0.70m: orange mottled red, mottled dark brown																	
Borehole discontinued at 0.80m depth. Target depth reached.																				

NOTES: ^(*)Soil origin is "probable" unless otherwise stated. ^(*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Hand auger
REMARKS:

OPERATOR: (J. Henley)

LOGGED: JH
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

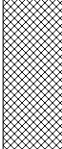
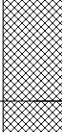
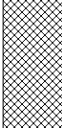


BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 32.2 AHD
COORDINATE: E:326393.1, N:6231703.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH09
PROJECT No: 233414.04
DATE: 05/05/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS					
05/05/25 No free groundwater observed	32		FILL / Sandy CLAY: pale brown to brown; low to medium plasticity.		FILL			w=PL		ES		0.10	PID	<1ppm					
					0.20														
					0.30														
					0.50														
			FILL / Clayey SAND: orange-brown; fine to medium.		FILL			M		ES		0.20							
								0.30											
			FILL / Silty CLAY with sand: pale grey, mottled red-brown; low to medium plasticity.		FILL			w<PL		ES			PID	<1ppm					
	FILL / Silty CLAY: orange-brown to brown; low to medium plasticity; possible reworked natural, with gravel, fine to medium.		FILL	w>PL	ES		0.60	PID	<1ppm										
	0.80	CLAY (CI-CH): yellow-brown to orange-brown; medium to high plasticity.		RS			w=PL		ES		0.90	PID	<1ppm						
		1.20m: colour change red-brown mottled pale grey							ES		1.20	PID	<1ppm						
		Borehole discontinued at 1.40m depth. Target depth reached.																	

NOTES: ^(*)Soil origin is "probable" unless otherwise stated. ^(*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

NOTES: #Soil origin is "probable" unless otherwise stated. %Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Hand auger
REMARKS: *Blind replicate BD1/20250505 taken at 1.2 m to 1.4 m

OPERATOR: (J. Henley)

LOGGED: JH
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 32.6 AHD
COORDINATE: E:326409.7, N:6231697.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH10
PROJECT No: 233414.04
DATE: 05/05/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED													SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS				
05/05/25 No free groundwater observed	32		FILL / Silty SAND: brown; fine to medium; trace rootlets.		FILL	ND	M		ES			PID	<1ppm				
		0.20	FILL / Sandy SILT: brown; low to medium plasticity.		FILL				0.20								
							ES				0.30	PID	<1ppm				
		0.50	FILL / Silty CLAY: yellow-brown; fine to medium, possible alluvial, possible reworked natural, with ironstone gravel.	FILL			ES			0.50	PID	<1ppm					
		0.70	CLAY (CL-CI): yellow-brown to orange-brown; low to medium plasticity.		RS		w<PL										
			1	1.10m: colour change red-brown								ES			PID	<1ppm	

NOTES: ^(#)Soil origin is "probable" unless otherwise stated. ^(*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools

OPERATOR: (J. Jeffcoat)

LOGGED: JH

METHOD: Hand auger

CASING: Uncased

REMARKS: *Blind replicate BD2/20250505 taken at 0.8 m to 1.1 m
 Coordinates and levels surveyed by Crux

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 30.3 AHD
COORDINATE: E:326390.7, N:6231718.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH12B
PROJECT No: 233414.04
DATE: 30/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS				
			CONCRETE SLAB.					ND										
		0.12	FILL / SAND: yellow-brown; fine to coarse.		FILL	ND		M		ES		0.12	PID	<1ppm				
		0.20	CLAY (CI-CH): orange-brown; medium to high plasticity.		RS			w=PL		ES		0.20	PID	<1ppm				
			0.33m: becoming pale grey with red mottling with depth															
			Borehole discontinued at 0.33m depth. Refusal on inferred bedrock									0.30						

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Diatube to 0.12m, Hand auger to 0.33m
REMARKS: Borehole located in the basement
Coordinates and levels surveyed by Crux

OPERATOR: (S. Ferguson)

LOGGED: SAF
CASING: Uncased

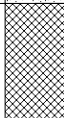
Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 30.7 AHD
COORDINATE: E:326425.3, N:6231722.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH13B
PROJECT No: 233414.04
DATE: 30/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS				
30/04/25 No free groundwater observed whilst augering			CONCRETE SLAB.					ND										
		0.12	FILL / SAND: yellow-brown; fine to medium.		FILL	ND		M		ES		0.12	PID	<1ppm				
		0.20	CLAY (CI-CH) trace gravel: brown; medium to high plasticity; fine, sub-angular to sub-rounded, sandstone gravel.		RS			w=PL		ES		0.20	PID	<1ppm				
			Borehole discontinued at 0.31m depth. Refusal on inferred bedrock.									0.30						

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Diatube to 0.12m, Hand auger to 0.31m
REMARKS: Borehole located in the basement
Coordinates and levels surveyed by Crux

OPERATOR: (S. Ferguson)

LOGGED: SAF
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 35.2 AHD
COORDINATE: E:326452.1, N:6231726.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 233414.03
DATE: 30/04/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED										SAMPLE			TESTING AND REMARKS				
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾	DENSITY. ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
09/05/25 ▼	35	0.30	FILL / Silty CLAY: dark brown; low to medium plasticity; trace organic matter.		FILL	(MC)		w>PL		ES		0.20			Concrete		
		0.60	Silty CLAY (CI-CH): grey; medium to high plasticity; trace organic matter.		RS	(VSt)		w=PL		ES		0.30					
		1.00	Silty Sandy CLAY (CI) trace gravel: pale grey mottled red-brown; medium plasticity; fine sand; fine to medium, ironstone gravel.		XWM	(H)		w<PL		ES		0.45					
			Continued as rock log									0.60					
												0.80					
												1.00					
													2				
													3				
													4				
													5				
												6					
												7					
												8					
												9					

NOTES: ⁽¹⁾Soil origin is "probable" unless otherwise stated. ⁽²⁾Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

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: Bobcat
METHOD: HA to 0.6m, AD/T to 1.0m, NMLC to 14.48m
REMARKS: Hole reamed to HQ size for well installation

OPERATOR: Ground Test (JJ)

LOGGED: C.S. YIP
CASING: HW to 1m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 35.2 AHD
COORDINATE: E:326452.1, N:6231726.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 233414.03
DATE: 30/04/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED														SAMPLE			TESTING			
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)		GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
RL (m)																				
	35																			
	34	1 Continued from soil log					1.00													
		Silty Sandy CLAY (CI) trace gravel: pale grey mottled red-brown and orange-brown; medium plasticity; fine to medium sand; fine to medium, ironstone gravel; with medium strength ironstone bands.													SPT			7,10,25 (HB)		
	33	2					2.20		52	0										
	32	3				XW		SOIL			SOIL									
	35.5																			
	3.71	4 SANDSTONE: grey and orange-brown, fine to coarse grained, bedded, 0 to 10°; bedded at 0-10°, cross-bedded at 10-25°. Hawkesbury Sandstone.				XW - HW	3.71	SEAM			SEAM	3.71-3.80m: DS, 10°, 90 mm					PLT	PL(A)=0.04MPa		
							3.85	SEAM			SEAM	3.85-4.10m: DS, 0°, 250 mm								
	3.1						4.10	SEAM			SEAM	4.16m: DS, 10°, 20mm								
							4.20	M				4.30-4.44m: DS, 10°, 140 mm								
							4.30	M				4.49m: B, 0°, PR, VNR Clay, SM								
							4.44	SEAM			SEAM	4.57-4.64m: DS, 5°, 70 mm					PLT	PL(A)=0.05MPa		
							4.57	SEAM			SEAM	4.83m: B, 10°, PR, SN Fe, RF								
	3.0						4.64	SEAM			SEAM	4.70-5.00m: DS x4, 0-5°, 5-10mm								
09/05/25							5.24	SEAM			SEAM	5.12m: JT, 60°, PR, CN, RF								
							5.30	L				5.00-5.30m: DS, 15°, 2-10mm, x4								
							5.45	M				5.24-5.30m: DS, 15°, 60 mm								
		5.72m-6.40m: with siltstone beds and laminations				MW	5.70	L				5.40m: JT, 45-50°, PR, SN Fe, RF					PLT	PL(A)=0.07MPa		
						SW	5.78	M				5.52-5.70m: B x5 0-5°, IR, CN, RF					PLT	PL(A)=0.31MPa		
						HW	5.88					5.62m: DS, 0°, 5mm								
						SW	6.00					5.86m: DS, 5°, 5mm								
	2.9						6.35					6.00m: DS, 0°, 5mm								
							6.81	SEAM			SEAM	6.25m JT, 60°, PR, SN Fe, RF								
	2.8	6.81 SANDSTONE: pale grey and orange-brown, fine to medium grained; bedded at 0-10°, cross-bedded at 15-20°. Hawkesbury Sandstone.				XW	6.81	SEAM			SEAM	6.81-6.88m: DS, 10°, 70 mm					PLT	PL(A)=0.10MPa		
							6.88		86	62		6.92m: B, 10°, PR, SN Fe, RF								
							7.50					7.20-7.34m: B x2 5°, PR, SN Fe, RF								
							7.56					7.63m: DS, 5°, 20mm								
												7.65m: B, 5°, PR, SN Fe, RF					PLT	PL(A)=0.28MPa		
	8											7.84m: B 15°, PR, SN Fe, RF								
												7.88m: JT, 20°, PR, SN Fe, VR								
	2.7	8.40 SANDSTONE: pale grey, medium to coarse grained; bedded at 0-10°, cross-bedded at 10-20°. Hawkesbury Sandstone.				SW	8.40					7.90-7.95m: SZ, 10°, 50 mm								
												8.05m: B, 5°, PR, SN Fe, RF					PLT	PL(A)=0.81MPa		
												8.22m: DS, 5°, 40mm								
												8.29m: B 10°, PR, SN Fe, RF								
												8.48m: B, 0°, PR, CT CBS, RF								
	2.6	9				FR	9.30		100	98		9.26m: B, 5°, PR, CT CBS, RF					PLT	PL(A)=0.92MPa		
												9.29m: B, 5°, PR, CN, RF								
												9.92m: B, 10°, PR, Clay								
NOTES: #Soil origin is "probable" unless otherwise stated.																				

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Bobcat
METHOD: HA to 0.6m, AD/T to 1.0m, NMLC to 14.48m
REMARKS: Hole reamed to HQ size for well installation

OPERATOR: Ground Test (JJ)

LOGGED: C.S. YIP
CASING: HW to 1m

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 35.2 AHD
COORDINATE: E:326452.1, N:6231726.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 233414.03
DATE: 30/04/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED											SAMPLE			TESTING							
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	25		[CONT] SANDSTONE: pale grey, medium to coarse grained; bedded at 0-10°, cross-bedded at 10-20°. Hawkesbury Sandstone.							100	98		2mm, VR								
	11												10.42m: DS, 5°, 5mm					PLT	PL(A)=1.4MPa		
	24									100	100		10.90m DS, 5°, 10mm								
	12		12.25m-12.77m: fine to medium grained				FR						12.25m: B, 0°, IR, CN, VR					PLT	PL(A)=2.2MPa		
	23												12.83m B, 0°, PR, CN, RF					PLT	PL(A)=1.3MPa		
	13									100	99		13.33m: DS, 0°, 5mm					PLT	PL(A)=1.1MPa		
	22																				
	14																	PLT	PL(A)=1.1MPa		
	21																				
	15		Borehole discontinued at 14.48m depth. Target depth reached.															PLT	PL(A)=0.77MPa		
	20																				
	16																				
	19																				
	18																				
	17																				
	18																				
	19																				
	16																				

NOTES: #Soil origin is "probable" unless otherwise stated.

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Bobcat
METHOD: HA to 0.6m, AD/T to 1.0m, NMLC to 14.48m
REMARKS: Hole reamed to HQ size for well installation

OPERATOR: Ground Test (JJ)

LOGGED: C.S. YIP
CASING: HW to 1m

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Homes NSW

PROJECT: HAFF Project

LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 35.2 AHD

COORDINATE: E:326452.1, N:6231726.3

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03

PROJECT No: 233414.03

DATE: 30/04/25

SHEET: 1 of 2



1.00-6.00 m depth



6.00-11.00 m depth

CORE PHOTO LOG

CLIENT: Homes NSW

PROJECT: HAFF Project

LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 35.2 AHD

COORDINATE: E:326452.1, N:6231726.3

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03

PROJECT No: 233414.03

DATE: 30/04/25

SHEET: 2 of 2



11.00-14.48 m depth

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 31.9 AHD
COORDINATE: E:326364.0, N:6231713.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH08
PROJECT No: 233414.03
DATE: 01/05/25
SHEET: 1 of 3

[illegible]

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: Bobcat
METHOD: HA to 0.9m, AD/T to 2.5m, NMLC to 15.0m
REMARKS: Hole reamed to HQ size for well installation

OPERATOR: Ground Test (JJ)

LOGGED: C.S. YIP
CASING: HW to 2.5m

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 31.9 AHD
COORDINATE: E:326364.0, N:6231713.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH08
PROJECT No: 233414.03
DATE: 01/05/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED															SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (whole core intact) SOIL MOISTURE	GRAPHIC	BS XW HW MW SW FR	WEATH. DW	DEPTH (m)	STRENGTH VL M H VH EH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
09/05/25	31	1	Continued from soil log SANDSTONE: pale grey, orange-brown and red-brown , fine to medium grained; bedded at 0-10°, cross-bedded at 15-20°. Hawkesbury Sandstone.					2.50									1			Concrete		
	30	2							2.70									2			Sand	
	29	3				MW			3.10	L				3.10-3.20m: DS, 0-5°				3	PLT	PL(A)=0.15MPa PLT PL(A)=0.12MPa		
	28	4				XW			3.20	SEAM				3.28-3.70m: DS, 0-5°								
	27	5				MW			3.28	IM	90	54		4.31m JT, 75°, P R, SN Fe, VR, (4.17-4.45m)								
	26	6				XW			3.70	SEAM				4.45-4.59m: DS, 0-5°								
	25	7				MW			4.45	L				4.66-4.75m: DS, 0-5°								
	24	8				XW			4.59	SEAM				4.88-5.20m: DS, 10°								
	23	9				MW			4.66	L				5.22- 5.28m: DS, 10°								
	22					XW			4.75	SEAM				5.30m: B, 10°, P R, SN Fe, RF								
			SANDSTONE: orange-brown and red-brown, medium to coarse grained; indistinctly bedded at 0-10°, cross-bedded at 15-20°. Hawkesbury Sandstone.					4.88	L				6.50-6.52m: B x2, 20°, P R, Clay 2mm, RF									
									5.38	SEAM	100	74		6.63m: B, 0°, P R, Clay 5mm, VR								
														6.70m: DS, 5°, 30mm								
														8.14m JT x2, 60-70°, I R, SN Fe, VR								
			From 8.42m: pale grey					8.42		100	99		8.69m: DS, 0°, 20mm									
														8.83m: B, 20°, P R, Clay 2mm, RF								

PLANT: Bobcat
METHOD: HA to 0.9m, AD/T to 2.5m, NMLC to 15.0m
REMARKS: Hole reamed to HQ size for well installation

OPERATOR: Ground Test (JJ)

LOGGED: C.S. YIP
CASING: HW to 2.5m

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 31.9 AHD
COORDINATE: E:326364.0, N:6231713.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH08
PROJECT No: 233414.03
DATE: 01/05/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED										SAMPLE			TESTING									
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
	10.00		SANDSTONE: pale grey, medium to coarse grained; indistinctly bedded at 0-10°, cross-bedded at 15-20°. Hawkesbury Sandstone.				RS XW HW NW SW FR															
	21	11								100	97		10.45m: DS, 0°, 30mm 10.93m: DS, 0°, 20mm				11	PLT	PL(A)=0.77MPa			
	20	12	12.00m-12.09m: laminite band										11.86m: B, 10°, PR, CN, RF 11.98m: DS, 0°, 10mm 12.16m: DS, 0°, 10mm				12	PLT	PL(A)=0.87MPa			
	19	13	12.40m-12.50m: siltstone clasts				FR		M				12.46m: B, 20°, PR, CT CBS, RF				13	PLT	PL(A)=0.90MPa			
	18	14								100	98		13.96m DS, 0°, 20mm				14	PLT	PL(A)=1.2MPa			
	17	15																15	PLT	PL(A)=1.4MPa		
			Borehole discontinued at 15.00m depth. Target depth reached.																			
	16	16																				
	15	17																				
	14	18																				
	13	19																				
	12																					

NOTES: [#]Soil origin is "probable" unless otherwise stated.

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Bobcat
METHOD: HA to 0.9m, AD/T to 2.5m, NMLC to 15.0m
REMARKS: Hole reamed to HQ size for well installation

OPERATOR: Ground Test (JJ)

LOGGED: C.S. YIP
CASING: HW to 2.5m

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

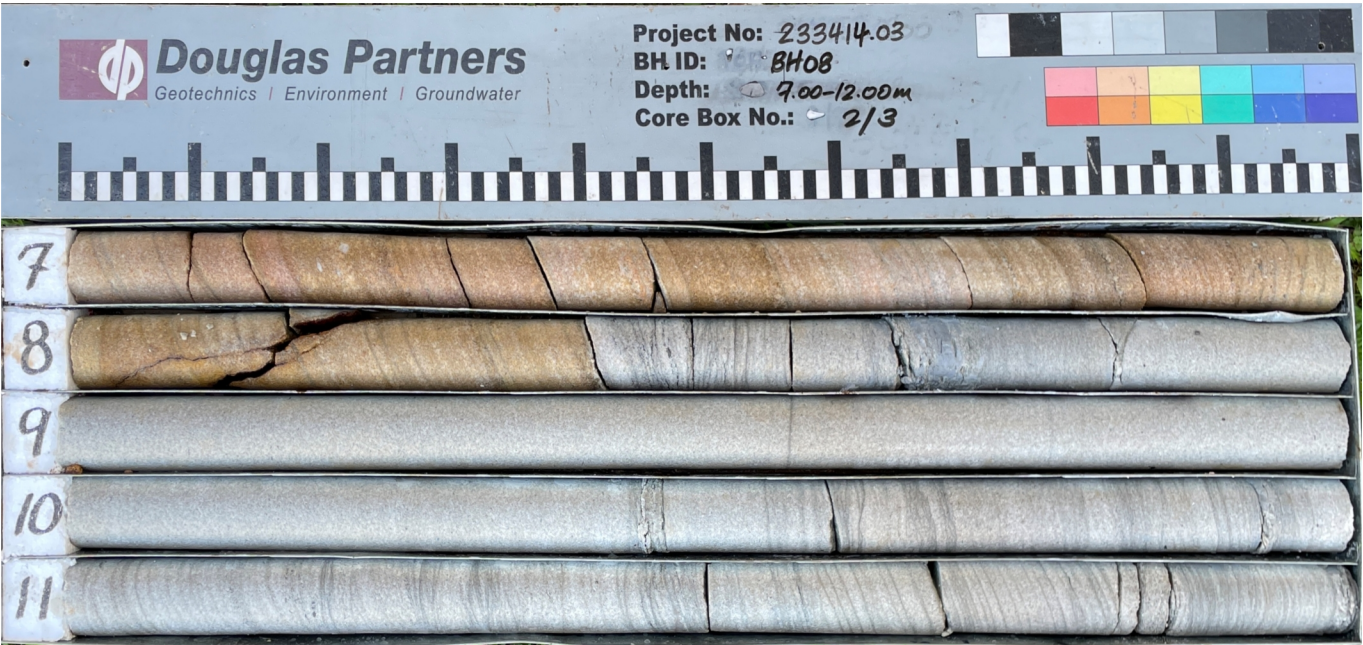
CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 31.9 AHD
COORDINATE: E:326364.0, N:6231713.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH08
PROJECT No: 233414.03
DATE: 01/05/25
SHEET: 1 of 2



2.50-7.00 m depth



7.00-12.00 m depth

CORE PHOTO LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 31.9 AHD
COORDINATE: E:326364.0, N:6231713.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH08
PROJECT No: 233414.03
DATE: 01/05/25
SHEET: 2 of 2



12.00-15.00 m depth

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 33.3 AHD
COORDINATE: E:326443.4, N:6231690.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH11
PROJECT No: 233414.03
DATE: 02/05/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS							
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾	DENSITY. ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	33	0.40	FILL / Silty CLAY trace gravel: dark brown and grey; low to medium plasticity; fine to medium, ironstone gravel; trace organic matter.		FILL	(MC)		w>PL		ES		0.20		SPT 2,6,8 N=14		
										A/ES		0.40				
										A/ES		0.50				
	1		Silty CLAY (CI-CH) with gravel: orange-brown mottled red-brown; medium to high plasticity; fine to medium, ironstone gravel.		RS	St		w=PL				1.00				
	1.30		Silty Sandy CLAY (CI-CH): pale grey, mottled red-brown; medium to high plasticity; fine to medium sand.		XWM	H		w<PL		SPT		1.45				
	1.80	2	SANDSTONE: orange-brown and pale grey, fine to medium grained; with extremely weathered bands. Hawkesbury Sandstone.			NA		NA				2				
	2.50		Continued as rock log							A		2.40				
		3										3				
	30															
		4										4				
	29															
		5										5				
	28															
		6										6				
	27															
		7										7				
	26															
		8										8				
	25															
		9										9				
	24															

09/05/25

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: Bobcat
METHOD: HA to 0.5m, AD/T to 2.5m, NMLC to 13.4m, WB to 14m
REMARKS: Hole reamed to HQ size and extended to 14m for well installation

OPERATOR: Ground Test (CS)

LOGGED: C.S. YIP
CASING: HW to 2.5m

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 33.3 AHD
COORDINATE: E:326443.4, N:6231690.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH11
PROJECT No: 233414.03
DATE: 02/05/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED										SAMPLE				TESTING					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (N/mm ²) SOIL MOISTURE (%)	GRAPHIC	WEATH. DW FR	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	33																		
	32																		
	2																		
	31																		
	30	Continued from soil log SANDSTONE: pale grey and red-brown, fine to coarse grained; bedded at 0-10°. Hawkesbury Sandstone.				2.50	SEAM				SEAM	250-271m: DS, 210mm 274m: JT, 35°, PR, SN Fe, RF				PLT	PL(A)=0.06MPa		
	29					2.71	VL L					285m: DS, 20mm 288m: DS, 10°, 5mm 290m: DS, 10°, 5mm 292m: DS, 10°, 5mm 296-3.01m: DS, 50mm 3.06-3.13m: DS, 70mm 3.20m: JT, 60°, PR, SN Fe, RF				PLT	PL(A)=0.23MPa		
	28					3.38	SEAM	100	18		SEAM	338-3.59m: DS, 210mm 3.65-3.74m: DS, 90mm 3.80m JT, 70°, PR, SN Fe, VR				PLT	PL(A)=0.11MPa		
	27					3.59	SEAM				SEAM	3.84-4.15m: DS, 290mm							
	26					3.74	SEAM				SEAM	4.37-4.64m: DS, 270mm							
	25					3.84	SEAM				SEAM	4.64-4.76m: DS, 120mm							
	24					4.15	SEAM				SEAM	4.84-5.38m: DS, 540mm							
	23					4.37	SEAM				SEAM	5.53-5.76m: DS, 230mm							
	22					4.67	SEAM				SEAM	6.15m: DS, 5°, 20mm 6.2m: DS, 0°, 5mm							
	21					4.76	SEAM				SEAM	6.54-7.58m: core loss due to drilling equipment malfunction (i.e. not seam)							
	20					4.84	SEAM				SEAM								
	19					5.38	SEAM	100	36		SEAM								
	18					5.53	SEAM				SEAM								
	17					5.76	SEAM				SEAM								
	16					6.25	SEAM				SEAM								
	15	SANDSTONE: pale grey, medium to coarse grained; bedded at 0-10°, cross-bedded at 10-20°. Hawkesbury Sandstone.				6.54	SEAM				SEAM								
	14					7.58	SEAM				SEAM								
	13						SEAM				SEAM								
	12						SEAM				SEAM								
	11						SEAM				SEAM								
	10						SEAM				SEAM								
	9						SEAM				SEAM								
	8						SEAM				SEAM								
	7						SEAM				SEAM								
	6						SEAM				SEAM								
	5						SEAM				SEAM								
	4						SEAM				SEAM								
	3						SEAM				SEAM								
	2						SEAM				SEAM								
	1						SEAM				SEAM								
	0						SEAM				SEAM								
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							SEAM				SEAM								

PLANT: Bobcat	OPERATOR:
METHOD: HA to 0.5m, AD/T to 2.5m, NMLC to 13.4m, WB to 14m	
REMARKS: Hole reamed to HQ size and extended to 14m for well installation	

OPERATOR: Ground Test (CS)

LOGGED: C.S. YIP
CASING: HW to 2.5m

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 33.3 AHD
COORDINATE: E:326443.4, N:6231690.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH11
PROJECT No: 233414.03
DATE: 02/05/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED											SAMPLE			TESTING																		
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE												
	10.00	SANDSTONE: pale grey, medium to coarse grained; bedded at 0-10°, cross-bedded at 10-20°. Hawkesbury Sandstone. 10.04m-10.88m: fine to medium grain, grey				PS SW HW MW SW FR	VL L M H VH		73	71		10.03m: DS, 5°, 10mm 10.87m: DS, 10°, 20mm 12.22m: DS, 0°, 20mm 12.27m: DS, 0°, 5mm 12.40m: DS, 0°, 20mm 12.61m: DS, 0°, 10mm					PLT	PL(A)=1.5MPa														
	11																							PLT	PL(A)=0.93MPa							
	12																							100	97					PLT	PL(A)=1.0MPa	
	13																														PLT	PL(A)=1.0MPa
	20																														PLT	PL(A)=0.75MPa
	14	Borehole discontinued at 13.40m depth. Target depth reached.																														
	19																															
	15																															
	18																															
	16																															
	17																															
	17																															
	16																															
	18																															
	15																															
	19																															
	14																															

NOTES: [#]Soil origin is "probable" unless otherwise stated.

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Bobcat
METHOD: HA to 0.5m, AD/T to 2.5m, NMLC to 13.4m, WB to 14m
REMARKS: Hole reamed to HQ size and extended to 14m for well installation

OPERATOR: Ground Test (CS)

LOGGED: C.S. YIP
CASING: HW to 2.5m

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Homes NSW
PROJECT: HAFF Project
LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 33.3 AHD
COORDINATE: E:326443.4, N:6231690.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH11
PROJECT No: 233414.03
DATE: 02/05/25
SHEET: 1 of 2



2.50-7.00 m depth



7.00-12.00 m depth

CORE PHOTO LOG

CLIENT: Homes NSW

PROJECT: HAFF Project

LOCATION: 2 Flide Street, Caringbah, NSW 2229

SURFACE LEVEL: 33.3 AHD

COORDINATE: E:326443.4, N:6231690.0

DATUM/GRID: MGA2020 Zone 56

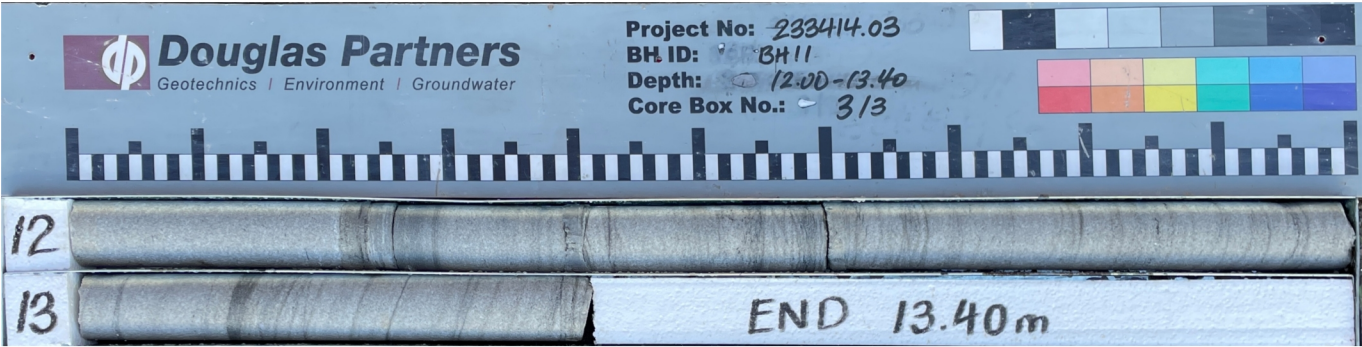
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH11

PROJECT No: 233414.03

DATE: 02/05/25

SHEET: 2 of 2



12.00-13.40 m depth

Appendix D

Results of Laboratory Testing

CERTIFICATE OF ANALYSIS 379768

Client Details

Client	Douglas Partners Pty Ltd
Attention	Lachlan Straney
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>233414.03, Caringbah</u>
Number of Samples	4 Soil
Date samples received	06/05/2025
Date completed instructions received	06/05/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	13/05/2025
Date of Issue	13/05/2025
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Results Approved By

Diego Bigolin, Inorganics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

Misc Inorg - Soil					
Our Reference		379768-1	379768-2	379768-3	379768-4
Your Reference	UNITS	BH03	BH08	BH08	BH11
Depth		0.8-1	1.3-1.5	2.5-2.6	1-1.45
Date Sampled		30/04/2025	01/05/2025	01/05/2025	02/05/2025
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	06/05/2025	06/05/2025	06/05/2025	06/05/2025
Date analysed	-	08/05/2025	08/05/2025	08/05/2025	08/05/2025
pH 1:5 soil:water	pH Units	6.8	7.3	6.4	5.2
Electrical Conductivity 1:5 soil:water	µS/cm	19	32	29	26
Chloride, Cl 1:5 soil:water	mg/kg	<10	10	10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	<10	30	25	32

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell.
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.

QUALITY CONTROL: Misc Inorg - Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			06/05/2025	[NT]	[NT]	[NT]	[NT]	06/05/2025	[NT]
Date analysed	-			08/05/2025	[NT]	[NT]	[NT]	[NT]	08/05/2025	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	95	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	96	[NT]

Result Definitions

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

Quality Control Definitions

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

CERTIFICATE OF ANALYSIS 380179

Client Details

Client	Douglas Partners Pty Ltd
Attention	Lisa Teng
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>233414.04 CARINGBAH</u>
Number of Samples	6 Water
Date samples received	09/05/2025
Date completed instructions received	09/05/2025

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	16/05/2025
Date of Issue	16/05/2025
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Results Approved By

Diego Bigolin, Inorganics Supervisor
 Giovanni Agosti, Group Technical Manager
 Greta Petzold, Operation Manager
 Jenny He, Inorganic Team Leader
 Timothy Toll, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

VOCs in water					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date Extracted	-	12/05/2025	12/05/2025	12/05/2025	14/05/2025
Date Analysed	-	13/05/2025	13/05/2025	13/05/2025	15/05/2025
Dichlorodifluoromethane	µg/L	<10	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1	<1
Chloroform	µg/L	7	1	23	6
2,2-dichloropropane	µg/L	<1	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1	<1
Cyclohexane	µg/L	<1	<1	2	<1
Carbon tetrachloride	µg/L	<1	<1	<1	<1
Benzene	µg/L	<1	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1	<1
Bromodichloromethane	µg/L	2	<1	3	2
trans-1,3-dichloropropene	µg/L	<1	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1

VOCs in water					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Bromoform	µg/L	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2
Styrene	µg/L	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1	<1
o-xylene	µg/L	<1	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	102	102	103	103
Surrogate Toluene-d8	%	101	100	101	100
Surrogate 4-Bromofluorobenzene	%	95	94	95	97

vTRH(C6-C10)/BTEXN in Water						
Our Reference		380179-1	380179-2	380179-3	380179-4	380179-5
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509	TS/20250508
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	12/05/2025	12/05/2025	12/05/2025	14/05/2025	12/05/2025
Date analysed	-	13/05/2025	13/05/2025	13/05/2025	15/05/2025	13/05/2025
TRH C ₆ - C ₉	µg/L	<10	<10	22	<10	[NA]
TRH C ₆ - C ₁₀	µg/L	10	<10	26	<10	[NA]
TRH C ₆ - C ₁₀ less BTEX (F1)	µg/L	10	<10	26	<10	[NA]
Benzene	µg/L	<1	<1	<1	<1	87%
Toluene	µg/L	<1	<1	<1	<1	91%
Ethylbenzene	µg/L	<1	<1	<1	<1	89%
m+p-xylene	µg/L	<2	<2	<2	<2	90%
o-xylene	µg/L	<1	<1	<1	<1	89%
Naphthalene	µg/L	<1	<1	<1	<1	[NA]
Surrogate Dibromofluoromethane	%	102	102	103	103	100
Surrogate Toluene-d8	%	101	100	101	100	100
Surrogate 4-Bromofluorobenzene	%	95	94	95	97	100

vTRH(C6-C10)/BTEXN in Water		
Our Reference		380179-6
Your Reference	UNITS	TB/20250508
Date Sampled		08/05/2025
Type of sample		Water
Date extracted	-	12/05/2025
Date analysed	-	13/05/2025
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	%	102
Surrogate Toluene-d8	%	101
Surrogate 4-Bromofluorobenzene	%	96

svTRH (C10-C40) in Water					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
Date analysed	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
TRH C ₁₀ - C ₁₄	µg/L	<50	<50	<50	<50
TRH C ₁₅ - C ₂₈	µg/L	<100	<100	<100	<100
TRH C ₂₉ - C ₃₆	µg/L	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50
TRH >C ₁₀ - C ₁₆	µg/L	<50	<50	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	<50	<50	<50
TRH >C ₁₆ - C ₃₄	µg/L	<100	<100	<100	<100
TRH >C ₃₄ - C ₄₀	µg/L	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50
Surrogate o-Terphenyl	%	82	83	85	83

PAHs in Water					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
Date analysed	-	13/05/2025	13/05/2025	13/05/2025	13/05/2025
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1
Surrogate <i>p</i> -Terphenyl-d14	%	80	68	72	92

Organochlorine Pesticides in Water					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
Date analysed	-	13/05/2025	13/05/2025	13/05/2025	13/05/2025
alpha-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
HCB	µg/L	<0.2	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2	<0.2
Mirex	ug/L	<0.2	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	106	79	92	109

OP Pesticides in Water					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
Date analysed	-	13/05/2025	13/05/2025	13/05/2025	13/05/2025
Dichlorvos	µg/L	<0.2	<0.2	<0.2	<0.2
Mevinphos	µg/L	<0.2	<0.2	<0.2	<0.2
Phorate	µg/L	<0.2	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2	<0.2	<0.2
Diazinon	µg/L	<0.2	<0.2	<0.2	<0.2
Disulfoton	µg/L	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos-methyl	µg/L	<0.2	<0.2	<0.2	<0.2
Parathion-Methyl	µg/L	<0.2	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos	µg/L	<0.2	<0.2	<0.2	<0.2
Fenthion	µg/L	<0.2	<0.2	<0.2	<0.2
Parathion	µg/L	<0.2	<0.2	<0.2	<0.2
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2	<0.2
Methidathion	µg/L	<0.2	<0.2	<0.2	<0.2
Fenamiphos	µg/L	<0.2	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2	<0.2
Phosalone	µg/L	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.2	<0.2	<0.2	<0.2
Coumaphos	µg/L	<0.2	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	106	79	92	109

PCBs in Water					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
Date analysed	-	13/05/2025	13/05/2025	13/05/2025	13/05/2025
Aroclor 1016	µg/L	<2	<2	<2	<2
Aroclor 1221	µg/L	<2	<2	<2	<2
Aroclor 1232	µg/L	<2	<2	<2	<2
Aroclor 1242	µg/L	<2	<2	<2	<2
Aroclor 1248	µg/L	<2	<2	<2	<2
Aroclor 1254	µg/L	<2	<2	<2	<2
Aroclor 1260	µg/L	<2	<2	<2	<2
Surrogate 2-Fluorobiphenyl	%	106	80	87	110

Total Phenolics in Water					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
Date analysed	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05

HM in water - dissolved					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
Date analysed	-	12/05/2025	12/05/2025	12/05/2025	12/05/2025
Arsenic-Dissolved	µg/L	<1	<1	1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	1	<1	<1
Copper-Dissolved	µg/L	2	7	2	2
Lead-Dissolved	µg/L	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	3	9	24	3
Zinc-Dissolved	µg/L	18	39	89	17

Metals in Waters - Acid extractable				
Our Reference		380179-1	380179-2	380179-3
Your Reference	UNITS	BH03	BH08	BH11
Date Sampled		08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water
Date prepared	-	12/05/2025	12/05/2025	12/05/2025
Date analysed	-	12/05/2025	12/05/2025	12/05/2025
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05

Ion Balance					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	13/05/2025	13/05/2025	13/05/2025	13/05/2025
Date analysed	-	13/05/2025	13/05/2025	13/05/2025	13/05/2025
Calcium - Dissolved	mg/L	6.1	3	15	6.4
Potassium - Dissolved	mg/L	2	1	3	2
Sodium - Dissolved	mg/L	46	110	140	46
Magnesium - Dissolved	mg/L	5.0	6.8	17	5
Hardness (calc) equivalent CaCO ₃	mg/L	36	36	110	36
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	13	10	30	11
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	13	10	30	11
Sulphate, SO ₄	mg/L	48	88	40	47
Chloride, Cl	mg/L	56	99	230	54
Ionic Balance	%	-1.0	7.0	3.0	1.0

Miscellaneous Inorganics					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	09/05/2025	09/05/2025	09/05/2025	09/05/2025
Date analysed	-	09/05/2025	09/05/2025	09/05/2025	09/05/2025
pH	pH Units	5.6	5.4	6.1	[NA]
Electrical Conductivity	µS/cm	370	710	1,100	[NA]
Total Suspended Solids	mg/L	460	170	66	[NA]
Total Dissolved Solids (grav)	mg/L	190	490	660	[NA]
Total Cyanide	mg/L	<0.004	<0.004	<0.004	<0.004
Nitrate as N in water	mg/L	0.053	0.53	0.02	[NA]
Nitrite as N in water	mg/L	0.005	0.03	0.02	[NA]
NOx as N in water	mg/L	0.058	0.56	0.03	[NA]
Ammonia as N in water	mg/L	0.02	0.02	0.01	[NA]
Organic Nitrogen as N	mg/L	<0.2	6.9	<0.2	[NA]
TKN in water	mg/L	0.1	6.8	0.1	[NA]
Total Nitrogen in water	mg/L	0.2	7.4	0.2	[NA]
Phosphate as P in water	mg/L	0.01	0.006	<0.005	[NA]

Microbiological Testing					
Our Reference		380179-1	380179-2	380179-3	380179-4
Your Reference	UNITS	BH03	BH08	BH11	BD1/20250509
Date Sampled		08/05/2025	08/05/2025	08/05/2025	08/05/2025
Type of sample		Water	Water	Water	Water
Date of testing	-	10/05/2025	10/05/2025	10/05/2025	10/05/2025
E. coli	cfu/100mL	<18 mpn/100mL	<100	<1000	<18 mpn/100mL
Faecal Coliforms	cfu/100mL	<18 mpn/100mL	<100	<1000	<18 mpn/100mL

Method ID	Methodology Summary
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish).
	Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis.
	Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C.
	NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation below:-
	$\text{TDS} = \text{EC} * 0.6$
Inorg-019	Suspended Solids - determined gravimetrically by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
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).

Method ID	Methodology Summary
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 stoichiometrically from Phosphorus (assumed to be present as Phosphate). Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: VOCs in water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date Extracted	-			14/05/2025	1	12/05/2025	13/05/2025		14/05/2025	[NT]
Date Analysed	-			15/05/2025	1	13/05/2025	14/05/2025		15/05/2025	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	93	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	1	7	9	25	97	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	100	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	95	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Dibromomethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	103	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	1	2	3	40	90	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	95	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	101	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	95	[NT]
Bromoform	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	97	[NT]
Styrene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	100	1	102	99	3	101	[NT]
Surrogate Toluene-d8	%		Org-023	100	1	101	99	2	102	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	101	1	95	93	2	109	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			14/05/2025	1	12/05/2025	13/05/2025		14/05/2025	[NT]
Date analysed	-			15/05/2025	1	13/05/2025	14/05/2025		15/05/2025	[NT]
TRH C ₆ - C ₉	µg/L	10	Org-023	<10	1	<10	<10	0	96	[NT]
TRH C ₆ - C ₁₀	µg/L	10	Org-023	<10	1	10	<10	0	96	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	95	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	97	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	100	1	102	99	3	101	[NT]
Surrogate Toluene-d8	%		Org-023	100	1	101	99	2	102	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	101	1	95	93	2	109	[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	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	[NT]
Date analysed	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	[NT]
TRH C ₁₀ - C ₁₄	µg/L	50	Org-020	<50	1	<50	<50	0	92	[NT]
TRH C ₁₅ - C ₂₈	µg/L	100	Org-020	<100	1	<100	<100	0	99	[NT]
TRH C ₂₉ - C ₃₆	µg/L	100	Org-020	<100	1	<100	<100	0	86	[NT]
TRH >C ₁₀ - C ₁₆	µg/L	50	Org-020	<50	1	<50	<50	0	92	[NT]
TRH >C ₁₆ - C ₃₄	µg/L	100	Org-020	<100	1	<100	<100	0	99	[NT]
TRH >C ₃₄ - C ₄₀	µg/L	100	Org-020	<100	1	<100	<100	0	86	[NT]
Surrogate o-Terphenyl	%		Org-020	73	1	82	84	2	103	[NT]

QUALITY CONTROL: PAHs in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	380179-2
Date extracted	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	12/05/2025
Date analysed	-			13/05/2025	1	13/05/2025	13/05/2025		13/05/2025	13/05/2025
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	78
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	72	76
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	72	75
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	74	77
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	75	74
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	75
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	62	64
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	65	68
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	87	1	80	78	3	73	76

QUALITY CONTROL: Organochlorine Pesticides in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	380179-2
Date extracted	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	12/05/2025
Date analysed	-			13/05/2025	1	13/05/2025	13/05/2025		13/05/2025	13/05/2025
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	79	82
HCB	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	86	88
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	76	79
delta-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	75	72
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	82	86
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	83	86
Dieldrin	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	83	84
Endrin	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	77	80
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	80	83
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	75	79
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Mirex	ug/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	95	1	106	87	20	80	87

QUALITY CONTROL: OP Pesticides in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	380179-2
Date extracted	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	12/05/2025
Date analysed	-			13/05/2025	1	13/05/2025	13/05/2025		13/05/2025	13/05/2025
Dichlorvos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	90	90
Mevinphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Phorate	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Dimethoate	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Diazinon	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Disulfoton	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Chlorpyrifos-methyl	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Parathion-Methyl	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	76	78
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	85	88
Malathion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	86	89
Chlorpyrifos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	92	90
Fenthion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Parathion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	85	80
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Methidathion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Fenamiphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	81	83
Phosalone	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Azinphos-methyl (Guthion)	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Coumaphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	95	1	106	87	20	80	87

QUALITY CONTROL: PCBs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	380179-2
Date extracted	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	12/05/2025
Date analysed	-			13/05/2025	1	13/05/2025	13/05/2025		13/05/2025	13/05/2025
Aroclor 1016	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1221	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1232	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1242	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1248	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1254	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	92	96
Aroclor 1260	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	96	1	106	90	16	79	89

QUALITY CONTROL: Total Phenolics in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	[NT]
Date analysed	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	102	[NT]

QUALITY CONTROL: HM in water - dissolved					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date prepared	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	[NT]
Date analysed	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	104	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	98	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	95	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	2	1	67	98	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	107	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	[NT]		102	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	3	3	0	97	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	18	16	12	96	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	380179-2
Date prepared	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	12/05/2025
Date analysed	-			12/05/2025	1	12/05/2025	12/05/2025		12/05/2025	12/05/2025
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	1	<0.05	<0.05	0	99	98

QUALITY CONTROL: Ion Balance					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	380179-2
Date prepared	-			13/05/2025	1	13/05/2025	13/05/2025		13/05/2025	13/05/2025
Date analysed	-			13/05/2025	1	13/05/2025	13/05/2025		13/05/2025	13/05/2025
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	6.1	6.1	0	94	94
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	2	2	0	94	96
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	46	46	0	91	#
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	5.0	5.0	0	93	92
Hardness (calc) equivalent CaCO ₃	mg/L	3	Metals-020	[NT]	1	36	36	0	[NT]	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	13	[NT]		[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	13	[NT]		115	[NT]
Sulphate, SO ₄	mg/L	1	Inorg-081	<1	1	48	48	0	108	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	1	56	56	0	118	[NT]
Ionic Balance	%		Inorg-040	[NT]	1	-1.0	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	380179-2
Date prepared	-			09/05/2025	1	09/05/2025	09/05/2025		09/05/2025	09/05/2025
Date analysed	-			09/05/2025	1	09/05/2025	09/05/2025		09/05/2025	09/05/2025
pH	pH Units		Inorg-001	[NT]	1	5.6	[NT]		102	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	370	[NT]		99	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	460	[NT]		95	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	190	[NT]		101	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	<0.004	[NT]		83	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.053	0.05	6	111	104
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.005	<0.005	0	97	99
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.058	0.054	7	108	103
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.02	0.02	0	103	95
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	0.1	0.1	0	[NT]	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	0.2	0.2	0	89	79
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	0.01	0.009	11	105	92

Result Definitions

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

Quality Control Definitions

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

Report Comments

VOC vials have headspace

Microbiology analysed by Sonic Food & Water Testing. Report No. W2510574 & W2510578

The time between collection and the commencement of testing should not exceed 24 hours. Samples tested outside this time may have their results compromised

VOCs/BTEX in water - No vials were supplied for analysis of sample 380179-4. Subsampled from plastic bottles provided.

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.