Douglas PARTNERS

GROUNDED EXPERTISE

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Report on Geotechnical Investigation

Westfield, Warringah Mall - AVAC Sewer Pump Station

Warringah Mall, 145 Condamine St, Brookvale NSW

Prepared for Scentre Design & Construction Pty Ltd

Project 71015.54

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

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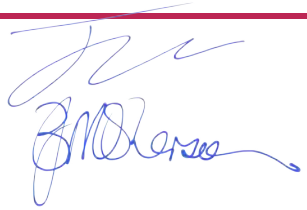

Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

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Report on Geotechnical Investigation
Westfield, Warringah Mall - AVAC Sewer Pump Station
Warringah Mall, 145 Condamine St, Brookvale NSW

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a geotechnical investigation undertaken for the proposed AVAC Sewer Pump Station at Westfield, Warringah Mall, 145 Condamine St, Brookvale NSW (the site). The investigation was commissioned by email instruction to proceed dated 30 July 2023 from Micha Hinden of Scentre Design & Construction Pty Ltd and was undertaken in accordance with Douglas' proposal 71015.54.P.001.Rev2, dated 7 May 2024.

It is understood that it is proposed to construct a new sewer pump station and underground storage tank at the site to replace the existing temporary sewer pump station. Figure 1 below shows an extract from the high-level mark-up provided. The site is shown on Drawing 1, Appendix B.

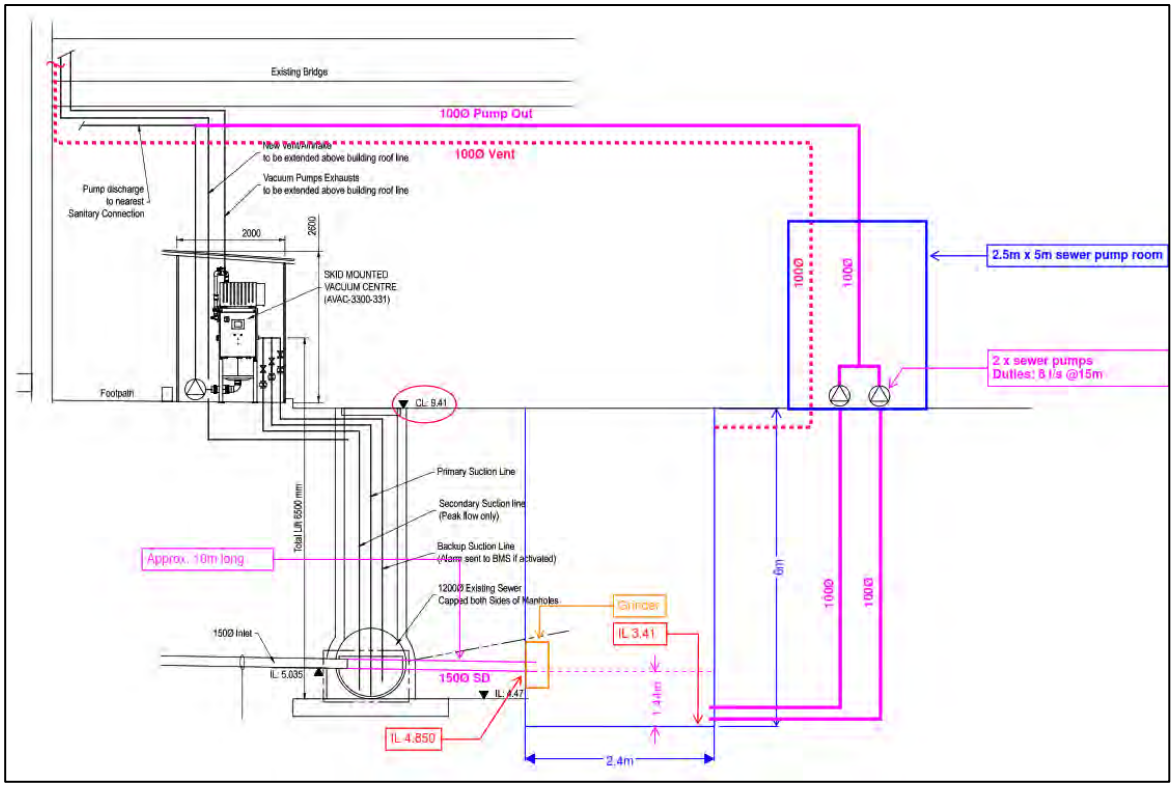

Figure 1: Extract of Sewer Pump Configuration from high level mark-up provided by Scentre Group

The aim of the investigation was to assess the subsurface soil and groundwater conditions at the site in order to provide geotechnical advice for the design and construction of the proposed sewer pump station.

The investigation included the drilling of two boreholes, installation of one groundwater monitoring well and laboratory testing of selected samples. The details of the fieldwork are presented in this report, together with comments and recommendations on the items listed above.

A contamination assessment has also been carried out alongside the geotechnical investigation and the results are provided separately.

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

2. Previous investigation

Douglas Partners Pty Ltd (DP) has previously undertaken extensive geotechnical, environmental and hydrogeological investigations at Warringah Mall over the years for various stages of development. Much of the previous investigation information for the Stage 2 Warringah Mall redevelopment was consolidated within Douglas report ref: 71015.37 (dated July 2018), titled Preliminary Geotechnical and Hydrogeological Investigation .

Reference to this assessment indicates a number of previous investigation boreholes and Cone Penetration Tests (CPTs) were conducted in the vicinity of the proposed AVAC Sewer Pump station.

Previous investigations have generally found the site to be underlain by alluvial sands, clays and peats ranging from soft to stiff and loose to medium dense within the CPTs. The alluvial soils overly sandstone bedrock at variable depths across the site. Where encountered, some previous investigation locations near the proposed (AVAC) sewer pump station encountered rock at depth of between 3.3 m to 6.1 m.

An existing groundwater monitoring well (BH510) located about 15 m south of the proposed sewer pump station encountered silty clay with peaty sand bands to the termination depth of 6 m. Groundwater levels measured at levels between 2.69 m and 3.24 m below ground level (5.38 m AHD to 5.93 m AHD) during the period from August 2011 to July 2014.

3. Site Description

The site, as shown below in Figure 2, is located within the Westfield Warringah Mall shopping precinct at 145 Condamine Street, Brookvale, NSW. The greater Westfield Warringah Mall site is bounded by Old Pittwater Road, Cross Street and Condamine Street / Pittwater Road, to the south, north and east of the shopping centre, respectively. The proposed sewer pump station and tank is located within the eastern on-grade carpark, adjacent to the intersection William Street and Condamine Street. The ground surface level is at approximately RL 9 m relative to the Australian Height Datum (AHD).

At the time of the investigation, the site was generally occupied by on-grade, asphaltic concrete (AC) carpark, adjacent to the multi-storey shopping mall buildings and associated multi-level parking structures to the west. The proposed sewer pump station and tank will underlie the existing AC carpark and concrete pedestrian traffic island.

Figure 2: Aerial Photograph of Site (site shown in red outline)

4. Published Data

4.1 Geology

Reference to the Sydney 1:100 000 Geology Series Sheet indicates that the subject site is underlain by stream alluvium and estuarine deposits comprising silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places and common shell layers. The boundary line between the Hawkesbury Sandstone unit (green) and the alluvial sediment unit (yellow) is located beyond the eastern street frontage with Pittwater Road, roughly 80 m to the east of site. The regional geological mapping at the subject site is shown in Figure 3, which indicates mapping of stream alluvial and estuarine deposits in yellow, and Hawkesbury Sandstone in green.

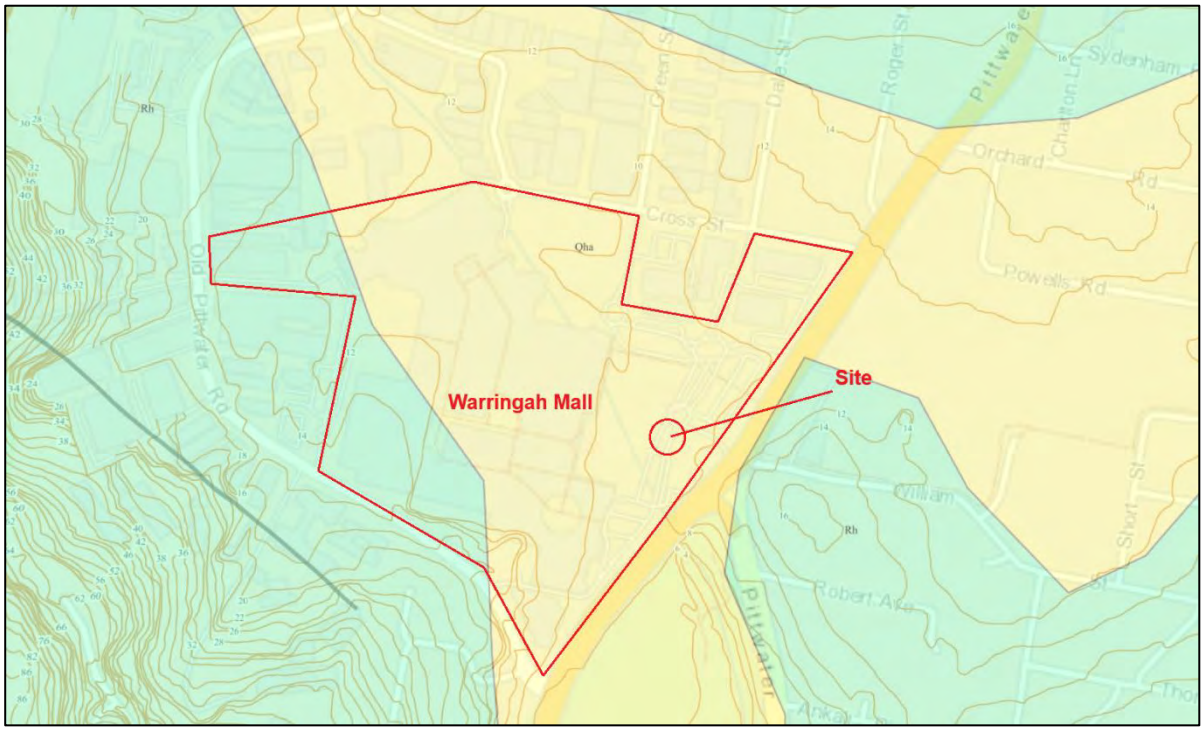

Figure 3: Extract of regional geology mapping and regional 2 m topographic contours at Warringah Mall

4.2 Acid Sulfate Soils

Reference to the Acid Sulfate Soil Risk mapping (data supplied by NSW Department of Environment and Climate Change based on published 1:25,000 Acid Sulfate Soil Risk Mapping, 1994-1998) indicates that the subject site is underlain by soil with "low probability of occurrence" of acid sulphate soil (ASS).

Reference to the Northern Beaches Council "Warringah Acid Sulfate Soils Map WLEP 2000" indicates the site in located in an area of "Class 4" Acid Sulfate soil risk, Class 4 indicates Acid sulfate soils are likely to be found beyond 2 metres below the natural ground surface.

5. Fieldwork

5.1 Fieldwork methods

Fieldwork for the geotechnical investigation was carried out between 27th and 29th May 2024 during night work hours, and included:

- Service scanning to clear the borehole locations of buried services, undertaken by personnel engaged by Scentre Group;
- Non-Destructive Digging (NDD) at the two boreholes (BH1 and BH2), using a vacuum truck together with hand augering techniques to depth of 1.5 m below existing ground surface;
- The boreholes were then extended to weathered rock at depths between 5.35 m (BH1) to 6 m (BH2), using a bobcat mounted drilling rig and using solid flight augers;

- BH1 and BH2 were then extended to depths between 9.0 m to 9.6 m below ground level respectively using NMLC diamond coring equipment to recover continuous rock core samples;
- Standard Penetration Tests (SPTs) were carried out at regular intervals through the soil profile; and
- Installation of one groundwater monitoring well in a second locations drilled next to BH2.

Both boreholes were backfilled with gravel and spoil, with a 1 m bentonite seal at the soil-rock interface on completion, reinstated with asphaltic concrete and concrete at ground surface.

The groundwater monitoring well was backfilled with 5 mm filtered sand and sealed with bentonite as part of the groundwater monitoring well construction. The well was installed with a Gatic cover and reinstated with concrete flush with the ground surface. Construction details for the monitoring well are shown on the borehole log (for BH2) in Appendix C.

The locations of the boreholes are shown on Drawing 1 in Appendix B.

The eastings, northings and ground surface levels shown on the borehole logs were measured using a differential GPS.

5.2 Field work results

Detailed descriptions of the subsurface conditions encountered are given in the borehole logs included in Appendix C alongside photographs of the rock core and notes defining classification methods and descriptive terms.

5.2.1 Boreholes

The general strata encountered in the boreholes is summarised as follows:

Pavement / Fill	Generally comprised 60 mm of asphaltic concrete (AC) or, 150 mm of concrete pavement over 200 mm of AC pavement overlying fill comprising cemented road base and silty clay with trace sandstone and ironstone gravels to depths of up to 1.4 m.
Alluvial Soil:	Very loose and loose organic clayey and peaty sand, with occasional quartz gravel, encountered to depth of between 5.4 m and 4.0 m. Very soft clay with peat and sand encountered below the alluvial sands in BH2 only at 4.0 m to a depth of 5.2 m.
Extremely Weathered Sandstone:	Very dense fine to coarse grained clayey sand and possibly very low strength rock encountered below the alluvial soils to depth of about 6 m.
Sandstone:	Fine to coarse grained, slightly to moderately weathered Hawkesbury Sandstone encountered at depths between 5.9 m to 6.0 m and extending to the maximum investigation depth of 9.6 m. Initially very low to low strength, improving to medium strength from about 7.9 m to 8.2 m.

Bedding planes recorded in the rock cores dip at less than 15° from horizontal, which is typical for the Hawkesbury Sandstone. Fracture spacing (which includes bedding plane partings and joints) indicates that the rock is generally fractured to slightly fractured. Clay seams / decomposed beds up to 60 mm thick, were also encountered.

5.2.2 Groundwater

Groundwater seepage was noted at about 2.6 m in BH2 completion of augering. The necessary use of water as a drilling fluid precluded the observation of groundwater during coring.

After installation, the groundwater monitoring well installed within BH2 and the previous investigation borehole BH510 were purged of drilling fluid and water using a submersible pump and digital data loggers were installed to monitor recharge of the groundwater. A summary of the well construction details and groundwater measurements taken following installation of the groundwater wells are presented in Table 1 and Table 2 below.

Table 1: Well Construction Details

BH Ref	Ground Surface Level (m AHD)	Filter Zone Depth (m)	Filter Zone Material
BH2	8.9	2.2 – 5.5	Alluvial soil
BH510	8.6	3.0 – 6.0	Alluvial soil

Table 2: Summary of Manual Groundwater Measurements

BH Ref	Water Depth (m)	Water Level [RL m AHD]	Date of Reading	Comments
BH2	2.5	6.4	06/06/2024	Measurement taken prior to Falling Head Test
BH510	2.33	6.29	06/06/2024	Measurement taken prior to Falling Head Test
BH510	3.24	5.38	10/07/2014	
BH510	2.93	5.69	28/05/2013	
BH510	3.10	5.52	29/05/2013	
BH510	3.16	5.46	07/09/2012	
BH510	2.69	5.93	02/03/2012	
BH510	2.80	5.82	22/08/2011	
BH510	2.80	5.82	15/06/2010	

Notwithstanding the above, it should be noted that groundwater levels can vary seasonally and in the long term due to several factors.

5.2.3 Permeability Testing

Falling head permeability tests were carried out in each borehole to evaluate the hydraulic conductivity of soil encountered in the boreholes. The test involves adding water and measuring the changes in water level in the well at regular time intervals using the dataloggers. The results of the permeability tests using Hvorslev's (1951) method are summarised in Table 3 below. Results sheets are provided in Appendix C.

Table 3: Hydraulic Conductivity Test Results

Borehole	Test Zone Depth (m)	Test Zone Material	Estimated Hydraulic Conductivity (k) (m/s)	Estimated Hydraulic Conductivity (k) (m/day)
BH2	2.2 – 5.5	Alluvial soil	7.5×10^{-6}	0.65
BH510	4.5 – 6.0	Alluvial soil	7.7×10^{-6}	0.66

6. Laboratory testing

6.1 Geotechnical Laboratory Testing

Geotechnical laboratory testing was carried out on selected soil and rock samples. The results are summarised below and detailed laboratory test reports are provided in Appendix E.

6.2 Aggressivity

Three soil samples were tested at an external NATA accredited laboratory to assess aggressivity (pH, chloride, sulphate content and electrical conductivity) to buried concrete elements. The results are summarised in Table 4 and the laboratory result sheets are attached in Appendix D.

Table 4: Summary of Aggressivity Test Results

Borehole	Depth (m)	Material	pH	Chloride (mg/kg)	Sulphate (mg/kg)	Electrical Conductivity (µS/cm)
BH1	1.4 – 1.5	Clayey SAND	6.7	<10	21	58
BH1	3.4 – 3.5	Peaty SAND	6.4	10	78	81
BH2	5.2 – 5.3	Sandy CLAY	5.2	<10	320	190

6.2.1 Soil Particle Size

Two samples were tested from BH1 (1.4–1.5 m) and BH2 (4.3–4.5 m) to assess the particle size distribution. Detailed laboratory results are attached in Appendix D.

The results from BH1 generally indicate that the sand tested is generally poorly graded and predominantly fine and medium grained with 28% silt / clay fines.

The sample tested from BH2 was predominantly silts / clay fines with about 24% fine to coarse sand.

6.2.2 Point Load Strength Index Testing

The results of point load strength index testing ($Is_{(50)}$), carried out at regular intervals on rock cores, are shown on the borehole logs in Appendix C. The $Is_{(50)}$ results range from less than 0.1 MPa to 0.93 MPa in the underlying bedrock, generally indicate rock of very low to medium strength.

6.2.3 Acid Sulfate Soils

A number of samples were also screened for the presence of Acid Sulphate soils. Details of this testing and the results are presented within the contamination assessment report issued separately to this report.

7. Proposed development

It is proposed to construct a new vacuum pump station to replace the existing temporary system. The design of the new system is still in development but is understood include an above ground sewer pump station and an underground holding tank with associated service connections. It is understood that the connection between the new system and existing sewer may involve trenches or possibly an under bore extending from the proposed tank location. The inground tank is understood to be about 2.4 m by 3.0 m in plan dimensions and up to 6 m depth. Based on this, the maximum excavation depth for the development expected to be about 6 m. The proposed development is located in the vicinity of a number of large stormwater culverts which cross the greater Warringah Mall site in a roughly northwest to southeast orientation. The provided drawings (SDC-42.0001, RevA and SDC-42.1001, RevA, Dated 06/06/24) and high-Level mark-up (CAR-060111, Rev6, dated22/11/2016) are included in Appendix E.

8. Geotechnical Model

Based upon the information from this investigation and review of the previous Douglas investigations undertaken in the vicinity of the proposed sewer pump station, the site is generally underlain by layers of fill up to 1.4 m, with some localised areas of deeper fill up to 3 m depth noted in previous investigations to the east of the proposed development site. The fill is typically underlain by alluvial soils comprising very loose to loose and very soft to soft organic/peaty sands and clays to depths of up to 5-6 m. Thin layers (typically less than 1 m thick) of residual clayey sand and extremely weathered rock underlie the alluvial soil in some places which typically grade to very low to low strength sandstone at depths of about 6 m. The sandstone was noted to improve to medium strength from depths of about 8 m in the investigation boreholes BH1 and BH2.

It is noted that based on Pells et al (1998) and Pells, Douglas et al (1978), which provides a classification system for shale and sandstone in the Sydney region, some of the sandstone would be referred to as medium to high strength from depths of around 8 m.

The subsurface profile encountered in the boreholes has been summarised into four units as outlined in Table 5 below.

Table 5: Geotechnical Model

Unit	Material	Description	Top of Unit Depth (m) [RL m AHD]
1	Fill / Pavement	Asphaltic concrete (AC) concrete pavement overlying fill comprising cemented road base and silty clay with trace sandstone and ironstone gravel	(0.0 m) [8.9 - 9.1 m AHD)
2	Alluvial Soil	Loose and very loose organic clayey and peaty sand, with occasional quartz gravel and very soft clay with peat and sand	(1.4) [7.5 - 7.7 m AHD)
3	Extremely Weathered and Very Low to Low strength Sandstone	Extremely weathered (sugary) rock grading to pale grey and orange-brown stained, very low to low strength, fractured to slightly fractured and moderately to slightly weathered.	(5.4 – 5.2 m) [3.7 - 3.8 m AHD)
4	Medium or medium to high strength Sandstone with some extremely weathered seam	Pale grey and orange-brown and purple stained, medium or medium to high strength, fractured to slightly fractured, slightly weathered with some extremely weathered seams.	(7.9 - 8.2 m) [1.0 – 0.9 m AHD)

Groundwater levels measured in the wells in vicinity of the proposed sewer pump station were noted at 2.3 m to 2.5 m below ground level, with past levels measured in BH510 (15 m to the south) between 2010 and 2014 ranging from about 2.8 m to 3.2 m below ground level. Reference to the detailed groundwater investigation undertaken across the broader Warringah Mall site (Douglas Report 71015.06, dated June 2011) indicates that the groundwater in the area generally flows towards the east at a gradient of approximately 0.02.

Notwithstanding the above, it should be noted that groundwater levels can vary seasonally and in the long term and may fluctuate over time, particularly, following periods of heavy rainfall.

9. Comments

9.1 Excavation and Groundwater Conditions

Based on the boreholes, the excavation for the sewer pump station and associated tank are anticipated to extend through Unit 1, Unit 2 and possible some Unit 3 material. The excavatability of the materials that will likely be encountered during the excavation works are summarised in Table 6 below.

Table 6: Summary of Soil and Rock Excavatability

Unit	Material	Excavatability
1	Fill	Readily excavated by conventional earthmoving equipment such as hydraulic excavators with bucket attachments.
2	Alluvial Soils	
3	Extremely Weathered and Very Low to Low strength Sandstone	Removal may require hydraulic excavators with rock hammers and ripping.

Due to the relatively shallow depth to groundwater, it is expected that moderate to heavy seepage will occur into the excavations as well as any pile or deeper trench excavations required, and consideration will need to be given to managing the inflow of groundwater during excavation.

The rate of groundwater seepage can be relatively high in sandy alluvial soils and a conventional 'sump and pump' dewatering methods may not be suitable to control inflow into deeper excavations below the groundwater level.

Uplift or buoyancy of the proposed underground storage tanks due to installation below the water table and fluctuations of the water table, should also be considered in their design. Fluctuations of several metres could occur following prolonged heavy rainfall.

9.1.1 Methods of Dewatering

Dewatering on sites underlain by sandy soils is usually undertaken with spearpoint wells (i.e. 'spears') installed at regular intervals within the confines of the excavation. Spears (machine-slotted PVC pipes) are installed below the groundwater table and generally spaced at about 1 m to 2 m centres around the perimeter of the excavation. Alternatively, larger diameter spears can be used and positioned close to the centre of the site. The spears are connected by a series of connecting pipes hoses and pumps which collect groundwater, usually in a sedimentation tank, prior to discharge off-site.

Based on the laboratory grading tests and the in-situ falling head permeability tests, the alluvial clayey sands / sandy clays underlying the site are likely to have a bulk permeability (k) of between $4.4x10^{-5}$ and $7.7x10^{-6}$ m/s. These values are typical for clayey sands and may be used as a basis for preliminary design of the temporary spear-point dewatering system for this site.

Construction dewatering typically requires a Water Supply Works Approval from WaterNSW, or the Natural Resources Access Regulator (NRAR). For dewatering volumes greater than 3 ML/year, a Water Access Licence and appropriate water share allocation may be required.

9.1.2 Drawdown and Settlement

The dewatering system should consider the effect of groundwater drawdown (i.e. lowering of the water table) and the possible resulting settlement on neighbouring buildings and structures. In addition, the effect of drawdown may also need to consider the effect on possible acid sulfate soils, if present in the drawdown zone.

The dewatering system should be designed to limit the drawdown within the permeable clayey and peaty sands outside the perimeter shoring wall, which is expected to reduce rapidly away from the dewatering system. It is expected that a drawdown of less than 1 m would be within the range of historic low groundwater levels and therefore, settlements due to (groundwater) drawdown of 1 m may be relatively minor (less than say 3-5 mm). It is therefore suggested that the proposed shoring and dewatering scheme should be designed to target a drawdown of no more than say, 1 m at the surrounding structures or utilities founded at a high level (i.e. above the groundwater table).

In order to reduce the (groundwater) drawdown outside the excavation to less than 1 m, the following options would generally be required in conjunction with the adoption of relatively impermeable perimeter shoring walls:

- Install impermeable shoring / cut off walls around the perimeter of the excavation with sufficient embedment to reduce inflow rates and drawdown. Shoring walls socketed at least 1 m into rock would significantly reduce inflow and drawdown, but this would probably require shoring walls taken down into rock at depths of about 6-6.5 m;
- Use of recharge / reinjection wells to direct pumped water back into the ground outside the excavation perimeter to help maintain a more stable groundwater table. Usually, vertical reinjection wells are installed outside the site where there is space. Reinjection is difficult and not commonly adopted in built up areas and would generally be subject to approval from relevant authorities.

During construction, it is recommended that drawdown outside the excavation, in the vicinity of the adjacent structures and critical utilities (supported at a high-level) should be monitored in general accordance with the following:

- Install standpipes in accessible areas outside the proposed excavation to monitor groundwater drawdown levels during dewatering;
- Measure groundwater levels on a weekly basis for two weeks prior to operation of the dewatering system to establish pre-developed levels;
- Measure groundwater levels frequently during the beginning of the of dewatering (say twice a day for 2 days), reducing to a lesser frequency following the initial period (say daily and possibly then weekly) until the dewatering system is decommissioned, or until a lesser frequency is advised by a geotechnical engineer; and
- Where drawdown levels exceed a pre-agreed ‘trigger level’ (to be set), the reason for the change in groundwater level should be investigated and measures put in place to rectify the exceedance. These measures could include reduction of pumping rates or suspension of dewatering.

The dewatering of the site should be carried out by a contractor with demonstrated experience in similar conditions.

Numerical modelling should be carried out to confirm the requirements of the proposed dewatering system and predict drawdown levels and associated settlements on adjacent properties. Such modelling can also be used to estimate the possible volumes of groundwater take during dewatering which can be used to inform Water Supply Work Approval and / or Water Access Licence applications with WaterNSW / NRAR. Groundwater modelling is generally carried out once details of the proposed shoring and dewatering system are available.

9.2 Excavation Support

Vertical excavations in fill and alluvial soils (Unit 1 and 2) and rock less than medium strength (Unit 3) cannot be relied upon to remain stable and will require both temporary and permanent lateral support during and after excavation. This includes localised excavation for the construction and installation of the associated in-ground tank and any deep trenches for service connections. The use of batter slopes should be limited to areas above the groundwater table, due to the potential for unstable conditions below the groundwater table.

9.2.1 Batter Slopes

Batter slopes are not generally considered suitable for excavations extending below the groundwater table and should therefore be limited to excavations of less than approximately 2 m, based on current groundwater levels. For this area, batter slopes should be no steeper than the suggested slopes in Table 7 below. If surcharge loads are applied near the crest of the slope, or water seepage emerges from the face, then further specific geotechnical review and flatter batters or the use of shoring may be required.

Table 7: Suggested Temporary Batter Slopes for Excavation above the Groundwater Table

Unit	Material	Maximum Temporary Batter Slope (H:V)
1	Fill	1.5 : 1
2	Alluvial Soil	2 : 1

9.2.2 Retaining Walls / Shoring

Where batter slopes cannot be used, or for excavations below the groundwater table, shoring walls will be required to support the fill and alluvial soils (Unit 1 and 2) and Unit 3 rock, if encountered. It is understood that the excavation for the installation of the proposed tank will need to be suitable for personnel to enter in order to install an anchor 'strap' and concrete base for the tank. It may also be necessary to undertake under-boring from the tank excavation to connect with the existing sewer, depending on the method of construction adopted. Shoring for the excavation will therefore need to consider the relativity high water table in the area and the stability of the very loose to loose (and very soft) alluvial soils in order to maintain a safe working environment during construction.

Possible options for shoring may include:

- Secant piles, comprising alternating 'hard' and 'soft' piles drilled to overlap the neighbouring piles;
    - Can provide a robust shoring system that limits groundwater inflow, however, is a relatively expensive method and typically used for permanent shoring support.
- Cutter soil mixed (CSM) walls, a specialist tool is used to mix the in-situ soils with a binding agent (typically cement/grout) to create a shoring wall. The trench excavation for the soil mixing is typically supported with a bentonite slurry during drilling which is then displaced by the soil cement mixture of the wall, as it rises from the bottom of the trench. Reinforcement is then placed within the wet soil-cement mixture. Some additional key points to note for CSM walls are summarised as follows:

  - Strength of the soil-cement wall is often governed by the soil type in the mixture. Due to the clay and organic content of the soils on site, the resulting strengths may be reduced, but is likely to adequate for temporary shoring purposes;
  - Reduces spoil generation for excavation of the shoring wall (by mixing the insitu soils with fluid cementitious grout;
  - Can form a relatively watertight shoring system to reduce inflows;
  - Requires a large set-up area due to the required bentonite slurry management; and
  - Would generally have difficulties to penetrate competent rock.

- Proprietary small-diaphragm wall systems may be available, such as the Castec® shoring wall system, however it is recommended that the capability of such systems be confirmed with the supplier.
- Driven steel or polyvinyl sheet piles, comprising interlocking sheets;
  - This method is typically associated with high noise and vibration equipment which may not be suitable for the site (some specialist driving methods are available, including the Giken "Silent Piler");
  - Typically suitable for temporary support, only;
  - Unlikely to penetrate rock without pre-drilling and irregularities in the rock surface can reduce effectiveness in reducing water inflow into the excavation.

Other methods of shoring may be appropriate depending on the details of the construction method and requirements and can be reviewed once further details are available.

Regardless of the method adopted, the shoring contractor should confirm the capabilities of the proposed method of installation with consideration of the ground conditions on site (i.e. groundwater, alluvial soils, rock level and strength, etc).

Cantilevered shoring systems are not appropriate where lateral deflection of the soil must be controlled, such as within the zone of influence of movement sensitive structures, such as footings of the existing buildings, or utilities and structures within the car park. The footing type and founding level of any adjoining footings, structures and utilities should be considered in the shoring design.

It is suggested that the preliminary design of cantilevered support or shoring with one row of props or anchors (or internal bracing) be based on a triangular earth pressure distribution using the earth pressure coefficients provided in Table 8 below. The 'Active' earth pressure coefficient (Ka) values below may be used where some movement is acceptable.

Table 7: Recommended Earth Pressure Parameters for Shoring

Unit	Material	Unit Weight (kN/m^3)	Active Earth Pressure Coefficient (K_a)	
			Short Term	Long Term
1	Fill	20	0.3	0.4
2	Alluvial Soils	20	0.4	0.5
3	Extremely Weathered and Very Low to Low strength Sandstone	22	0.25	0.3

The above values assume that some deformation of the retaining wall may occur. Where the wall movement needs to be reduced (i.e. due to adjacent to existing / sensitive structures and services) the use of 'at rest' earth pressures, about 50% higher than the above active earth pressure coefficients, is recommended.

For walls where two or more rows of props, internal bracing or anchors are used, the shoring can be designed using a rectangular or trapezoidal earth pressure distribution. The lateral earth pressure can be calculated using 6H kPa (where H, in metres, equals the depth of the excavation requiring support). Adjacent to movement-sensitive structures or utilities, where it is critical that deformation is controlled, it may be necessary to calculate the pressure using 8H kPa. These pressures can be applied as either rectangular or trapezoidal earth pressure distributions.

In additional to normal earth pressures the design of shoring should allow for all surcharge loads, including building footings, inclined slopes behind the wall, traffic and construction related activities applied as a rectangular earth pressure distribution over the depth of influence. For most civil applications this is typically taken as the full-depth of excavation for the shoring system.

The earth pressure loading described above does not include either earthquake loads or hydrostatic pressures. The hydrostatic head for a water table rising to within say, a metre from the surface, should be allowed for in the shoring design, while at the same time reducing the unit weight of the retained earth (materials) to account for the buoyant condition.

For shoring installed with a 'dig-and-drop' methodology (i.e. of trench boxes / shields), vertical unsupported excavation should be limited to about 1.2 m before the shoring is installed. Any gaps between the trench shields / boxes and the excavation sidewalls should be backfilled with the excavated (trench) spoil.

Excavation activities must in general comply with the NSW Safework Excavation Code of Practice (COP, dated January 2020) in respect to occupational health and safety acts and regulations.

As a general rule, parking cars, placing stockpiles or operating mobile plant within a 1.5:1 (H:V) line drawn up from the base of the excavation (i.e. zone of influence) should be prevented without specific geotechnical assessment. If workers are required to enter the excavation, mobile plant operation such as excavators should be minimised within the zone of influence (and subject to specific assessment by the shoring designer). The shoring supplier and designer should consider the size of plant that will be operated adjacent to the excavation and the resulting applied track pressures.

Passive resistance for piles founded below bulk excavation level (i.e. secant piles) may be based on an ultimate passive bearing pressure of 400 kPa very low to low strength sandstone (Unit 3) and 4000 kPa in medium strength sandstone (Unit 4), which is not adversely affected by discontinuities. A factor of safety must be applied to these ultimate value, while considering the displacement that is required to mobilise the passive resistance. The first 0.5 m of rock socket below the bulk excavation level should not be taken into account for the purpose of passive restraint. The minimum socket depth should be equal to the greater of one pile diameter or 1.0 m below the lowest level of any nearby excavation.

9.2.3 **Vibration**

The use of vibratory methods to advance sheet piles for excavation support (and some other shoring and excavation methods) may be associated with the transmission of vibrations to adjacent occupied and vacant structures. During excavation, particularly where rock excavation is required, it will be necessary to use appropriate methods and equipment to keep ground vibrations at adjacent buildings and structures within acceptable limits. The level of acceptable vibration is dependent on various factors including the type of structure (e.g. reinforced concrete or brick structures etc.), its structural condition, the frequency range of vibrations produced by the construction equipment, the natural frequency of the structure and the vibration transmitting medium.

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 AS2670.2-1990 “Evaluation of human exposure to whole-body vibrations – continuous and shock induced vibrations in buildings (1-80 Hz)” indicates an acceptable day time limit of 8 mm/s VSPPV for human comfort.

Based on the experience of DP and with reference to AS2870, it is suggested that a maximum VSPPV of 8 mm/s (applicable at the foundation level of existing buildings) be provisionally employed at this site for both architectural and human comfort considerations, although this vibration limit may need to be reduced for sensitive structures or equipment in the area. Existing asset, building and utility owners in the vicinity of the proposed excavation should be consulted in regard to acceptable vibration levels.

9.3 **Foundations**

Based on the results of the investigation, the fill and alluvial soils at the site are generally not considered a suitable bearing stratum for most structures. It is therefore recommended that structures should be founded on footings taken to bedrock, or on piles.

Given the presence of fill deeper than 0.8 m, the ground profile at the site is considered consistent with a ‘P’ Classification in accordance with AS2870. It Is noted that AS2870 Is intended for foundations of residential buildings, and therefore is not directly applicable to the current development. The classification does, however, provide a general indication of foundation requirements for single storey structures.

9.3.1 **Shallow Foundations**

Shallow footings founded on soil could possibly be appropriate for smaller isolated structures (e.g., signage). Shallow footings founded on existing fill (Unit 1) or alluvium (Unit 2) may be

governed by total and differential settlement requirements and would require more detailed assessment once loading and performance criteria are known. It is expected that the new above ground pump station will need to be fully supported on pile foundations.

For the main tank and pump structures founded directly on sandstone bedrock, the bearing pressures given in Table 8 may be adopted for design purposes. The designer should give due consideration to uplift and buoyancy forces for the proposed below-ground tank and structures.

9.3.2 Pile Foundations

The results of the investigation indicate that ground conditions at the proposed sewer pump station comprise fill over loose / very soft alluvial soils, with the depth to bedrock ranging from about 5m to 6 m below ground level. Groundwater is also noted to be at a depth of about 2.5 m.

Bored piles may be considered in such conditions, however, temporary liners or casing is likely to be required to maintain the pile excavation stability though the alluvial soils, which would collapse if left unsupported. In addition, the method of concrete placement should consider the potential presence of high groundwater (i.e. tremie pour).

Alternatively, continuous flight auger (CFA), concrete-injected piles could be adopted. This is a non-displacement pile that has relatively low noise and vibration levels. CFA piles would be predominantly end-bearing piles in this environment and therefore require suitable bedrock for the bearing stratum.

Based on the results of field work, pile foundation design to support axial compression loads may be based on the bearing pressures given in Table 8.

Table 8: Maximum Bearing Pressures for Pile Foundations on Sandstone

Unit Reference	Description	End Bearing Pressure (MPa)		Shaft Adhesion in Compression* (kPa)	
		Allowable	Ultimate**	Allowable	Ultimate**
Unit 3	Very low strength sandstone	1	3	70	100
Unit 4	Medium strength sandstone	3.5	20	300	800

Note: *For design to cater for tension loading, it is recommended that a socket adhesion of 70% of the compressive value is adopted. Socket adhesion values assume at least 'R2' socket roughness, as per Walker & Pells (1998).

**Ultimate values occur at large settlements (>5% of the pile diameter). Pile performance at allowable bearing pressures should also be assessed, with due consideration of pile group effects.

All pile foundations should be the subject of geotechnical inspection by a suitably qualified and experienced geotechnical professional.

9.4 **Aggressivity**

In accordance with Table 6.4.2(C) and Table 6.5.2(C) in AS2159-2009, the results of the chemical laboratory testing indicate that the soil present at the site is 'moderately' aggressive to buried concrete and 'non-aggressive' to buried steel.

10. References

AS 2159. (2009). *Piling - Design and Installation.* Standards Australia.

AS 2870. (2011). *Residential Slabs and Footings.* Standards Australia.

Pells, P. J., Douglas, D. J., Rodway, B., Thorne, C., & McMahon, B. K. (1978). *Design Loadings of Foundations on Shale and Sandstone in the Sydney Region.* Australian Geomechanics Journal Vol G8.

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.

11. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at Warringah Mall, 145 Condamine St, Brookvale NSW in accordance with Douglas' proposal 71015.54.P.001.Rev2, dated 7 May 2024 and acceptance received from Micha Hinden dated 30 July 2023. The work was carried out under contract No.: 14635, dated 15 May 2024). This report is provided for the exclusive use of Scentre Design & Construction Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and / or their agents.

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

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

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

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

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

The scope of work for this investigation / report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of fill of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such fill may contain contaminants and hazardous building materials.

Appendix A

Notes About This Report

About this Report

November 2023

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

continued next page

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

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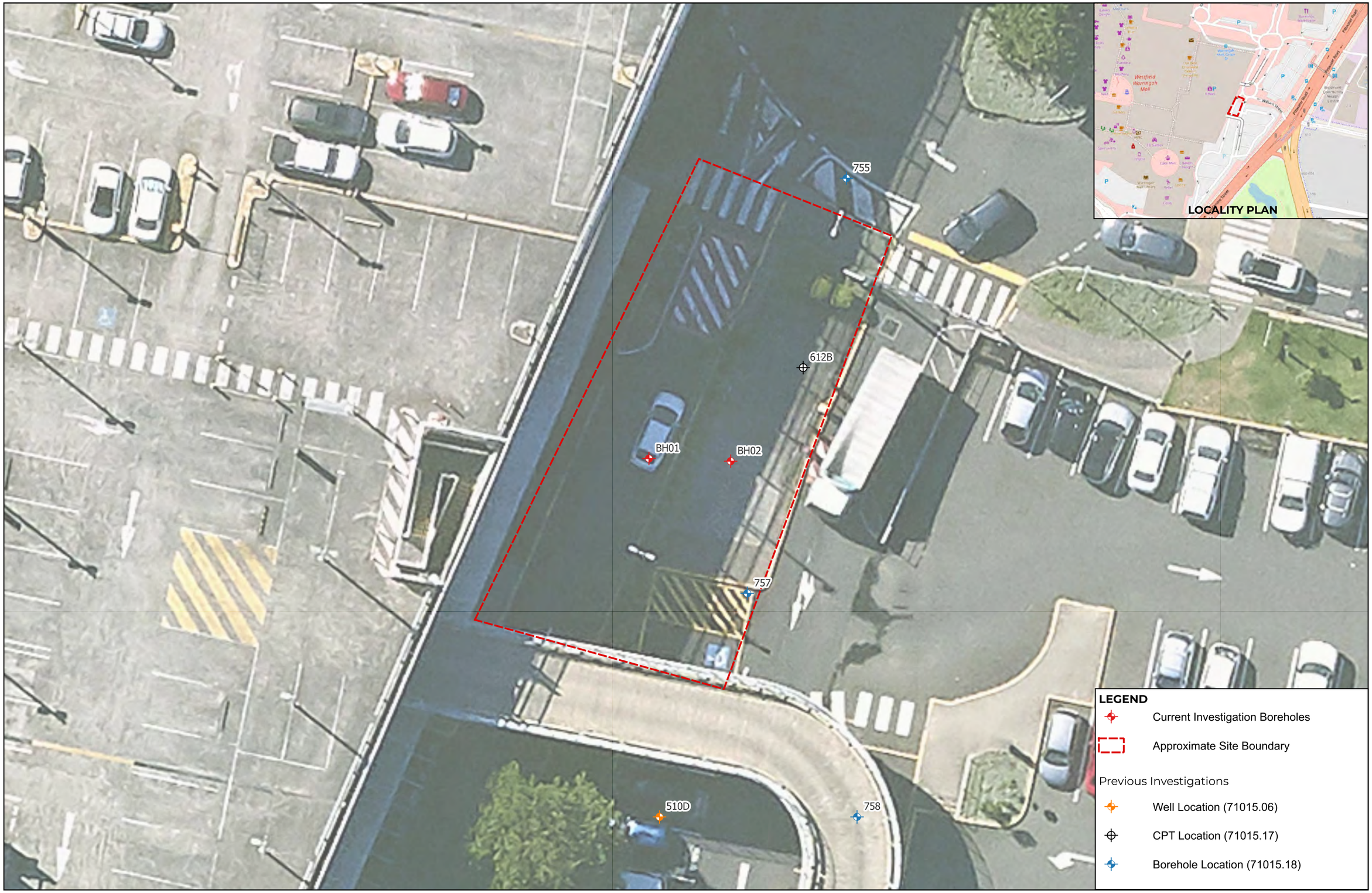
Appendix B

Drawings



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	01.07.2024	EC

SCALE: 0 2 4 6 8 10 m
1:200 @ A3

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

CLIENT:
Scentre Design & Construction Pty Ltd

NOTE:
1: Basemap from Metromap (Dated 25.03.2024)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Brookvale Westfield - AVAC Sewer Pump Station

PROJECT ADDRESS:
Warringah Mall 145 Condamine St, Brookvale

DRAWING TITLE:
TEST LOCATION PLAN

PROJECT NO: **710015.54**
DRAWING NO: **1**
REVISION: **0**

Appendix C

Fieldwork

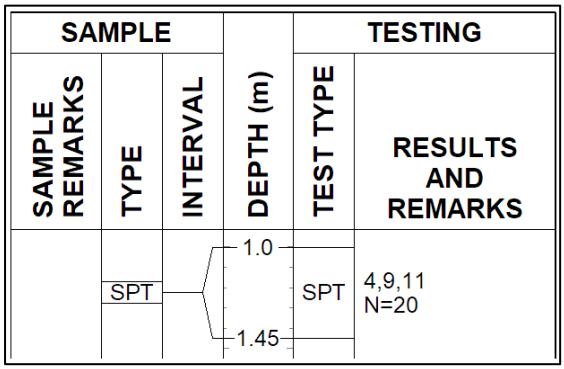
Sampling, Testing and Excavation Methodology

Terminology
Symbols
Abbreviations

March 2024

Sampling and Testing

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



Sampling

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

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

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

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

Field and Laboratory Testing

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

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

Field and laboratory testing (continued)

Test Type	Code
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

▷	seepage/inflow
▽	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

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

Douglas PARTNERS

Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style XW. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

Introduction

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

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

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

Particle size designation and Behaviour Model

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

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

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

[1] – refer grain size subdivision descriptions below

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

Component proportions

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

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

[1] As defined in AS1726-2017 6.1.4.4

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

Composite Materials

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

Soil Descriptions

Classification

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

Soil Name

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

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

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

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

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

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

Identification of minor components

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

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

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

Soil Composition

Plasticity

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

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

Grain Size

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

Grading

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

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

Soil Condition

Moisture

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

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

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

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

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

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

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

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

Consistency (fine grained soils)

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

Relative Density (coarse grained soils)

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

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

Compaction (anthropogenically modified soil)

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

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

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

Soil Origin

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

Cobbles and Boulders

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

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

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Rock Strength

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

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

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

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

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

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

Degree of Weathering

The degree of weathering of rock is classified as follows:

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

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

Degree of Alteration

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

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

Degree of Fracturing

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

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

Rock Quality Designation

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

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

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

Stratification Spacing

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

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

Defect Descriptions

Defect Type

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

Rock Defect Orientation

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

Rock Defect Coating

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

Rock Defect Infill

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

Rock Defect Shape/Planarity

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

Rock Defect Roughness

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

Defect Orientation

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

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BOREHOLE LOG

CLIENT: Scentre Design & Construction Pty Ltd
PROJECT: Brookvale Westfield - AVAC Sewer pump station
LOCATION: Warringah Mall, 145 Condamine St, Brookvale, NSW 21
SURFACE LEVEL: 9.1 AHD
COORDINATE: E:339537.4, N:6262232.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°
LOCATION ID: BH1
PROJECT No: 71015.54
DATE: 27/05/24 - 28/05/24
SHEET: 1 of 2

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
	9.04 / 0.06	ASPHALTIC CONCRETE PAVEMENT: 60 mm thick.										
		FILL / Silty Gravelly SAND: grey-brown; fine to medium; low plasticity silt; fine to medium, blue metal gravel. Cemented road base.		FILL	ND	ND						
	7.70 / 1.40	Clayey SAND, trace gravel; fine to coarse; low plasticity clay; fine to medium, quartz gravel.		ALV			PFAS	A/ES		1.40	PID	2.5ppm
								ES		1.90	PID	1.6ppm
		From 1.40m: Organic odour								2.00		
	6.75 / 2.35	Peaty SAND, with silt, trace gravel: dark grey; fine to coarse; coarse, quartz gravel.			L	M		ES		2.40	PID	1.2ppm
										2.50	PID	1.3ppm
								SPT			SPT	2,2,3 N=5
										2.90		0ppm
								ES		3.00	PID	
								ES		3.40	PID	0ppm
				ALV						3.50		
								ES		3.90	PID	0ppm
										4.00	PID	1.2ppm
								SPT			SPT	1,0,1 N=1
					VL	W				4.45		
		5.10m: Very low 'TC' bit resistance										
	3.75 / 5.35	Continued as rock										2/0 (HB)

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
OPERATOR: Ground Test (JJ)
LOGGED: CSY
METHOD: DT to 1.4m, VE to 1.5m, AD/T to 5.35m, NMLC to 9.00m
CASING: HWT to 5.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Scentre Design & Construction Pty Ltd
PROJECT: Brookvale Westfield - AVAC Sewer pump station
LOCATION: Warringah Mall, 145 Condamine St, Brookvale, NSW 21
SURFACE LEVEL: 9.1 AHD
COORDINATE: E:339537.4, N:6262232.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°
LOCATION ID: BH1
PROJECT No: 71015.54
DATE: 27/05/24 - 28/05/24
SHEET: 2 of 2

CONDITIONS ENCOUNTERED												SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (DW: PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (<0.06, 0.06-0.2, 0.2-0.6, 0.6-2, >2)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	9	0																	
	8	1													1				
	7	2													2				
	6	3													3				
	5	4													4				
	4	5													5				
		5.39	Continued from soil As below after 5.88m			5.35 5.39					5.35m: , Unless otherwise stated below, rock is fractured along rough, stained, planar bedding dipping at 0 -15 degrees.								
		5.88				5.88													
	3	6	SANDSTONE: pale grey, fine to coarse grained, bedded, 0 to 15°; with extremely weathered seams, and sub-rounded quartz gravel inclusions up to 8 mm diameter. Hawkesbury Sandstone		SW		VL to L	84	63		6.05m: DS, 10°, 60mm 6.11m: IS, 3°, 5 mm 6.27m: DS, 0°, 50mm				6	PLT	PL(A)=0.06MPa		
	2	7													7				
	1	8				8.18	M	100	70		8.25m: CS, 10°, 60mm 8.62m: IS, 5°, 42mm 8.71m: DS, 0°, 24mm 8.79m: DS, 0°, 3mm				8	PLT	PL(A)=0.2MPa		
	0	9	Borehole discontinued at 9.00m depth. Target Depth Reached.													PLT	PL(A)=0.4MPa		

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

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: Bobcat
METHOD: DT to 1.4m, VE to 1.5m, AD/T to 5.35m, NMLC to 9.00m
REMARKS:
OPERATOR: Ground Test (JJ)
LOGGED: CSY
CASING: HWT to 5.5m

Refer to explanatory notes for symbol and abbreviation definitions

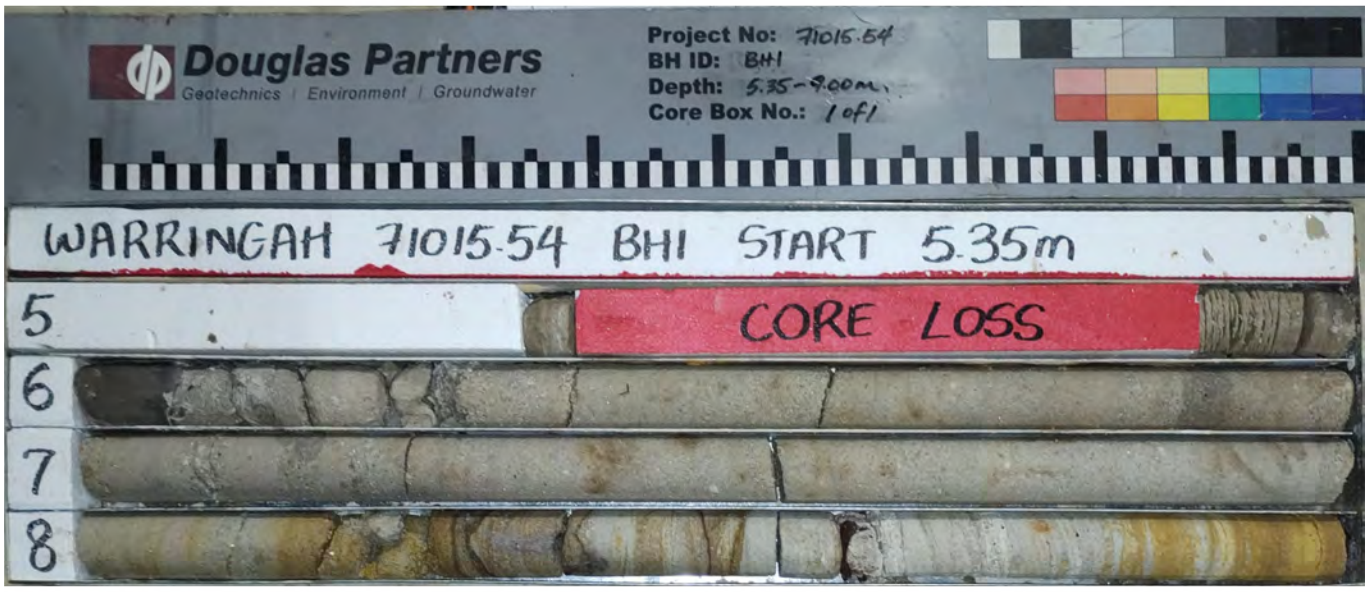
Douglas PARTNERS

CORE PHOTO LOG

CLIENT: Scentre Design & Construction Pty Ltd
PROJECT: Brookvale Westfield - AVAC Sewer pump station
LOCATION: Warringah Mall, 145 Condamine St, Brookvale, NSW 21

SURFACE LEVEL: 9.1 AHD
COORDINATE: E:339537.4, N:6262232.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH1
PROJECT No: 71015.54
DATE: 27/05/24 - 28/05/24
SHEET: 1 of 1



BOREHOLE LOG

CLIENT: Scentre Design & Construction Pty Ltd
PROJECT: Brookvale Westfield - AVAC Sewer pump station
LOCATION: Warringah Mall, 145 Condamine St, Brookvale, NSW 21
SURFACE LEVEL: 8.9 AHD
COORDINATE: E:339542.0, N:6262232.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°
LOCATION ID: BH2
PROJECT No: 71015.54
DATE: 28/05/24 - 29/05/24
SHEET: 1 of 2

CONDITIONS ENCOUNTERED								SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE		REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL / WELL PIPE
	0.15	CONCRETE PAVEMENT: 150 mm thick.			ND	ND								
	0.35	ASPHATIC CONCRETE PAVEMENT: 200 mm thick.		FILL	(MC)	w=PL			ES		0.35	PID	2.7ppm	Gravel
	0.50	FILL / Silty CLAY, trace gravel: red-brown mottled brown; medium to high plasticity; fine to medium, sandstone and ironstone gravel.		FILL	ND	ND					0.50			
	1.40	FILL / Gravelly SAND, with silt; fine to coarse; fine to coarse, blue metal gravel; Cemented road base.							ES		1.40	PID	2.1ppm	
		Clayey SAND, with silt, trace gravel: dark grey; fine to medium; low plasticity clay; fine to medium, quartz gravel.		ALV	L	M					1.60			
									ES		1.80	PID	0ppm	Bentonite
Observed on completion of auger drilling 27/05/24 0100											2.00			
									ES		2.30	PID	0ppm	
											2.50			
									SPT		2.80	SPT	1,3,3 N=6	
													0ppm	
									ES		3.00	PID		
	4.00	CLAY, with peat, with sand: dark grey; low plasticity; fine to coarse sand; Strong organic odour.		ALV	VS	W			ES		3.50	PID	0ppm	
											3.80			
									ES		3.90	PID	0ppm	
											4.00			
									SPT		4.30	SPT	0 1 blow sunk > 450 mm	
													0ppm	
									A/ES		4.50	PID		
									ES		4.80	PID	0ppm	
											5.00			
	5.20	Clayey SAND, with silt: pale grey; fine to coarse; low plasticity clay.		XWM	(D)				ES		5.20	PID	0ppm	Gravel
	5.50	Continued as rock							SPT		5.30 5.41	SPT	18/110 (HB)	

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: DT to 0.4m, VE to 1.5m, AD to 5.5m, NMLC to 9.6m
REMARKS:

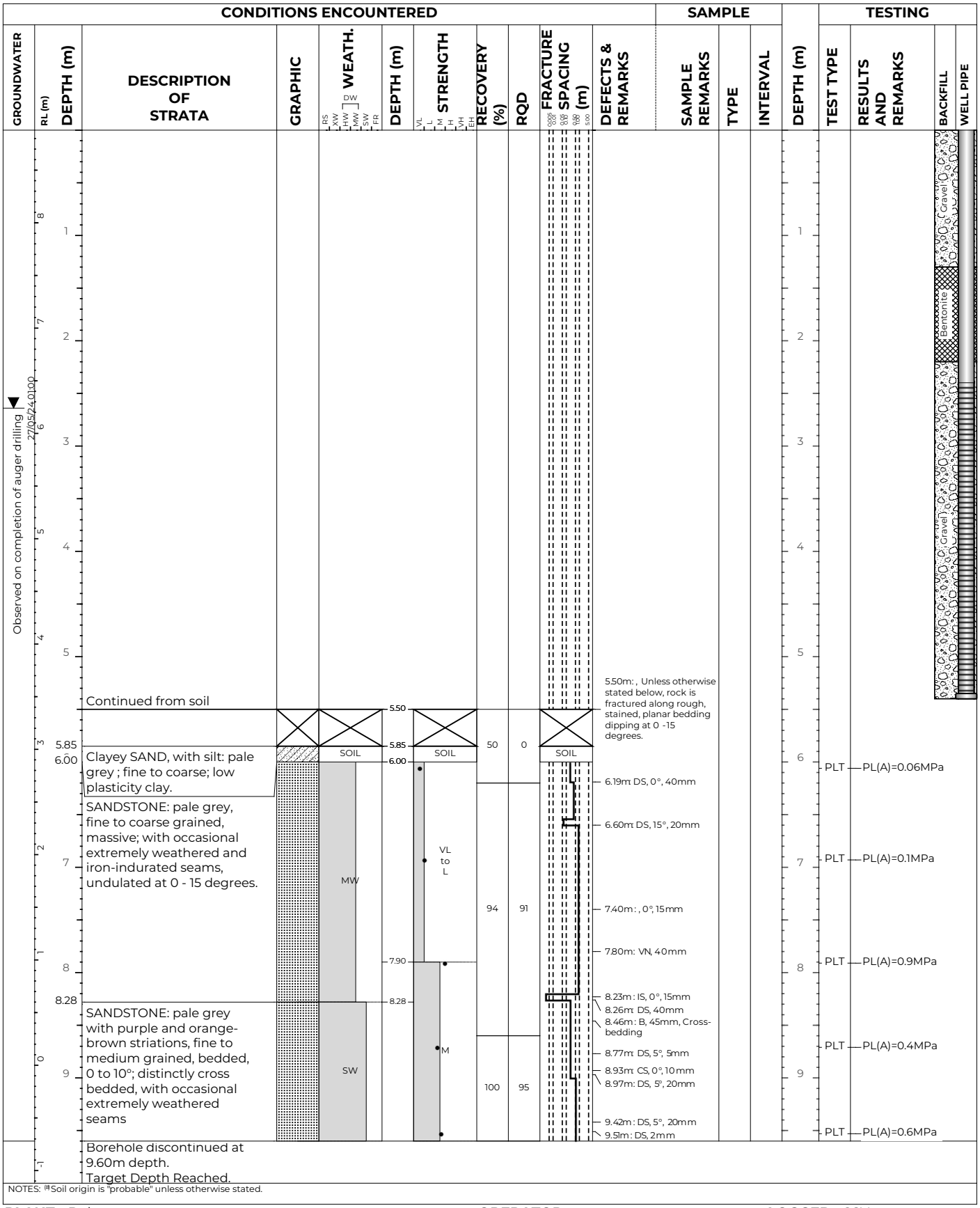
OPERATOR: Ground Test (JJ)
LOGGED: CSY
CASING: HWT to 5.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Scentre Design & Construction Pty Ltd
PROJECT: Brookvale Westfield - AVAC Sewer pump station
LOCATION: Warringah Mall, 145 Condamine St, Brookvale, NSW 21
SURFACE LEVEL: 8.9 AHD
COORDINATE: E:339542.0, N:6262232.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°
LOCATION ID: BH2
PROJECT No: 71015.54
DATE: 28/05/24 - 29/05/24
SHEET: 2 of 2



Generated with CORE-GS by Geroc - Split Soil-Rock Log

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

PLANT: Bobcat
OPERATOR: Ground Test (JJ)
LOGGED: CSY
METHOD: DT to 0.4m, VE to 1.5m, AD to 5.5m, NMLC to 9.6m
CASING: HWT to 5.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: Scentre Design & Construction Pty Ltd
PROJECT: Brookvale Westfield - AVAC Sewer pump station
LOCATION: Warringah Mall, 145 Condamine St, Brookvale, NSW 21

SURFACE LEVEL: 8.9 AHD
COORDINATE: E:339542.0, N:6262232.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH2
PROJECT No: 71015.54
DATE: 28/05/24 - 29/05/24
SHEET: 1 of 1

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

Permeability Testing - Rising or Falling Head Test Report

Client:	Scentre Group	Project No:	71015.54
Project:	Warringah Mall - AVAC Sewer Pump Station	Test date:	06-Jun-24
Location:		Tested by:	JL

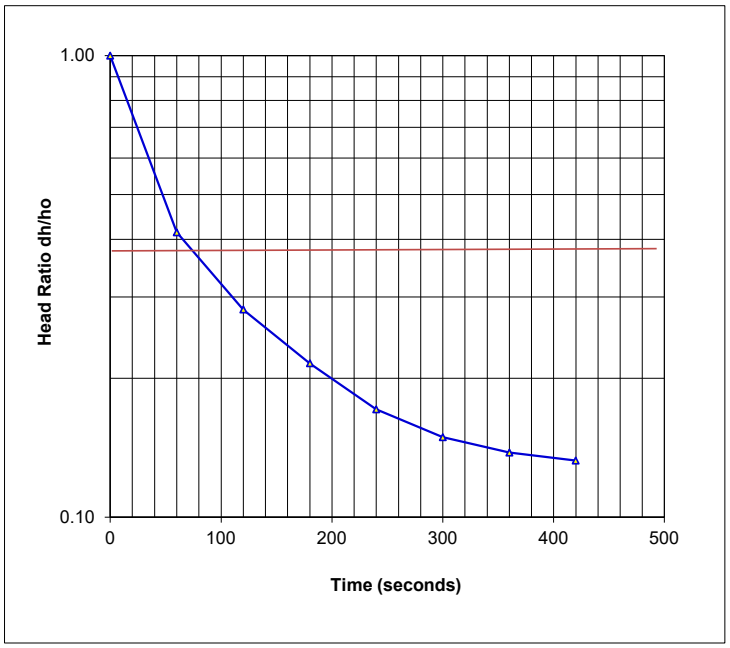
Test Location		**Test No.**	BH2	
Description:	Falling Head Test in well installed within borehole	Easting:	339542	m
Material type:	Alluvial Soil	Northing	6262232.8	m
		Surface Level:	8.9	m AHD

Details of Well Installation

Effective diameter (2re)	50	mm	Depth to water before test	2.84	m
borehole diameter (2R)	110	mm	Depth to water at start of test	1.03	m
Effective Length of well screen (Le)	2.2	m	Depth of top of PVC standpipe	2.2	m
			Depth of base of PVC standpipe	5.4	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	1.03	1.81	1.000
60.00	2.09	0.75	0.414
120.00	3.35	0.51	0.282
180.00	2.45	0.39	0.215
240.00	2.53	0.31	0.171
300.00	2.57	0.27	0.149
360.00	2.59	0.25	0.138
420.00	2.6	0.24	0.133



To = 1.2 mins
70 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**7.5E-06**	m/sec
	=	**0.647**	m/day

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

Permeability Testing - Rising or Falling Head Test Report

Client:	Scentre Group	Project No:	71015.54
Project:	Warringah Mall - AVAC Sewer Pump Station	Test date:	06-Jun-24
Location:		Tested by:	JL

Test Location

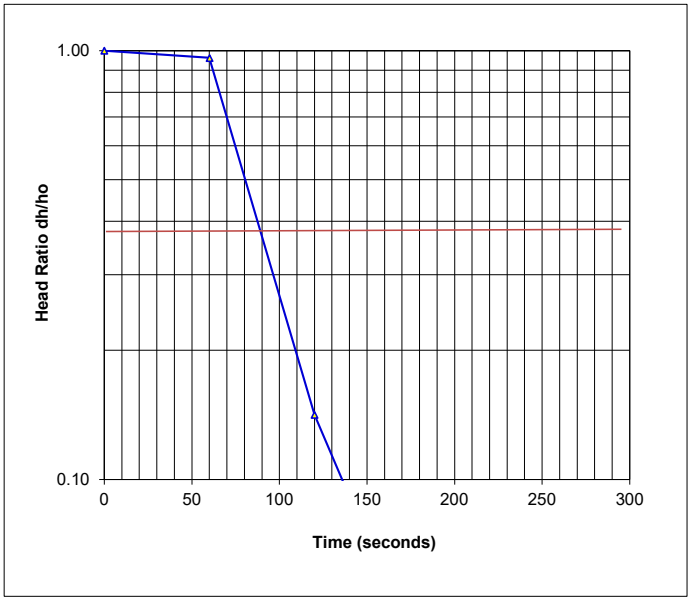
Description:	Falling Head Test in well installed within borehole	**Test No.**	BH510	
Material type:	Alluvial Soil	Easting:	339537.01	m
		Northing	6262207.11	m
		Surface Level:	8.6	m AHD

Details of Well Installation

Effective diameter (2re)	50	mm	Depth to water before test	2.45	m
borehole diameter (2R)	110	mm	Depth to water at start of test	0.33	m
Effective Length of well screen (Le)	1.5	m	Depth of top of PVC standpipe	4.5	m
			Depth of base of PVC standpipe	6.0	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	0.33	2.12	1.000
60.00	0.41	2.04	0.962
120.00	2.15	0.30	0.142
180.00	2.37	0.08	0.038
240.00	2.42	0.03	0.014
300.00	2.43	0.02	0.009
360.00	2.44	0.01	0.005



To = 1.5 mins
90 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity **k =** **7.7E-06** m/sec
= **0.661** m/day

Appendix D

Laboratory Results

Material Test Report

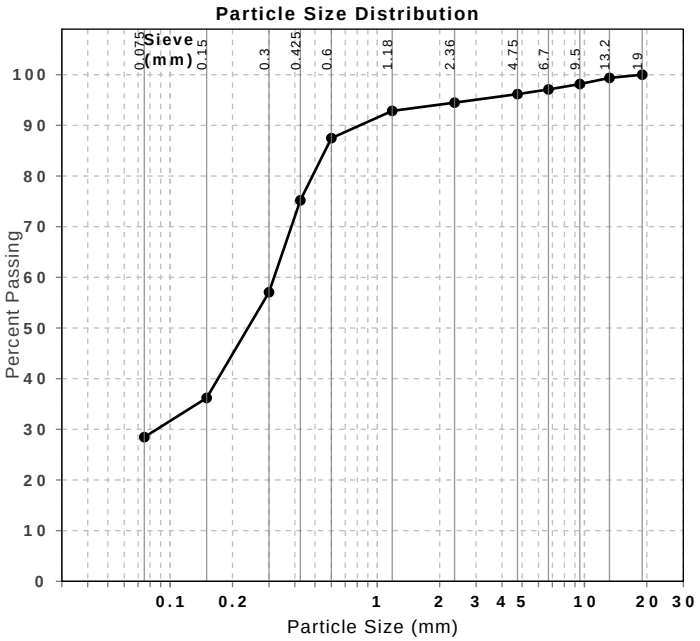
Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
Phone: (02) 9809 0666
Email: mick.gref@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mick Gref
Assistant Laboratory Manager
Laboratory Accreditation Number: 828

Report Number:	**71015.54-1**
Issue Number:	1
Date Issued:	07/06/2024
Client:	Scentre Design & Construction Pty Ltd
	Level 18/100 William Street, Sydney NSW
Contact:	Katherine Fox
Project Number:	71015.54
Project Name:	Brookvale Westfield - AVAC Sewer pump station
Project Location:	Warringah Mall, 145 Condamine St, Brookvale NSW
Work Request:	11478
Sample Number:	SY-11478A
Date Sampled:	28/05/2024
Dates Tested:	04/06/2024 - 06/06/2024
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Sample Location:	**BH01 (1.4 - 1.5m)**
Material:	Clayey SAND: trace gravel

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**99**		
9.5 mm	**98**		
6.7 mm	**97**		
4.75 mm	**96**		
2.36 mm	**94**		
1.18 mm	**93**		
0.6 mm	**87**		
0.425 mm	**75**		
0.3 mm	**57**		
0.15 mm	**36**		
0.075 mm	**28**		



Material Test Report

Report Number:	**71015.54-1**
Issue Number:	1
Date Issued:	07/06/2024
Client:	Scentre Design & Construction Pty Ltd
	Level 18/100 William Street, Sydney NSW
Contact:	Katherine Fox
Project Number:	71015.54
Project Name:	Brookvale Westfield - AVAC Sewer pump station
Project Location:	Warringah Mall, 145 Condamine St, Brookvale NSW
Work Request:	11478
Sample Number:	SY-11478B
Date Sampled:	28/05/2024
Dates Tested:	04/06/2024 - 06/06/2024
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Sample Location:	**BH02 (4.3 - 4.5m)**
Material:	CLAY: with sand and peat

Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
Phone: (02) 9809 0666
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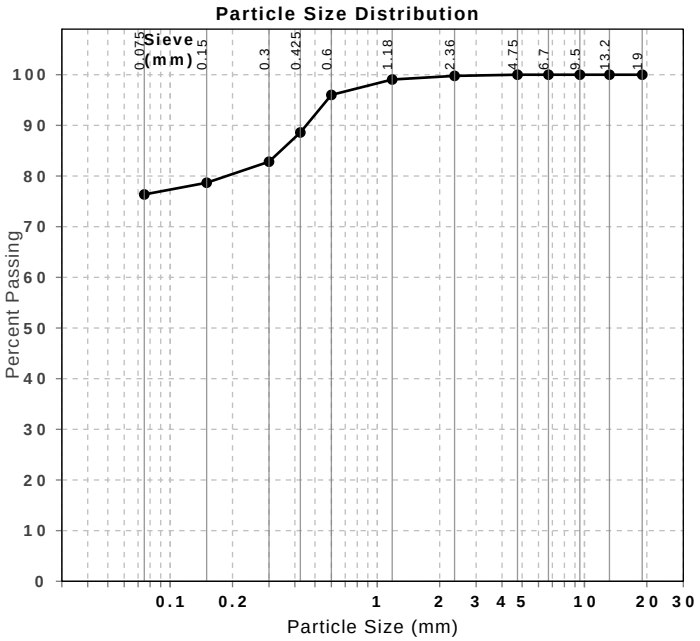
Approved Signatory: Mick Gref
Assistant Laboratory Manager
Laboratory Accreditation Number: 828

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**99**		
0.6 mm	**96**		
0.425 mm	**89**		
0.3 mm	**83**		
0.15 mm	**79**		
0.075 mm	**76**		



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CERTIFICATE OF ANALYSIS 352943

Client Details

Client	Douglas Partners Pty Ltd
Attention	Kurt Plambeck
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**71015.55, Brookvale**
Number of Samples	11 Soil
Date samples received	03/06/2024
Date completed instructions received	03/06/2024

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	11/06/2024
Date of Issue	11/06/2024

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Asbestos Approved By
Analysed by Asbestos Approved Analyst: Sneha Shakya, Nyovan Moonean
Authorised by Asbestos Approved Signatory: Lucy Zhu, Nyovan Moonean

Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Jack Wallis, Chemist (FAS)
Lucy Zhu, Asbestos Supervisor
Nyovan Moonean, Asbestos Approved Identifier/Counter
Sean McAlary, Chemist (FAS)

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in soil						
Our Reference		352943-1	352943-2	352943-3	352943-4	352943-5
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH02
Depth		1.4-1.5	1.9-2	2.9-3	3.4-3.5	0.35-0.5
Date Sampled		29/05/2024	29/05/2024	29/05/2024	29/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date Analysed	-	11/06/2024	11/06/2024	11/06/2024	11/06/2024	11/06/2024
Dichlorodifluoromethane	mg/kg	<1	<1	<1	<1	<1
Chloromethane	mg/kg	<1	<1	<1	<1	<1
Vinyl Chloride	mg/kg	<1	<1	<1	<1	<1
Bromomethane	mg/kg	<1	<1	<1	<1	<1
Chloroethane	mg/kg	<1	<1	<1	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloroethane	mg/kg	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
Bromochloromethane	mg/kg	<1	<1	<1	<1	<1
Chloroform	mg/kg	<1	<1	<1	<1	<1
2,2-Dichloropropane	mg/kg	<1	<1	<1	<1	<1
1,2-Dichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloropropene	mg/kg	<1	<1	<1	<1	<1
Cyclohexane	mg/kg	<1	<1	<1	<1	<1
Carbon Tetrachloride	mg/kg	<1	<1	<1	<1	<1
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromomethane	mg/kg	<1	<1	<1	<1	<1
1,2-Dichloropropane	mg/kg	<1	<1	<1	<1	<1
Trichloroethene	mg/kg	<1	<1	<1	<1	<1
Bromodichloromethane	mg/kg	<1	<1	<1	<1	<1
trans-1,3-Dichloropropene	mg/kg	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	mg/kg	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	mg/kg	<1	<1	<1	<1	<1
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropane	mg/kg	<1	<1	<1	<1	<1
Dibromochloromethane	mg/kg	<1	<1	<1	<1	<1
1,2-Dibromoethane	mg/kg	<1	<1	<1	<1	<1
Tetrachloroethene	mg/kg	<1	<1	<1	<1	<1
1,1,1,2-Tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
Chlorobenzene	mg/kg	<1	<1	<1	<1	<1

VOCs in soil						
Our Reference		352943-1	352943-2	352943-3	352943-4	352943-5
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH02
Depth		1.4-1.5	1.9-2	2.9-3	3.4-3.5	0.35-0.5
Date Sampled		29/05/2024	29/05/2024	29/05/2024	29/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
Bromoform	mg/kg	<1	<1	<1	<1	<1
m+p-Xylene	mg/kg	<2	<2	<2	<2	<2
Styrene	mg/kg	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
o-Xylene	mg/kg	<1	<1	<1	<1	<1
1,2,3-Trichloropropane	mg/kg	<1	<1	<1	<1	<1
Isopropylbenzene	mg/kg	<1	<1	<1	<1	<1
Bromobenzene	mg/kg	<1	<1	<1	<1	<1
n-Propylbenzene	mg/kg	<1	<1	<1	<1	<1
2-Chlorotoluene	mg/kg	<1	<1	<1	<1	<1
4-Chlorotoluene	mg/kg	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	mg/kg	<1	<1	<1	<1	<1
tert-Butylbenzene	mg/kg	<1	<1	<1	<1	<1
1,2,4-Trimethylbenzene	mg/kg	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
sec-Butylbenzene	mg/kg	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
4-Isopropyltoluene	mg/kg	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
n-Butylbenzene	mg/kg	<1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	mg/kg	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
Hexachlorobutadiene	mg/kg	<1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	107	108	108	107	107
Surrogate aaa-Trifluorotoluene	%	90	97	96	92	82
Surrogate Toluene-d_8	%	108	109	108	109	108
Surrogate 4-Bromofluorobenzene	%	94	93	94	94	94

VOCs in soil				
Our Reference		352943-6	352943-7	352943-8
Your Reference	UNITS	BH02	BH02	BH02
Depth		1.4-1.6	2.3-2.5	5.2-5.3
Date Sampled		28/05/2024	28/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil
Date Extracted	-	04/06/2024	04/06/2024	04/06/2024
Date Analysed	-	11/06/2024	11/06/2024	11/06/2024
Dichlorodifluoromethane	mg/kg	<1	<1	<1
Chloromethane	mg/kg	<1	<1	<1
Vinyl Chloride	mg/kg	<1	<1	<1
Bromomethane	mg/kg	<1	<1	<1
Chloroethane	mg/kg	<1	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1	<1
trans-1,2-Dichloroethene	mg/kg	<1	<1	<1
1,1-Dichloroethane	mg/kg	<1	<1	<1
cis-1,2-Dichloroethene	mg/kg	<1	<1	<1
Bromochloromethane	mg/kg	<1	<1	<1
Chloroform	mg/kg	<1	<1	<1
2,2-Dichloropropane	mg/kg	<1	<1	<1
1,2-Dichloroethane	mg/kg	<1	<1	<1
1,1,1-Trichloroethane	mg/kg	<1	<1	<1
1,1-Dichloropropene	mg/kg	<1	<1	<1
Cyclohexane	mg/kg	<1	<1	<1
Carbon Tetrachloride	mg/kg	<1	<1	<1
Benzene	mg/kg	<0.2	<0.2	<0.2
Dibromomethane	mg/kg	<1	<1	<1
1,2-Dichloropropane	mg/kg	<1	<1	<1
Trichloroethene	mg/kg	<1	<1	<1
Bromodichloromethane	mg/kg	<1	<1	<1
trans-1,3-Dichloropropene	mg/kg	<1	<1	<1
cis-1,3-Dichloropropene	mg/kg	<1	<1	<1
1,1,2-Trichloroethane	mg/kg	<1	<1	<1
Toluene	mg/kg	<0.5	<0.5	<0.5
1,3-Dichloropropane	mg/kg	<1	<1	<1
Dibromochloromethane	mg/kg	<1	<1	<1
1,2-Dibromoethane	mg/kg	<1	<1	<1
Tetrachloroethene	mg/kg	<1	<1	<1
1,1,1,2-Tetrachloroethane	mg/kg	<1	<1	<1
Chlorobenzene	mg/kg	<1	<1	<1

VOCs in soil				
Our Reference		352943-6	352943-7	352943-8
Your Reference	UNITS	BH02	BH02	BH02
Depth		1.4-1.6	2.3-2.5	5.2-5.3
Date Sampled		28/05/2024	28/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil
Ethylbenzene	mg/kg	<1	<1	<1
Bromoform	mg/kg	<1	<1	<1
m+p-Xylene	mg/kg	<2	<2	<2
Styrene	mg/kg	<1	<1	<1
1,1,2,2-Tetrachloroethane	mg/kg	<1	<1	<1
o-Xylene	mg/kg	<1	<1	<1
1,2,3-Trichloropropane	mg/kg	<1	<1	<1
Isopropylbenzene	mg/kg	<1	<1	<1
Bromobenzene	mg/kg	<1	<1	<1
n-Propylbenzene	mg/kg	<1	<1	<1
2-Chlorotoluene	mg/kg	<1	<1	<1
4-Chlorotoluene	mg/kg	<1	<1	<1
1,3,5-Trimethylbenzene	mg/kg	<1	<1	<1
tert-Butylbenzene	mg/kg	<1	<1	<1
1,2,4-Trimethylbenzene	mg/kg	<1	<1	<1
1,3-Dichlorobenzene	mg/kg	<1	<1	<1
sec-Butylbenzene	mg/kg	<1	<1	<1
1,4-Dichlorobenzene	mg/kg	<1	<1	<1
4-Isopropyltoluene	mg/kg	<1	<1	<1
1,2-Dichlorobenzene	mg/kg	<1	<1	<1
n-Butylbenzene	mg/kg	<1	<1	<1
1,2-Dibromo-3-chloropropane	mg/kg	<1	<1	<1
1,2,4-Trichlorobenzene	mg/kg	<1	<1	<1
Hexachlorobutadiene	mg/kg	<1	<1	<1
1,2,3-Trichlorobenzene	mg/kg	<1	<1	<1
Surrogate Dibromofluoromethane	%	105	106	106
Surrogate aaa-Trifluorotoluene	%	103	104	107
Surrogate Toluene-d_8	%	108	106	108
Surrogate 4-Bromofluorobenzene	%	94	94	94

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		352943-1	352943-2	352943-3	352943-4	352943-5
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH02
Depth		1.4-1.5	1.9-2	2.9-3	3.4-3.5	0.35-0.5
Date Sampled		29/05/2024	29/05/2024	29/05/2024	29/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	11/06/2024	11/06/2024	11/06/2024	11/06/2024	11/06/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	90	97	96	92	82

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		352943-6	352943-7	352943-8	352943-9	352943-10
Your Reference	UNITS	BH02	BH02	BH02	BD1	TS1
Depth		1.4-1.6	2.3-2.5	5.2-5.3	-	-
Date Sampled		28/05/2024	28/05/2024	28/05/2024	28/05/2024	29/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	11/06/2024	11/06/2024	11/06/2024	11/06/2024	11/06/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	[NA]
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	[NA]
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	[NA]
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	90%
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	92%
Ethylbenzene	mg/kg	<1	<1	<1	<1	90%
m+p-xylene	mg/kg	<2	<2	<2	<2	91%
o-Xylene	mg/kg	<1	<1	<1	<1	90%
Naphthalene	mg/kg	<1	<1	<1	<1	[NA]
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	[NA]
Surrogate aaa-Trifluorotoluene	%	103	104	107	99	91%

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		352943-11
Your Reference	UNITS	TB1
Depth		-
Date Sampled		29/05/2024
Type of sample		Soil
Date extracted	-	04/06/2024
Date analysed	-	11/06/2024
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
Naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	109

svTRH (C10-C40) in Soil						
Our Reference		352943-1	352943-2	352943-3	352943-4	352943-5
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH02
Depth		1.4-1.5	1.9-2	2.9-3	3.4-3.5	0.35-0.5
Date Sampled		29/05/2024	29/05/2024	29/05/2024	29/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024	05/06/2024
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	77	76	88	81	82

svTRH (C10-C40) in Soil					
Our Reference		352943-6	352943-7	352943-8	352943-9
Your Reference	UNITS	BH02	BH02	BH02	BD1
Depth		1.4-1.6	2.3-2.5	5.2-5.3	-
Date Sampled		28/05/2024	28/05/2024	28/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50
Surrogate o-Terphenyl	%	75	76	75	75

PAHs in Soil						
Our Reference		352943-1	352943-2	352943-3	352943-4	352943-5
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH02
Depth		1.4-1.5	1.9-2	2.9-3	3.4-3.5	0.35-0.5
Date Sampled		29/05/2024	29/05/2024	29/05/2024	29/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.08	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	0.2	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	93	99	99	97	100

PAHs in Soil				
Our Reference		352943-6	352943-7	352943-8
Your Reference	UNITS	BH02	BH02	BH02
Depth		1.4-1.6	2.3-2.5	5.2-5.3
Date Sampled		28/05/2024	28/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	96	94	99

Organochlorine Pesticides in soil				
Our Reference		352943-1	352943-5	352943-6
Your Reference	UNITS	BH01	BH02	BH02
Depth		1.4-1.5	0.35-0.5	1.4-1.6
Date Sampled		29/05/2024	28/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	84	86	81

Organophosphorus Pesticides in Soil				
Our Reference		352943-1	352943-5	352943-6
Your Reference	UNITS	BH01	BH02	BH02
Depth		1.4-1.5	0.35-0.5	1.4-1.6
Date Sampled		29/05/2024	28/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024
Dichlorvos	mg/kg	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	84	86	81

PCBs in Soil				
Our Reference		352943-1	352943-5	352943-6
Your Reference	UNITS	BH01	BH02	BH02
Depth		1.4-1.5	0.35-0.5	1.4-1.6
Date Sampled		29/05/2024	28/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	0.1	<0.1	0.2
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	0.1	<0.1	0.2
Surrogate 2-Fluorobiphenyl	%	83	89	86

Acid Extractable metals in soil						
Our Reference		352943-1	352943-2	352943-3	352943-4	352943-5
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH02
Depth		1.4-1.5	1.9-2	2.9-3	3.4-3.5	0.35-0.5
Date Sampled		29/05/2024	29/05/2024	29/05/2024	29/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	06/06/2024	06/06/2024	06/06/2024	06/06/2024	06/06/2024
Arsenic	mg/kg	<4	<4	<4	<4	<8
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	19	7	12	10	57
Copper	mg/kg	4	5	3	3	<1
Lead	mg/kg	9	13	16	12	4
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	3	2	4	3	4
Zinc	mg/kg	12	18	12	6	5

Acid Extractable metals in soil						
Our Reference		352943-6	352943-7	352943-8	352943-9	352943-12
Your Reference	UNITS	BH02	BH02	BH02	BD1	BH01 - [TRIPLICATE]
Depth		1.4-1.6	2.3-2.5	5.2-5.3	-	1.4-1.5
Date Sampled		28/05/2024	28/05/2024	28/05/2024	28/05/2024	29/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	06/06/2024	06/06/2024	06/06/2024	06/06/2024	06/06/2024
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	14	13	2	1	9
Copper	mg/kg	13	2	27	<1	5
Lead	mg/kg	16	13	2	1	10
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	9	4	5	<1	3
Zinc	mg/kg	19	15	19	1	16

Misc Soil - Inorg				
Our Reference		352943-1	352943-5	352943-6
Your Reference	UNITS	BH01	BH02	BH02
Depth		1.4-1.5	0.35-0.5	1.4-1.6
Date Sampled		29/05/2024	28/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5

Misc Inorg - Soil				
Our Reference		352943-1	352943-4	352943-8
Your Reference	UNITS	BH01	BH01	BH02
Depth		1.4-1.5	3.4-3.5	5.2-5.3
Date Sampled		29/05/2024	29/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	03/06/2024	03/06/2024	03/06/2024
Date analysed	-	06/06/2024	06/06/2024	06/06/2024
pH 1:5 soil:water	pH Units	6.7	6.4	5.3
Electrical Conductivity 1:5 soil:water	µS/cm	58	81	190
Chloride, Cl 1:5 soil:water	mg/kg	<10	10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	21	78	320

Moisture						
Our Reference		352943-1	352943-2	352943-3	352943-4	352943-5
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH02
Depth		1.4-1.5	1.9-2	2.9-3	3.4-3.5	0.35-0.5
Date Sampled		29/05/2024	29/05/2024	29/05/2024	29/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Moisture	%	20	19	39	38	18

Moisture					
Our Reference		352943-6	352943-7	352943-8	352943-9
Your Reference	UNITS	BH02	BH02	BH02	BD1
Depth		1.4-1.6	2.3-2.5	5.2-5.3	-
Date Sampled		28/05/2024	28/05/2024	28/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Moisture	%	23	32	16	18

Asbestos ID - soils NEPM						
Our Reference		352943-1	352943-2	352943-3	352943-4	352943-6
Your Reference	UNITS	BH01	BH01	BH01	BH01	BH02
Depth		1.4-1.5	1.9-2	2.9-3	3.4-3.5	1.4-1.6
Date Sampled		29/05/2024	29/05/2024	29/05/2024	29/05/2024	28/05/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	07/06/2024	07/06/2024	07/06/2024	07/06/2024	07/06/2024
Sample mass tested	g	820.84	334.65	474.4	138.71	699.96
Sample Description	-	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil

Asbestos ID - soils NEPM			
Our Reference		352943-7	352943-8
Your Reference	UNITS	BH02	BH02
Depth		2.3-2.5	5.2-5.3
Date Sampled		28/05/2024	28/05/2024
Type of sample		Soil	Soil
Date analysed	-	07/06/2024	07/06/2024
Sample mass tested	g	562.14	203.8
Sample Description	-	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected
Total Asbestos#1	g/kg	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–
FA and AF Estimation*	g	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001
Asbestos comments	-	Nil	Nil

Asbestos ID - soils		
Our Reference		352943-5
Your Reference	UNITS	BH02
Depth		0.35-0.5
Date Sampled		28/05/2024
Type of sample		Soil
Date analysed	-	11/06/2024
Sample mass tested	g	Approx. 25g
Sample Description	-	Orange clayey soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	Nil
Trace Analysis	-	No asbestos detected

PFAS in Soils Short		
Our Reference		352943-5
Your Reference	UNITS	BH02
Depth		0.35-0.5
Date Sampled		28/05/2024
Type of sample		Soil
Date prepared	-	05/06/2024
Date analysed	-	05/06/2024
Perfluorohexanesulfonic acid - PFHxS	µg/kg	<0.1
Perfluorooctanesulfonic acid PFOS	µg/kg	<0.1
Perfluorooctanoic acid PFOA	µg/kg	<0.1
6:2 FTS	µg/kg	<0.1
8:2 FTS	µg/kg	<0.2
Surrogate $^{13}C_8$ *PFOS*	%	106
Surrogate $^{13}C_2$ *PFOA*	%	96
Extracted ISTD $^{18}O_2$ *PFHxS*	%	96
Extracted ISTD $^{13}C_4$ *PFOS*	%	95
Extracted ISTD $^{13}C_4$ *PFOA*	%	113
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	120
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	130
Total Positive PFHxS & PFOS	µg/kg	<0.1
Total Positive PFOS & PFOA	µg/kg	<0.1
Total Positive PFAS	µg/kg	<0.1

PFAS in TCLP Short		
Our Reference		352943-5
Your Reference	UNITS	BH02
Depth		0.35-0.5
Date Sampled		28/05/2024
Type of sample		Soil
Date prepared	-	05/06/2024
Date analysed	-	05/06/2024
pH of soil for fluid# determ.	pH units	7.9
pH of soil TCLP (after HCl)	pH units	1.8
Extraction fluid used		1
pH of final Leachate	pH units	4.9
Perfluorohexanesulfonic acid - PFHxS	µg/L	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01
6:2 FTS	µg/L	<0.01
8:2 FTS	µg/L	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	108
Surrogate $^{13}C_2$ *PFOA*	%	94
Extracted ISTD $^{18}O_2$ *PFHxS*	%	103
Extracted ISTD $^{13}C_4$ *PFOS*	%	100
Extracted ISTD $^{13}C_4$ *PFOA*	%	118
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	102
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	191
Total Positive PFHxS & PFOS	µg/L	<0.01
Total Positive PFOS & PFOA	µg/L	<0.01
Total Positive PFAS	µg/L	<0.01

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. NOTE#1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF relative to the sample mass tested) NOTE#2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
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-004	Toxicity Characteristic Leaching Procedure (TCLP) using AS 4439. Please note that the mass used may be scaled down from default based on sample mass available. Samples are stored at 2-6oC before and after leachate preparation.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.

Method ID	Methodology Summary
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLPs/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.4 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
Date Extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date Analysed	-			11/06/2024	1	11/06/2024	11/06/2024		11/06/2024	11/06/2024
Dichlorodifluoromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
trans-1,2-Dichloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-Dichloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	91	102
cis-1,2-Dichloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromochloromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroform	mg/kg	1	Org-023	<1	1	<1	<1	0	91	102
2,2-Dichloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-Dichloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	78	89
1,1,1-Trichloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	81
1,1-Dichloropropene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Carbon Tetrachloride	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	72	84
Dibromomethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-Dichloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	72	86
Bromodichloromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	76	89
trans-1,3-Dichloropropene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-Dichloropropene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-Trichloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	90	100
1,3-Dichloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromochloromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	74	87
1,2-Dibromoethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tetrachloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	84	95
1,1,1,2-Tetrachloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	76	89
Bromoform	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
m+p-Xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	76	89
Styrene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-Tetrachloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	75	88
1,2,3-Trichloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Isopropylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-Propylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
2-Chlorotoluene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-Chlorotoluene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-Trimethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
tert-Butylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-Trimethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-Dichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
sec-Butylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,4-Dichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-Isopropyltoluene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-Dichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-Butylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-Dibromo-3-chloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-Trichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-Trichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	99	1	107	107	0	102	100
Surrogate aaa-Trifluorotoluene	%		Org-023	91	1	90	92	2	86	97
Surrogate Toluene-d_8	%		Org-023	99	1	108	108	0	101	98
Surrogate 4-Bromofluorobenzene	%		Org-023	99	1	94	94	0	99	100

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			11/06/2024	1	11/06/2024	11/06/2024		11/06/2024	11/06/2024
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	80	90
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	80	90
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	72	84
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	90	100
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	76	89
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	76	89
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	75	88
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	91	1	90	92	2	86	97

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			05/06/2024	1	05/06/2024	05/06/2024		05/06/2024	05/06/2024
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	114	101
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	109	101
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	<100	<100	0	86	102
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	114	101
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	<100	<100	0	109	101
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	<100	<100	0	86	102
Surrogate o-Terphenyl	%		Org-020	81	1	77	77	0	85	82

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	80
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	88
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	84	84
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	90
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	92
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	92	92
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	70
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	<0.05	<0.05	0	82	88
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	101	1	93	97	4	96	94

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	86
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	88
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	88
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	94
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	98
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	84	88
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	98
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	94
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	98
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	82
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	89	1	84	87	4	91	101

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	106	100
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	98
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	98
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	104
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	102	98
Fenthion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	94
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	104
Phosalone	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	89	1	84	87	4	91	101

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Aroclor 1016	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	<0.1	1	0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	86	92
Aroclor 1260	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	90	1	83	90	8	92	89

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
Date prepared	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			06/06/2024	1	06/06/2024	06/06/2024		06/06/2024	06/06/2024
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	102	#
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	93	73
Chromium	mg/kg	1	Metals-020	<1	1	19	9	71	106	87
Copper	mg/kg	1	Metals-020	<1	1	4	6	40	98	88
Lead	mg/kg	1	Metals-020	<1	1	9	13	36	115	74
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	101	87
Nickel	mg/kg	1	Metals-020	<1	1	3	2	40	94	72
Zinc	mg/kg	1	Metals-020	<1	1	12	26	74	97	71

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	352943-5
Date prepared	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	1	<5	<5	0	102	95

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date prepared	-			03/06/2024	[NT]	[NT]	[NT]	[NT]	03/06/2024	[NT]
Date analysed	-			06/06/2024	[NT]	[NT]	[NT]	[NT]	06/06/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	109	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	115	[NT]

QUALITY CONTROL: PFAS in Soils Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date prepared	-			05/06/2024	[NT]	[NT]	[NT]	[NT]	05/06/2024	[NT]
Date analysed	-			05/06/2024	[NT]	[NT]	[NT]	[NT]	05/06/2024	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
6:2 FTS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
8:2 FTS	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	95	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	106	[NT]	[NT]	[NT]	[NT]	102	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	106	[NT]	[NT]	[NT]	[NT]	107	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	119	[NT]	[NT]	[NT]	[NT]	116	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	121	[NT]	[NT]	[NT]	[NT]	120	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	124	[NT]	[NT]	[NT]	[NT]	138	[NT]

QUALITY CONTROL: PFAS in TCLP Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			05/06/2024	[NT]	[NT]	[NT]	[NT]	05/06/2024	[NT]
Date analysed	-			05/06/2024	[NT]	[NT]	[NT]	[NT]	05/06/2024	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	107	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	95	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	107	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	102	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	117	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	96	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	103	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	103	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	83	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	105	[NT]	[NT]	[NT]	[NT]	114	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

Acid Extractable Metals in Soil:
- The laboratory RPD acceptance criteria has been exceeded for 352943-1 for Cr & Zn. Therefore a triplicate result has been issued as laboratory sample number 352943-12.
- # Low spike recovery was obtained for this sample. Sample matrix interference is suspected. However, an acceptable recovery was obtained for the LCS.
- The PQL(s) for 352943-5 has been raised for As due to the low spike recovery/recoveries. This may reflect other samples where similar in matrix and similar analytical interferences occur.

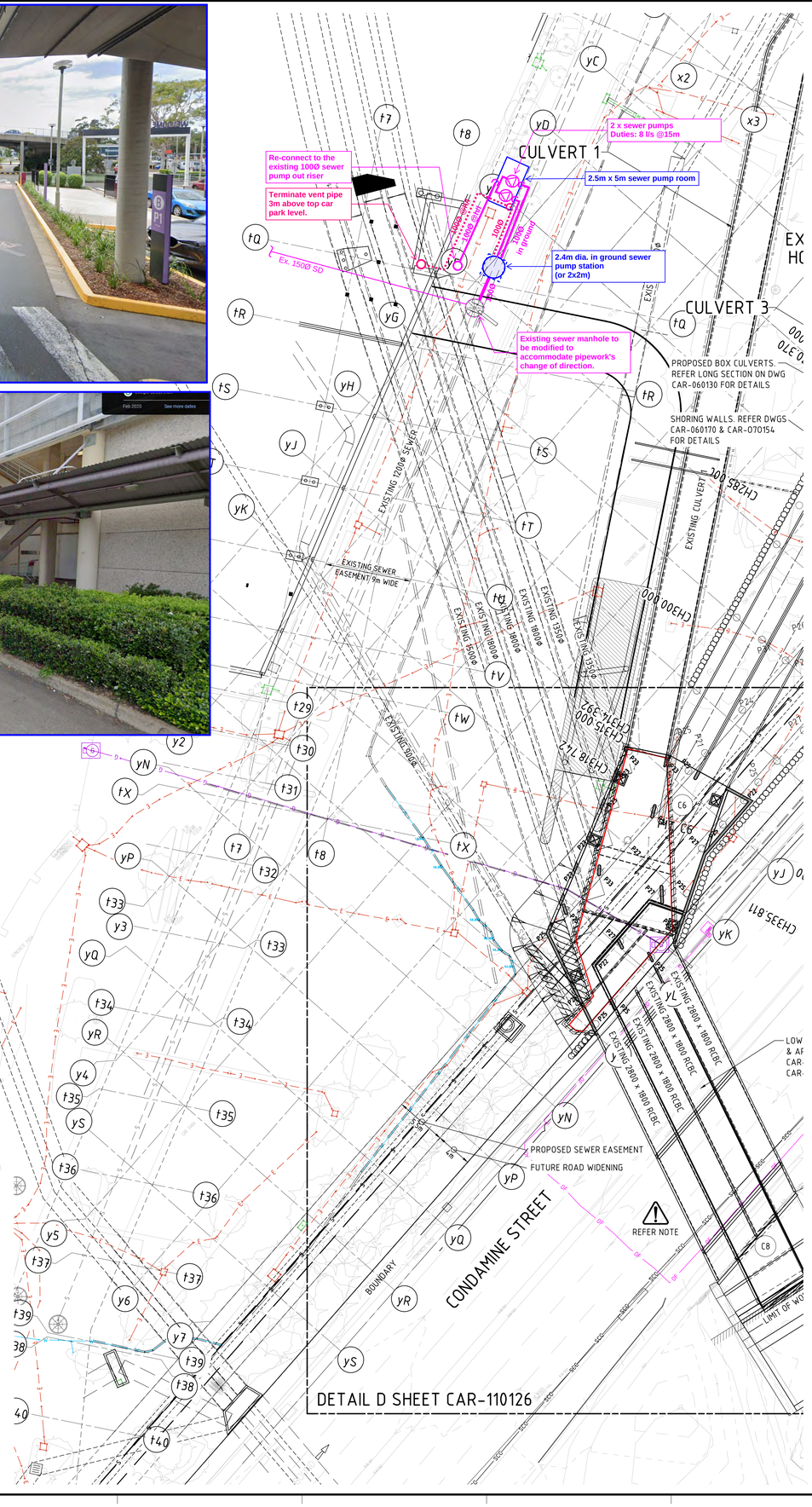
Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

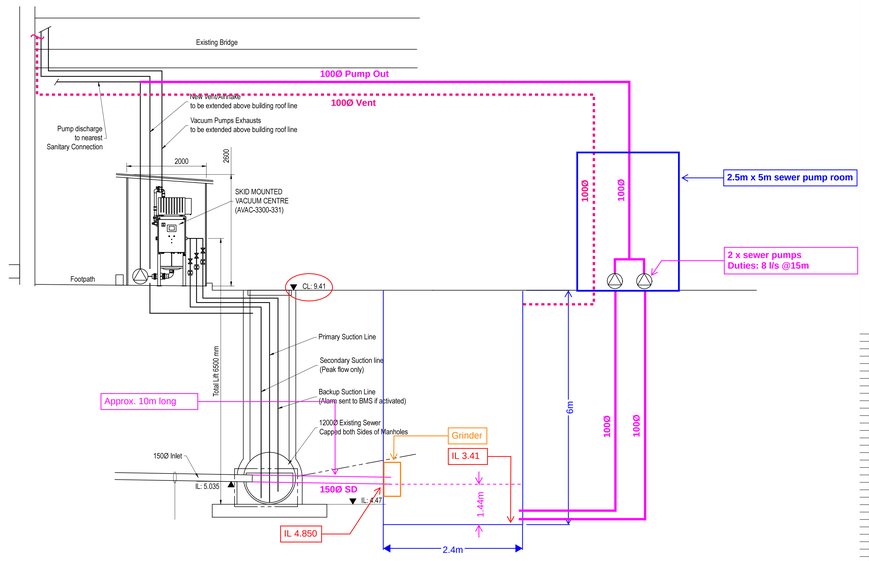
Note: All samples analysed as received. However, samples 352943-2, 4, 8 are below the minimum recommended 500mL sample volume as per National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos according to ASB-001 asbestos subsampling procedure. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab/MPL recommends supplying 40-60g or 500ml of sample in its own container.
Note: Sample 352943-5 was sub-sampled from jar provided by the client.

Appendix E

Provided Drawings





HIGH LEVEL SCOPE OF WORKS:

-Install concrete in ground pump station well 2.4m dia or 2x2m (contaminated soil and swamp ground conditions shall be considered);

-Supply and install grinder within the well;

-Modify existing manhole into inspection opening and extend new 150mm sewer line to the proposed well (approximately 10m away);

-Install 2 x 100mm pump lines and 2 x electrical conduits from the well to the proposed pump room;

-Construct new 2,5x5m pump room;

-Install 2 x above ground sewer pumps, all associated wiring and control panel within the pump room;

-Re-connect new 100mm pump out line upstream from the pumps to the existing pump out line at high level as shown;

-Install new 100mm vent pipe for the pump station and terminate 3m above car park's top level.

LEGEND

EXISTING

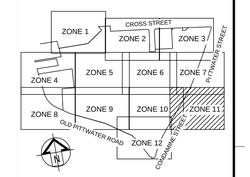
- BOX CULVERT
- STORMWATER DRAINAGE PIPE
- BOUNDARY
- ELECTRICITY (HIGH VOLTAGE)
- ELECTRICITY (LOW VOLTAGE)
- GAS
- WATER
- OPTIC FIBER
- SEWER
- STORMWATER DRAINAGE
- SOUTHERN CROSS CONDUIT
- TELSTRA
- FIRE SERVICES
- UNKNOWN SERVICES
- EXISTING SUBSOIL DRAIN
- FENCE

PROPOSED

- BOX CULVERT
- STORMWATER DRAINAGE PIPE
- SEWER
- LONGITUDINAL SECTION REFERENCE
- STORMWATER DRAINAGE
- ELECTRICITY (HIGH VOLTAGE)
- ELECTRICITY PIT
- SUBSOIL DRAIN
- SHORING WALL - REFER STRUCTURAL DRAWINGS

Rev	Date	By	Chk	Description
6	22/11/2016	CM	DNA	LAYOUT AMENDMENTS
5	29/07/2016	SP	DA	CRID REVISED
4	12/06/2016	SN	DNA	ISSUED FOR REVISED CONSTRUCTION
3	20/05/2016	CM	DNA	PLUS AMENDED
2	10/09/2015	BF	DNA	ISSUED FOR REVISED CONSTRUCTION
1	31/10/2014	LC	DNA	ISSUE FOR CONSTRUCTION
D	14/08/2014	GY	DNA	RE-ISSUED FOR COSTING - BING LEE
C	30/07/2014	GY	DNA	70% COSTING PACKAGE REVISED - BING LEE
B	31/01/2014	DH	DNA	70% COSTING PACKAGE REVISED
A	29/11/2013	DH	DNA	70% COSTING PACKAGE

Key Plan



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Westfield WARRINGAH

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Title
WARRINGAH STORMWATER AUGMENTATION CULVERT STAGE 2

GENERAL ARRANGEMENT PLAN
SHEET - 2 OF 2

Drawing Scale	Scale Bar 1:1	
1:200	0 2 4 6 8 10	
Drawn By	CAD Filename	Plot Date
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Project No.	Drawing No.	Revision
D11753	CAR-060111	6

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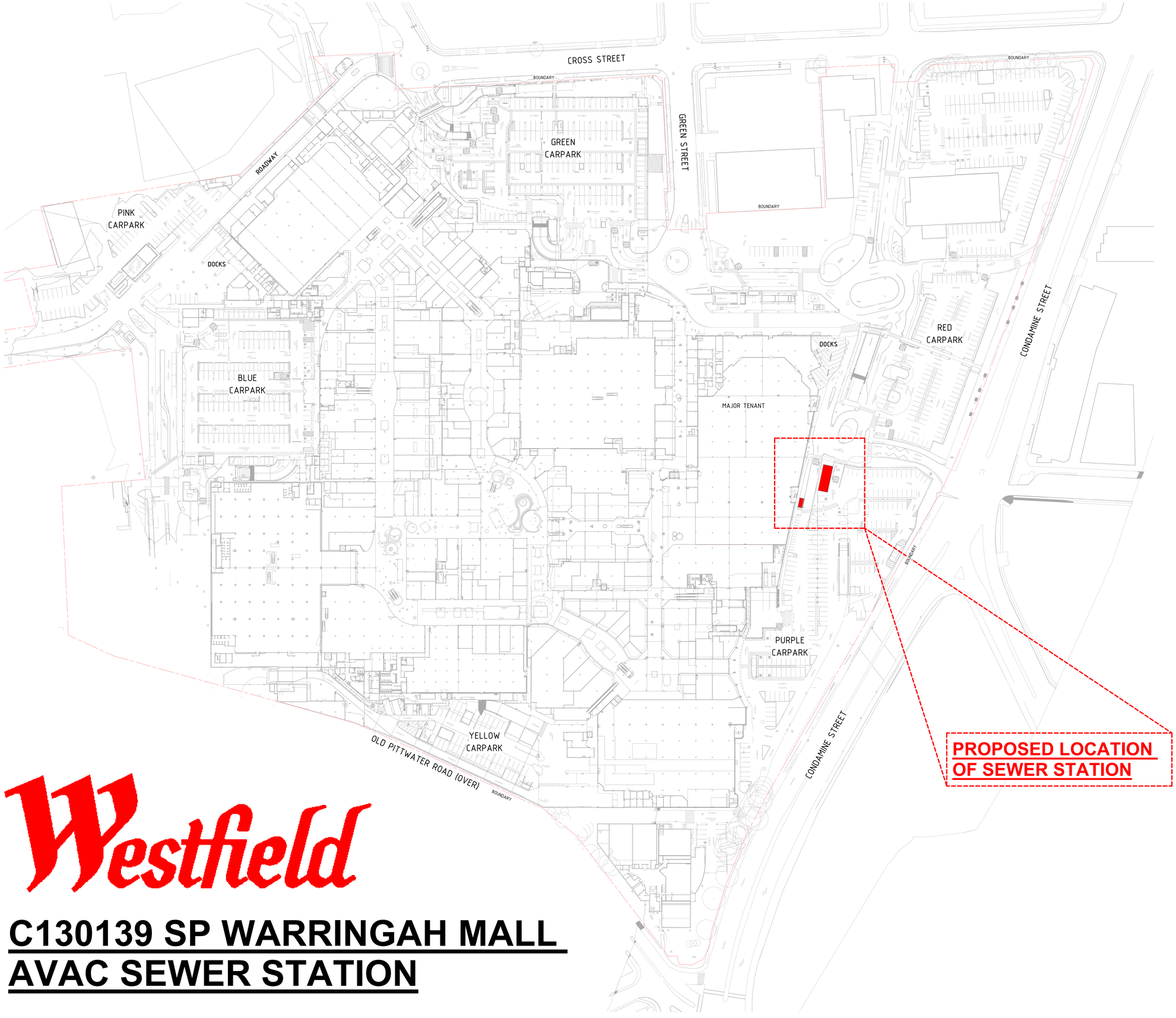

Westfield

C130139 SP WARRINGAH MALL
AVAC SEWER STATION

SDC-42.0001 [A]

PRINT IN COLOUR

NOTES & REFERENCES

THIS DRAWING MUST BE READ IN CONJUNCTION WITH RELEVANT NOTES FOUND ON DRAWINGS 00.0001/2 AS HIGHLIGHTED BELOW BUT NOT LIMITED TO:

NOTES
1. GENERAL
2. CIVIL
3. DEMOLITION
4. BULK EXCAVATION
5. FOOTINGS
6. SHORING
7. CONCRETE
8. BLOCKWORK
9. COLUMN
10. STRUCTURAL STEEL
11. EXPANSION JONT
12. FLOOR ACCESS POINTS
13. FLOOR TILING
14. STAIR
15. LIFT
16. RAMP
17. ESC/TRAVELATORS
18. MALL ENTRIES

NOTES (CONT.)
19. AUTOMATIC DOORS
20. EGRESS
21. GENERAL GLAZING
22. LOUVRE
23. COMPOSITE PANELS
24. CARPARK ENTRIES
25. PARKING
26. LOADING DOCKS
27. BOLLARDS
28. ROLLER SHUTTERS
29. SLAB SOFFIT INSUL.
30. METAL ROOF
31. BALUSTRADE
32. COLUMN CLADDING
33. SIGNAGE COLOURS
34. PAINT FINISHES
35. FIRE RATINGS
36. CEILINGS

NOTES (CONT.)
37. DOORWAYS
38. SKYLIGHTS
39. PRECAST CLADDING
40. OPAQUE CLADDING
41. HERBS
42. MALL FURNITURE
43. AHU PLANT ROOMS
44. LANDSCAPING
45. METAL WORK
46. WATERPROOFING
47. SERVICE CORRIDORS
48. REMEDIATION
49. WORKS
50. MALL COORDINATION WORKSHOP DWG

ARCHITECTURAL DRAWING REFERENCES

THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT DISCIPLINES SUCH AS STRUCTURAL SERVICES DETAIL DRAWINGS AND SPECIFICATIONS INCLUSIVE OF ARCHITECTURAL DWG SERIES PACKAGES HIGHLIGHTED BELOW BUT NOT LIMITED TO:

00 COVER INDEX/LEGENDS
01 GIRD SETOUT
04 EXISTING BUILDING
05 DEMOLITION
06 BULK EXCAVATION
06 SHORING & FOOTINGS
07 STAGING & IMPACT
07 HOARDING PLANS
08 GENERAL ARR. PLANS
09 MASTER LEASE PLANS
09 EGRESS PLANS
10 ZONE PLANS
11 CONCRETE PROFILES
12 BLOCKWORK DETAILS
13 FLOOR FINISHES
14 CEILING PLANS
15 MALL COORDINATION
16 EXTERNAL SIGNAGE
17 CARPARK & SIGNAGE
18 STRUCTURAL STEEL
19 INGROUND SERVICES
20 BUILDING ELEVATIONS
22 DETAILED ELEVATIONS
25 BUILDING SECTIONS
26 DETAILED SECTIONS
30 VERTICAL TRANSPORT
39 SERVICES KEYPLAN
40 LOADING DOCKS
41 ELECTRICAL SERVICES
42 HYDRAULIC SERVICES
43 MECHANICAL SERVICES
44 FIRE SERVICES
45 WASTE MANAGEMENT
47 INSULATION
49 MISC. METAL WORK
50 EXTERNAL FINISHES
53 GLAZING
54 ENTRIES
55 SKYLIGHTS
57 ROOFS & AWNINGS
60 CENTRE MANAGEMENT
61 AMENITIES
62 MALL PRECINCTS
63 VOIDS & BALUSTRADES
64 COLUMN FINISHES
65 WALL FINISHES
68 WINDOW SCHEDULE
69 DOOR SCHEDULE
70 EXTERNAL WORKS
80 LEASE PLANS
81 MINI MAJOR TENANTS
85 MAJOR TENANTS
99 STANDARD DETAILS

DIMENSIONS

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TYPICAL TAG LEGEND

REFER TO 00.0011 FOR LEGENDS

XX-XXX (WALL TYPE) / XXXX (WALL HEIGHT) (FIRE RATING)

XX OR XXX-XX

XX-XX

XXXXX XXXX / REFER TO XXXXX

WALL TAG: REFER TO 00.0001 / 10.SERIES (ZONE DRAWINGS)

STANDARD NOTE TAG: REFER TO DRAWING 00.0011 FOR SPECIFIC NOTE.

FINISHES TAG: REFER TO FINISHES SCHEDULE BOOKLET

PACKAGE SPECIFIC TAGS, SYMBOLS AND GRAPHICS

ZONE PLAN NUMBERING CONVENTION

ZONE CODES	DRAWING NO.	LEVEL CODES
XX XX	XX.XXXX	XXX = 01
XX XX		XXX = 02
XX XX		XXX = 03
XX XX		XXX = 04
XX XX PACKAGE	LEVEL CODE IF SEQUENTIAL SHEET No	XXX = 05
XX XX ZONE		XXX = 06
SUB-ZONE		XXX = 07
		XXX = 08
		XXX = 09

Rev	Date	By	Chk	Description
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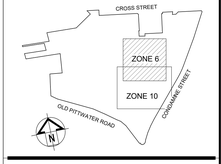

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GPO Box 4004 Sydney NSW 2001
ACN 000 267 265

Title
AVAC SEWERSTATION REPLACEMENT SOLUTION - KEY PLAN

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Drawing No.: SDC-42.0001
Revision: A

ISSUE FOR REVIEW

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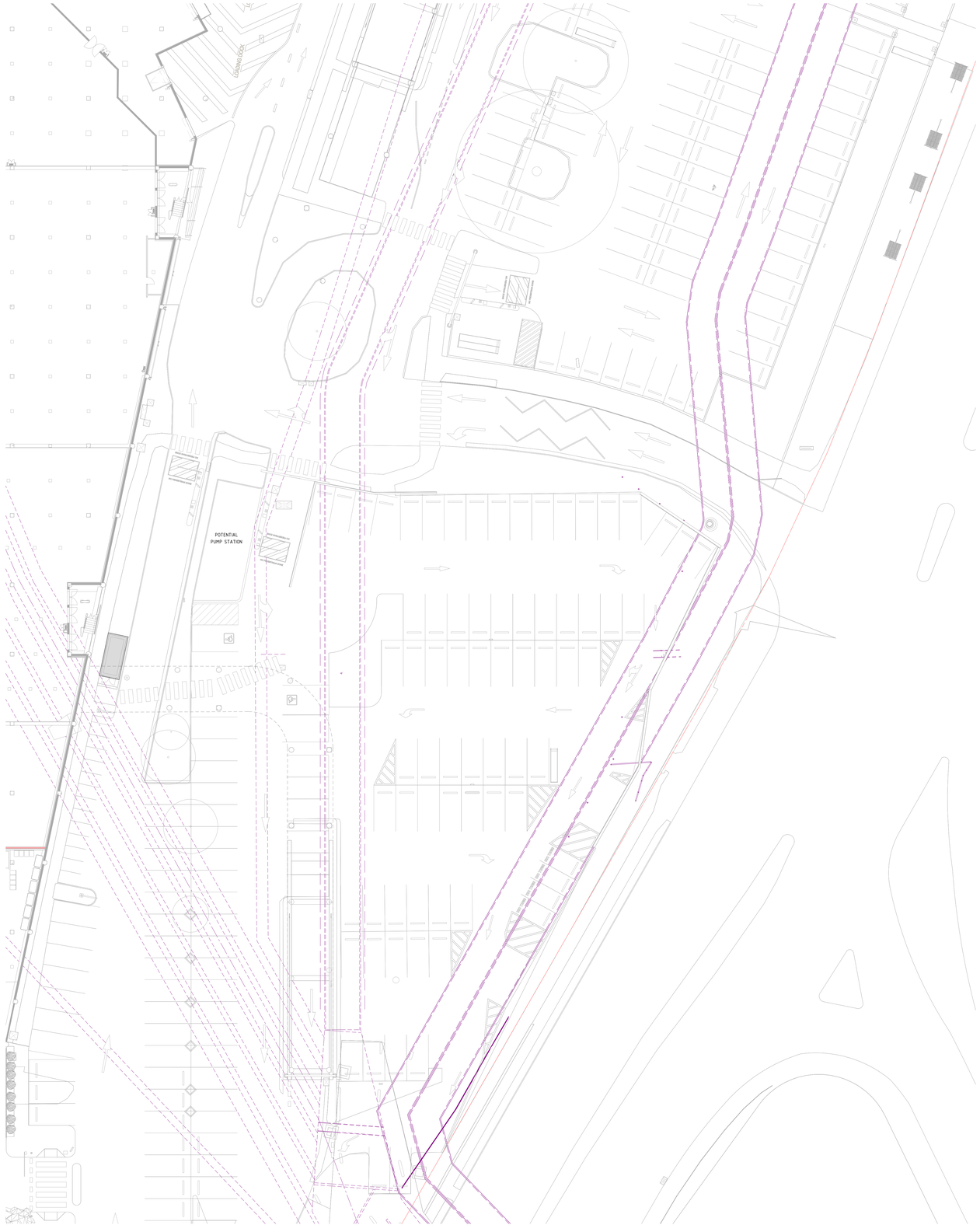
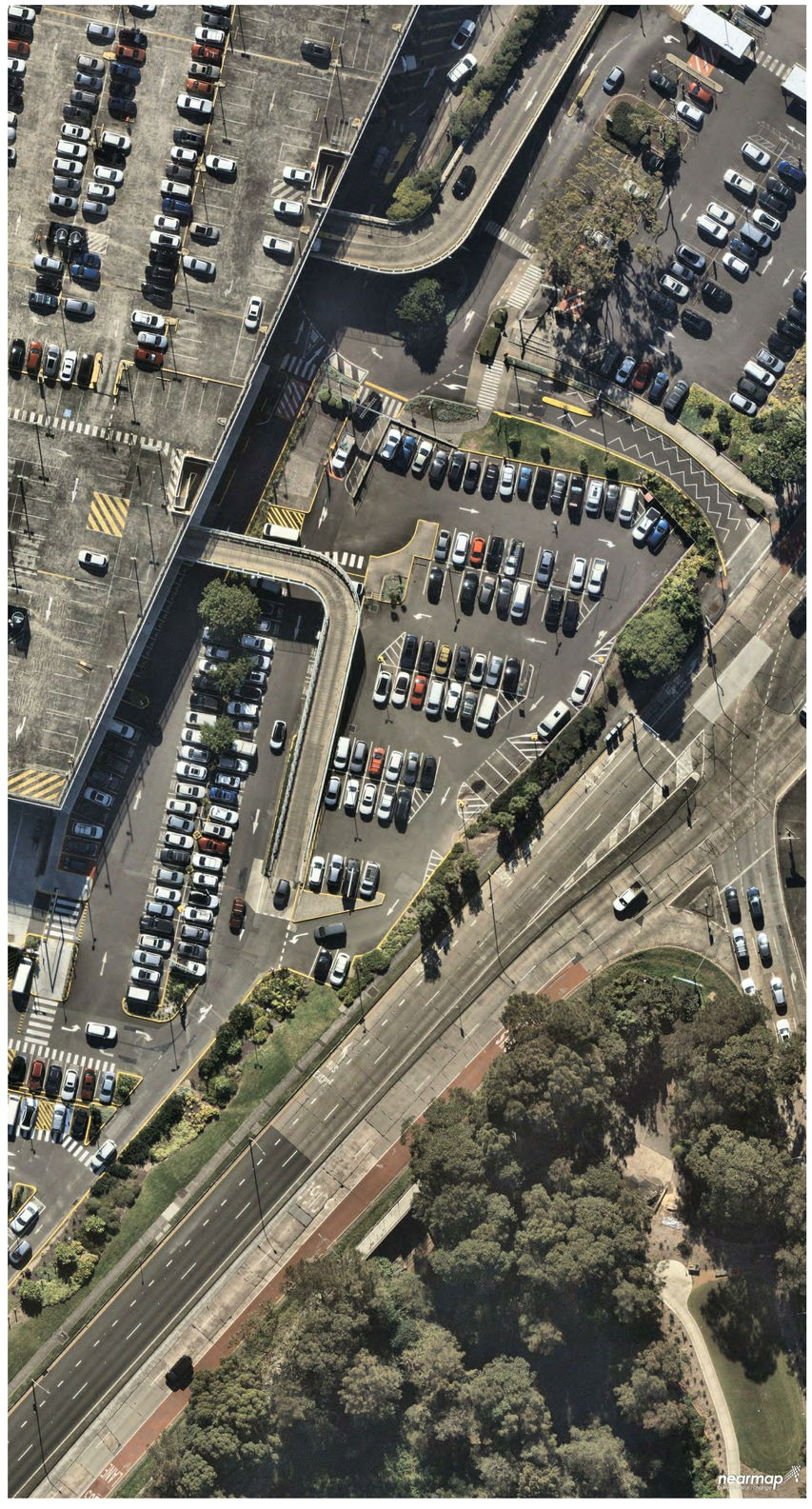


1 SEWER PUMP PLAN
1 : 200



NOTES & REFERENCES

THIS DRAWING MUST BE READ IN CONJUNCTION WITH RELEVANT NOTES FOUND ON DRAWINGS 00.0001/2 AS HIGHLIGHTED BELOW BUT NOT LIMITED TO:

NOTES
1. GENERAL
2. CIVIL
3. DEMOLITION
4. BULK EXCAVATION
5. FOOTINGS
6. SHORING
7. CONCRETE
8. BLOCKWORK
9. COLUMN
10. STRUCTURAL STEEL
11. EXPANSION JOINT
12. FLOOR ACCESS POINTS
13. FLOOR TILING
14. STAIR
15. LIFT
16. RAMP
17. ESC/TRAVELATORS
18. MALL ENTRIES

NOTES (CONT.)
19. AUTOMATIC DOORS
20. EGRESS
21. GENERAL GLAZING
22. LOUVRE
23. COMPOSITE PANELS
24. CARPARK ENTRIES
25. PAINTING
26. LOADING DOCKS
27. BOLLARDS
28. ROLLER SHUTTERS
29. SLAB SOFFIT INSUL.
30. METAL ROOF
31. BALUSTRADE
32. COLUMN CLADDING
33. SIGNAGE COLOURS
34. PAINT FINISHES
35. FIRE RATINGS
36. CEILINGS

NOTES (CONT.)
37. DOORWAYS
38. SKYLIGHTS
39. PRECAST CLADDING
40. SPANDLE CLADDING
41. HEBEL
42. MALL FURNITURE
43. AHU PLANT ROOMS
44. LANDSCAPING
45. METAL WORK
46. WATERPROOFING
47. SERVICE CORRIDORS
48. REMEDIATION
49. WORKS
50. MALL COORDINATION WORKSHOP DWG

ARCHITECTURAL DRAWING REFERENCES

THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT DISCIPLINES SUCH AS STRUCTURAL, SERVICES DETAIL DRAWINGS AND SPECIFICATIONS INCLUSIVE OF ARCHITECTURAL DWG SERIES PACKAGES HIGHLIGHTED BELOW BUT NOT LIMITED TO:

00 COVER INDEX/LEGENDS
01 GIRD SETOUT
04 EXISTING BUILDING
05 DEMOLITION
06 BULK EXCAVATION
08 SHORING & FOOTINGS
07 STAGING & IMPACT
09 HOARDING PLANS
08 GENERAL ARR. PLANS
09 MASTER LEASE PLANS
09 EGRESS PLANS
10 ZONE PLANS
11 CONCRETE PROFILES
12 BLOCKWORK DETAILS
13 FLOOR FINISHES
14 CEILING PLANS
15 MALL COORDINATION
16 EXTERNAL SIGNAGE
17 CARPARK & SIGNAGE
18 STRUCTURAL STEEL
19 INGROUND SERVICES
20 BUILDING ELEVATIONS
22 DETAILED ELEVATIONS
25 BUILDING SECTIONS
26 DETAILED SECTIONS
30 VERTICAL TRANSPORT
39 SERVICES KEYPLAN
40 LOADING DOCKS
41 ELECTRICAL SERVICES
42 HYDRAULIC SERVICES
43 MECHANICAL SERVICES
44 FIRE SERVICES
45 WASTE MANAGEMENT
47 INSULATION
49 MISC. METAL WORK
50 EXTERNAL FINISHES
53 GLAZING
54 ENTRIES
55 SKYLIGHTS
57 ROOFS & AWNINGS
60 CENTRE MANAGEMENT
61 AMENITIES
62 MALL PRECINCTS
63 VOIDS & BALUSTRADES
64 COLUMN FINISHES
65 WALL FINISHES
68 WINDOW SCHEDULE
69 DOOR SCHEDULE
70 EXTERNAL WORKS
80 LEASE PLANS
81 MINI MAJOR TENANTS
85 MAJOR TENANTS
99 STANDARD DETAILS

DIMENSIONS

ALL DIMENSIONS TO BE CHECKED ON SITE. WRITTEN DIMENSIONS ONLY TO BE USED. REFER TO ALL DETAIL DRAWINGS, STRUCTURAL, MECHANICAL AND SERVICE DRAWINGS BEFORE COMMENCING WORK.
REFER ANY DISCREPANCIES TO ARCHITECTS.

TYPICAL TAG LEGEND

REFER TO 00.0011 FOR LEGENDS.

XX-XXX-XX (WALL TYPE) (WALL HEIGHT) (FIRE RATING) — **WALL TAG:** REFER TO 00.0001 / 10 SERIES (ZONE DRAWINGS)

XX OR XXX-XX — **STANDARD NOTE TAG:** REFER TO DRAWING 00.0011 FOR SPECIFIC NOTE.

XX-XX — **FINISHES TAG:** REFER TO FINISHES SCHEDULE BOOKLET

XXXXX XXXX / REFER TO XXXXX — **PACKAGE SPECIFIC TAGS, SYMBOLS AND GRAPHICS**

ZONE PLAN NUMBERING CONVENTION

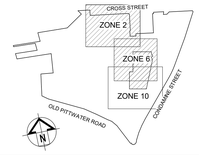
ZONE CODES
XX XX
XX XX
XX XX
XX XX PACKAGE
XX XX ZONE
SUB-ZONE

DRAWING NO.
XX.XXXX
LEVEL CODE IF SEQUENTIAL SHEET No

LEVEL CODES
XXX = 01
XXX = 02
XXX = 03
XXX = 04
XXX = 05
XXX = 06
XXX = 07
XXX = 08
XXX = 09

Rev	Date	By	Chk	Description
A	06/06/2024	JJ	MH	ISSUE FOR REVIEW

SITE ADDRESS : 145 OLD PITTWATER ROAD, BROOKVALE NSW 2100



AMP CAPITAL

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General Note:
THIS DRAWING TO BE CHECKED ON SITE. WRITTEN DIMENSIONS ONLY TO BE USED. REFER TO ALL DETAIL DRAWINGS, STRUCTURAL, MECHANICAL & SERVICES DRAWINGS BEFORE COMMENCING WORK. REFER ANY DISCREPANCIES TO THE ARCHITECT. DO NOT SCALE FROM DRAWINGS.

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GPO Box 4004 Sydney NSW 2001
ACN 000 267 265

Title:
AVAC SEWER PUMP REPLACEMENT PLANS

Drawing Scale: 1 : 200	Scale Bar 1:1 (0, 10, 20, 30, 40, 50)
Project No.: C130139	Plot Date: 06/06/2024 2:50:33 PM
Drawing No.: SDC-42.1001	Revision: A

SDC-42.1001 [A]

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