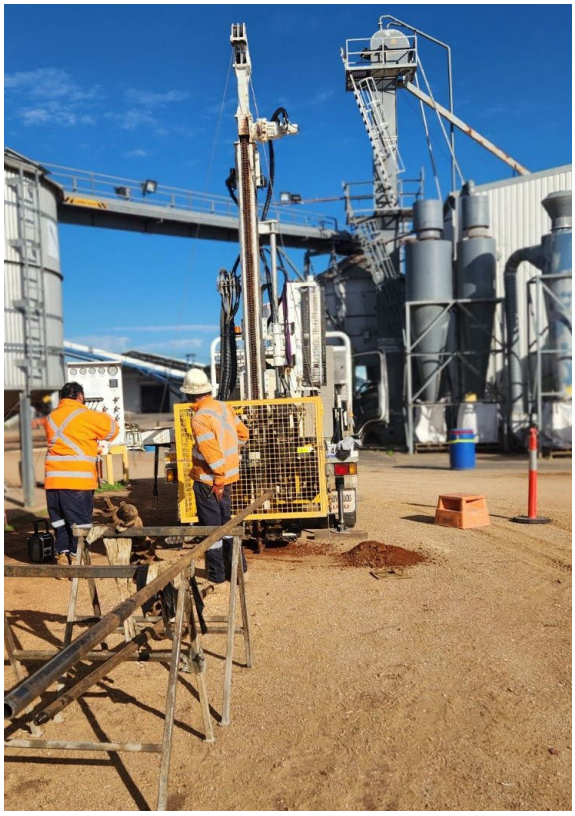
MACQUARIE GEOTECH



GenTech Narromine – Geotechnical Investigation

Job No.: G24049

Submitted to:

Phillip Yates Family Holdings Pty Ltd

Suite 402, Bowman House,

276 Edward St, Brisbane QLD 4000

Attn: Chris Philby

Geotechnical Investigation Report

Report No.: G24049

GenTech Narromine

REVISION CONTROL

Revision	Date	Details	Prepared By	Reviewed By
00	22 May 2024	Draft	Pathum Lakruwan	Martin Williams
01	4 September 2024	FINAL	Pathum Lakruwan	Martin Williams

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1 INTRODUCTION

At the request of Phillip Yates Family Holdings Pty Ltd, Macquarie Geotechnical (MG) has carried out a Geotechnical Investigation at the GenTech facility at 323 The McGrane Way, Narromine.

It is proposed to upgrade the sprinkler system, requiring the excavation of trenches across the site. In addition it is proposed to expand Sheds 3 and 4. The existing footing system is unknown, however, new footings are anticipated to be constructed as high-level pad/strip footings.

The objective of the investigation is to provide an Interpretive geotechnical report.

The comments and opinions expressed in this report are based on the ground conditions encountered during the site work and on the results of tests carried out in the field and in the laboratory. There may, however, be special conditions prevailing on the site which have not been disclosed by this investigation and which therefore have not been taken into account by this report.

2 SCOPE OF INVESTIGATION

The agreed scope of works are as follows:

- Undertake a brief desk study of the site to confirm the likely geological conditions of the site and to develop a geological model for the site.
- Undertake Before You Dig – Australia (BYDA) services search. Service clearance was undertaken by an accredited service locator.
- Mobilisation of one drill rig, drilling, logging and sampling of fifteen boreholes, comprising five structural holes (SBH) and ten environmental holes (EBH) as per Table 1 below. Only fourteen holes could be completed as SBH01 was not undertaken due to waterlogged access.
- In-situ testing comprised of Standard Penetration Tests (SPT) at 1.50m intervals, Dynamic Cone Penetrometer (DCP) testing, Hand Shear Vane (HSV) testing and Pocket Penetrometer (PP).

Table 1: Borehole Scope

Hole ID	Easting	Northing	Depth (m)
EBH01	615040	6430545	1.5
EBH02	615084	6430528	1.5
EBH03	615152	6430529	1.5
EBH04	615247	6430503	1.5
EBH05	615375	6430480	1.5
EBH06	615412	6430542	1.5
EBH07	615349	6430575	1.5
EBH08	615247	6430592	1.5
EBH09	615151	6430604	1.5

Hole ID	Easting	Northing	Depth (m)
EBH10	615094	6430637	1.5
SBH01	Not Undertaken Due To Waterlogged Access		
SBH02	614968	6430573	6.45
SBH03	615073	6430550	6.45
SBH04	615120	6430547	6.45
SBH05	615082	6430648	6.45

- Samples were taken at regular intervals and at every change of strata to allow for laboratory testing and returned to our NATA accredited laboratory in Dubbo, NSW. Laboratory testing comprised the following:
    - Five Atterberg Limits and Linear Shrinkage tests.
    - Five Emerson Class tests.
    - One California Bearing Ratio (CBR) test (on composite sample).
    - Five Soil Aggressivity tests.
    - Ten suite of Contamination testing, including heavy metals and hydrocarbons.

3 SITE DESCRIPTION

The project is located at 323 The McGrane Way, Narromine.

Figure 1: Site Location

4 DESK STUDY

A brief desk study was undertaken using readily available geological and geotechnical information and included the following:

- Minview geology map
- ASRIS/CSIRO.
- Naturally Occurring Asbestos Hazard Maps.

4.1 Regional Geology

The Minview geology map is shown in Figure 2 below:

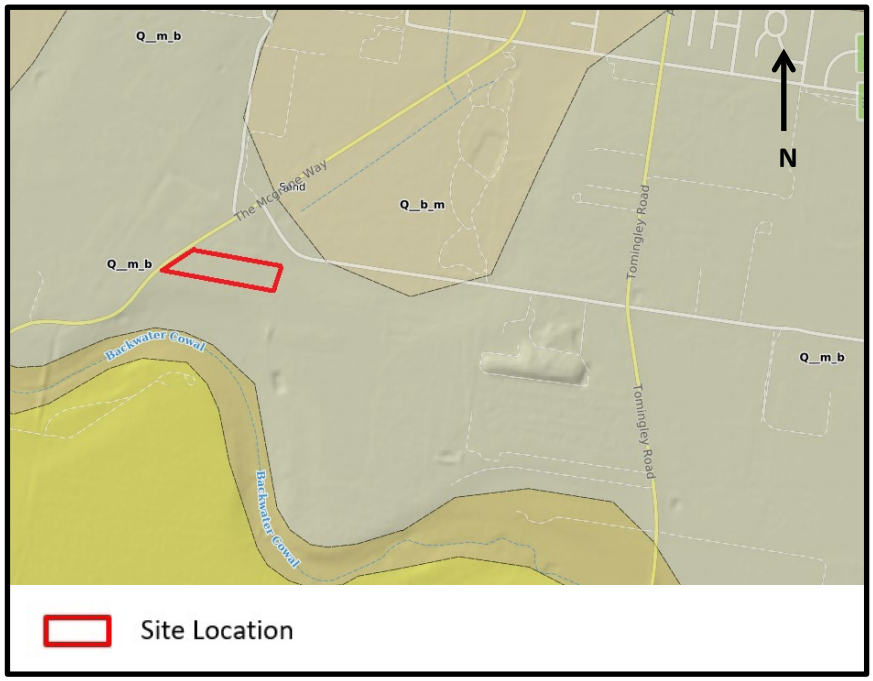


Figure 2: Geology map extract

With reference to the Minview geological map the site is underlain by the following:

Table 2: Summary of Geology

Geological Symbol	Group	Lithology
Q_m_b	Marra Creek Formation	Unconsolidated dark to pale grey and beige to pale yellow-grey clayey, sandy silt, silty clay and clay.

4.2 Acid Sulphate Maps

Reference is made to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Atlas of Australian Acid Sulphate Soils and presented in Figure 3 below:

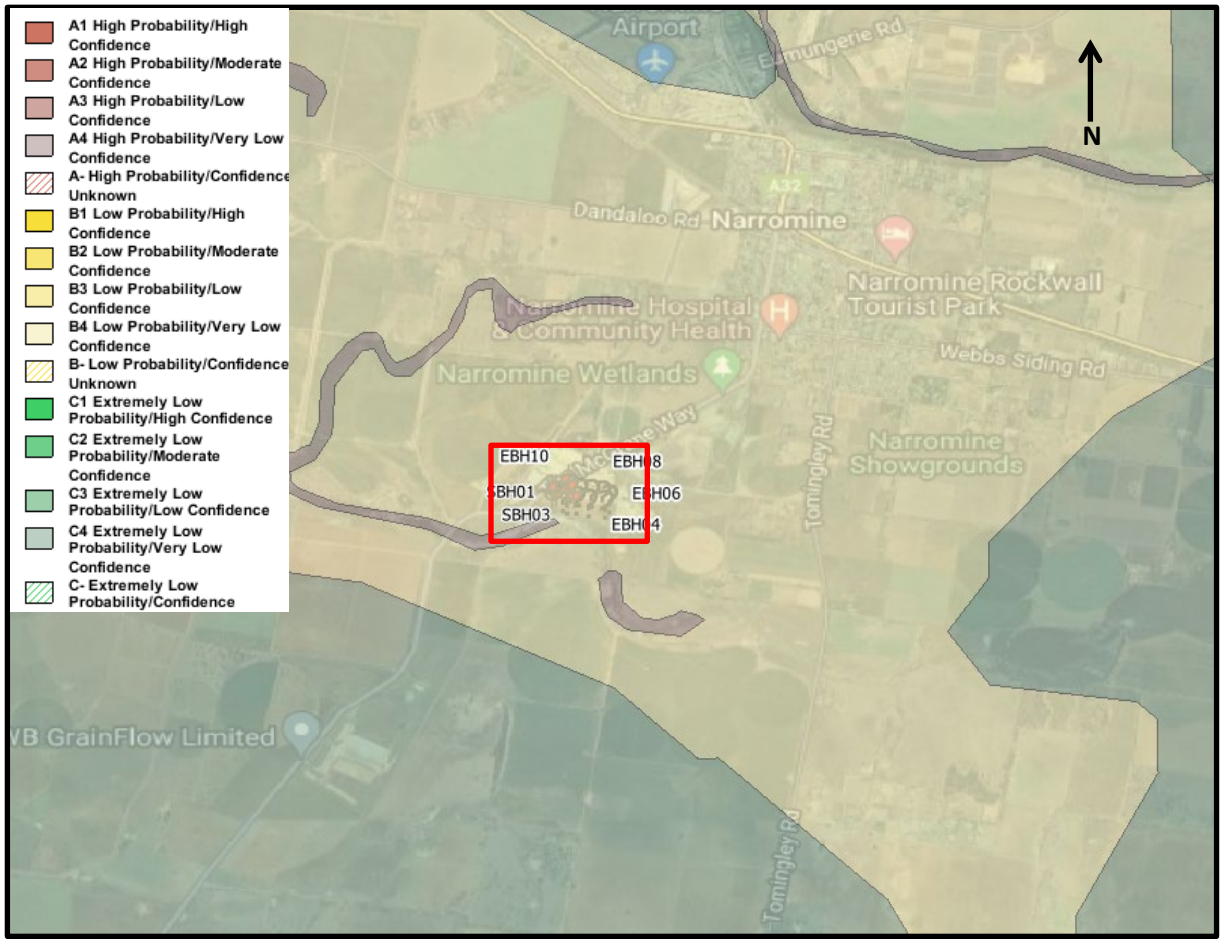


Figure 3: Acid Sulphate Risk Map

The acid sulphate risk map indicates a low probability of acid sulphate soils at the site.

4.3 Naturally Occurring Asbestos Maps

Reference is made to the NSW Department of Primary Industry Naturally Occurring Asbestos Hazard Maps and presented in Figure 4 below:

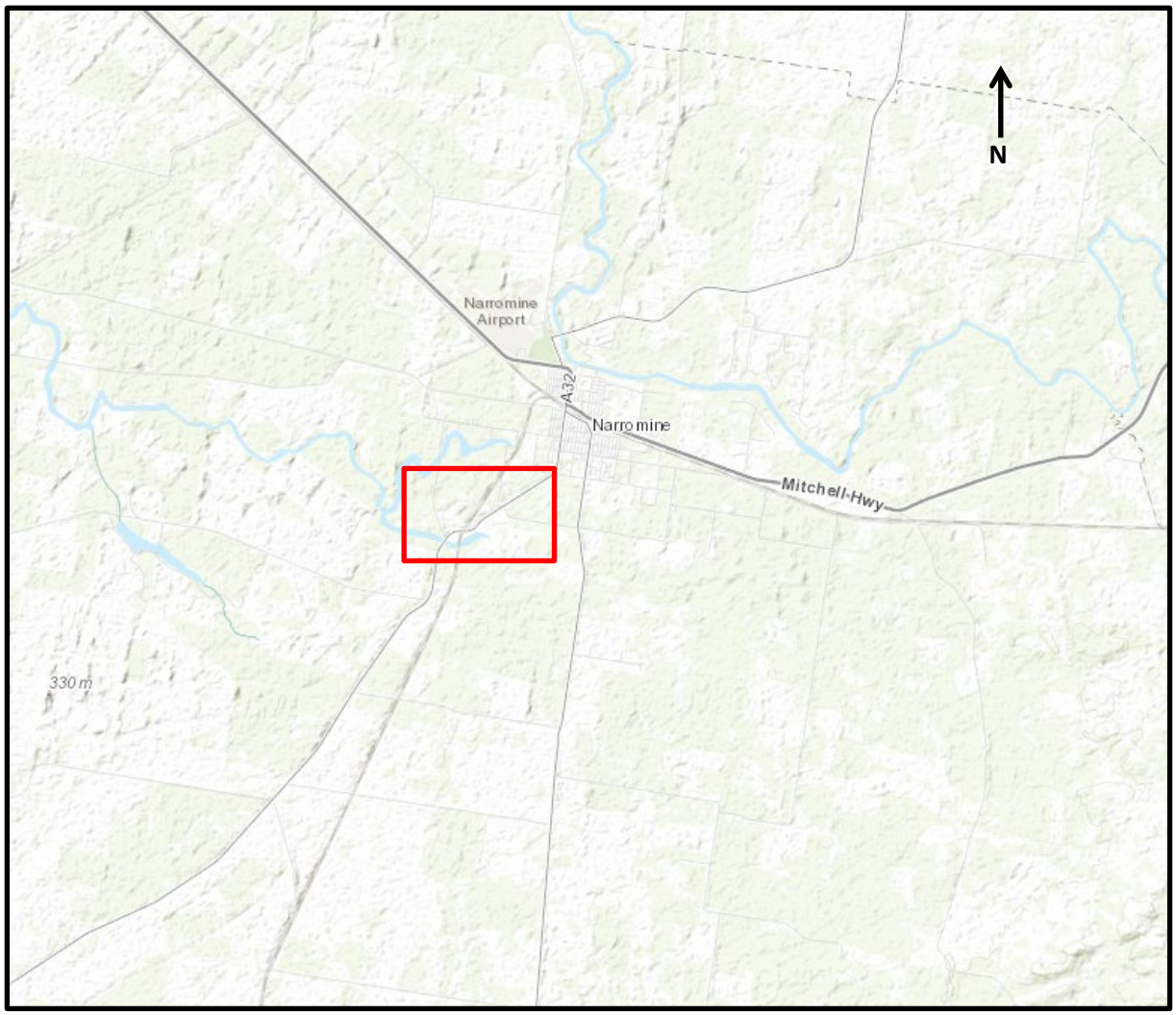


Figure 4: Naturally Occurring Asbestos Hazard Map

The map indicates no potential of Naturally Occurring Asbestos (NOA) at the site.

5 FIELDWORK

Fieldwork was undertaken between 4th to 9th April 2024 by an Engineering Geologist and Drillers from our Bathurst office. The fieldwork was undertaken in accordance with our proposal and AS1726 Geotechnical Site Investigation.

5.1 Service Location

MG obtained underground services and utility plans through 'Before You Dig – Australia (BYDA)' services. A qualified services locator from B4U Dig Locators was present on site to locate services and utilities near the proposed works prior to commencement of fieldwork.

5.2 GPS

All test locations were surveyed using a handheld GPS with co-ordinates recorded in MGA Zone 55 format and elevations in Australian Height Datum (AHD).

5.3 Boreholes

The boreholes were drilled at locations nominated by the client and are summarised in Table 1.

A D4TAPG was used to drill fourteen boreholes to depths of up to 6.45m utilising 115mm diameter solid flight augers. In situ testing comprised of Standard Penetration Tests (SPT) and Dynamic Cone Penetrometer (DCP) tests.

The boreholes were backfilled with arisings on completion.

Borehole logs and photographs are presented in Appendix C.

5.4 Sampling

The sampling was undertaken in general accordance with AS1289 1.2.1 and based on that defined in the proposal and considered the engineering requirements of the investigation and the nature of the materials encountered.

5.5 In Situ Testing

In-situ testing as specified by the client or our proposal was carried out in selected exploratory holes in accordance with the techniques outlined in the relevant Australian Standards and MG Quality procedures. The results are presented on the relevant exploratory hole logs in Appendix C.

5.5.1 Standard Penetration Testing

Standard Penetration Tests (SPT) were carried out in the boreholes with techniques outlined in AS1289 6.3.1 in order to determine the relative density and consistency of the strata encountered. The SPT "N" value (number of blows per 300mm penetration) or the blow count / penetration were recorded for each test.

5.5.2 Dynamic Cone Penetrometer Testing

Dynamic Cone Penetrometer (DCP) testing was carried out in the boreholes / test pits with techniques outlined in AS1289 6.3.2 in order to determine the relative density and consistency of the strata encountered. The numbers of blows per 100mm penetration were recorded.

5.5.3 Pocket Penetrometer Testing

Pocket Penetrometer (PP) testing was carried out on undisturbed samples and SPT split spoon samples.

5.6 Laboratory Testing

The samples were returned to Macquarie Geotechnical NATA accredited laboratory at Dubbo for further assessment and testing. The laboratory tests were carried out as per the laboratory testing indicated in the proposal.

6 EXISTING SUBSURFACE CONDITIONS

The subsurface conditions encountered in the boreholes are presented in detail in the attached borehole logs (refer Appendix C). The subsurface conditions encountered in all boreholes are broadly summarised in Table 3 below.

6.1 Exploratory Hole Summary

Table 3: Borehole Summary

Unit	Name	Depth Range (m)	Maximum Thickness (m)	Material Description
1	Topsoil	0.00 - 0.10	0.10	TOPSOIL
2	Uncontrolled Fill	0.00 - 0.10	0.10	Silty Clay with gravel
6	Alluvial soil	0.10 - 6.45	Not Determined	Sandy CLAY and Silty CLAY

6.2 Groundwater

The comments on groundwater are based on the observations made at the time of the investigation. Groundwater was not encountered in any of the boreholes at the time of investigation. It is possible that elevated groundwater levels may occur during wet periods. Seasonal variation in groundwater may also occur and should be considered as part of the design process.

7 LABORATORY TEST RESULTS

The laboratory tests were carried out on the samples nominated by Macquarie Geotechnical. The test results are shown in Tables 4 to 6 below and test certificates are attached in Appendix D.

Table 4: Laboratory Test Results - Classification

Hole ID	Depth (m)	Sample Description (USCS)	Atterberg Limits			Linear Shrinkage (%)	Moisture Content (%)	Emerson Class
			Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)			
EBH01	0.50 - 1.00	Sandy Clay*	49	17	32	12.5		2
EBH04	0.50 - 1.00	Silty Clay*					14.7	
SBH02	0.18 - 0.50	Sandy Clay*					16.3	
SBH02	0.50 - 1.00	Sandy Clay*	46	15	31	9.5		2
SBH03	0.50 - 1.50	Sandy Clay*	50	19	31	11.5		2
SBH04	0.10 - 0.50	Sandy Clay*	45	16	29	10.0		2
SBH05	0.10 - 0.50	Silty Clay*	30	13	17	7.0		3

Note: USCS – Unified Soil Classification System.
*Visual description.

Table 5: Laboratory Test Results – California Bearing Ratio (CBR)

Hole ID	Depth (m)	Sample Description (USCS)	California Bearing Ratio (CBR)			
			MDD (t/m^3)	OMC (%)	CBR (%)	CBR Swell (%)
SBH04	0.50 - 1.50	Sandy Clay*	1.74	17.0	5	1.5

Note: USCS – Unified Soil Classification System, MDD – Maximum Dry Density, OMC – Optimum Moisture Content.
* Visual description.

Table 6: Laboratory Test Results – Soil Chemical Properties

Hole ID	Depth (m)	Sample Description	Soil Chemical Properties (SCP)			
			pH	SO_4 (ppm)	Cl (ppm)	EC (uS/cm)
EBH01	0.50 - 1.00	Silty Clay*	8.8	29	22	160
EBH05	0.10 - 0.50	Silty Clay*	7.7	10	10	65
SBH02	0.18 - 0.50	Sandy Clay*	8.7	22	28	140
SBH03	0.50 - 1.50	Sandy Clay*	8.6	20	26	180
SBH04	0.50 - 1.50	Sandy Clay*	8.6	33	49	180

Note: * Visual description; SO_4 – Sulphate, Cl – Chloride, EC – Electrical Conductivity; *Visual description

8 GEOTECHNICAL ASSESSMENT

8.1 Site Classification

The classification of a site involves a number of geotechnical factors such as depth of bedrock, the nature and extent of subsurface soils and any specific problems (slope stability, soft soils, filling,

reactivity, etc). AS2870 specifically relates to construction of low rise residential dwellings and is not technically appropriate for industrial or commercial structures.

In accordance with AS2870 2011 the proposed development site will have an anticipated surface movement (Ys) of up to 55 mm and is classified as “Class H1-D”.

AS2870, allows reclassification, if the reactive clays are excavated and replaced with minimum 800mm of compacted granular fill ie. sands/gravels to AS3798.

The current class is H1-D, excavating and replacing minimum 800mm will reduce to class M-D. Excavation and replacement should be undertaken to 1m beyond the foundation perimeter.

If pile foundations are utilised, shrink/swell movements could be accommodated by suspending the slab with a sub slab void or using void formers.

An appropriate footing system should be designed in accordance with the above code to accommodate these anticipated movements. The possibility of additional movements, due to abnormal moisture variations, should be minimised by proper "site management" procedures as provided on the attached sheet.

It should be noted that this assessment is based on site conditions being represented by the natural soil profile. Any change in conditions noted during development, including cut or fill should be referred to MG for appropriate inspection and assessment.

8.2 Foundations

The investigation indicates that the ground conditions generally comprised of a thin cover (0.1m) of Topsoil or Uncontrolled Fill material overlying Alluvial Clay.

Standard Penetration Tests (SPTs) carried out in the natural clays gave ‘N’ values in the range 19 to 51, increasing with depth, indicating a Very Stiff to Hard Consistency. Only EBH10 showed a near surface softening indicated by DCP testing to be ‘soft to firm’ consistency.

8.2.1 Shallow Foundations

Based on our investigation, and our experience in this region, MG consider that the site is suitable for the support of high level/shallow foundations comprising pad/strip or slab on grade foundations.

MG recommend the following geotechnical design parameters:

Table 7: Estimated Geotechnical Engineering Parameters

Depth (m)	Soil Description	Unit Weight (KN/m³)	Effective Drained Stress Parameters		Undrained Shear Strength Cu kPa	Concrete to Soil Friction Angle δ (degrees)
			c' kPa	ϕ' Degrees		
Varying Depth	Alluvial Soil CLAY - Stiff	19	5	26	50	20
	Alluvial Soil CLAY Very Stiff to Hard	19	5	29	100	23

Table 8: Bearing Pressure

Depth (m)	Soil Description	Allowable Bearing Pressure (KPa)	Ultimate Bearing Pressure (KPa)	Modulus of Subgrade Reaction (MN/m³)
GL to 0.1	Topsoil/Fill	Not suitable for foundation support		
Variable Depth	Stiff CLAY (ALLUVIAL)	85	255	15
	Very stiff to hard CLAY (ALLUVIAL)	170	510	20

8.2.2 Pile Foundations

The following parameters are inferred and estimated based on site descriptions and limited in-situ testing.

The parameters provided below are dependent on the pile foundations being embedded a minimum of 4 x the pile diameter into the designated foundation strata. We have also assumed that ground conditions do not deteriorate below the investigated depths. The potential for encountering rock at greater depths cannot be discounted.

It is common for the top (minimum) 1.0m depth to be ignored in design to allow for ground disturbance factors.

For tension piles, the pullout resistance would be wholly dependent on skin friction.

Table 9: Piled Foundations

Depth (m)	Soil Description	Undrained Shear Strength Cu kPa	Ultimate End Bearing Capacity (KPa)	Ultimate Skin Friction (KPa)
GL to 0.1	Topsoil/FILL	Not suitable for foundation support		
Variable Depth	Stiff CLAY	50	450	20
	Very stiff to hard CLAY	100	900	40

8.2.3 Geotechnical Strength Reduction Factor (AS2159)

The geotechnical strength reduction factor for pile design is defined in the Piling Code. Selection of the geotechnical strength reduction factor (ϕ_g) is based on a series of individual risk ratings (IRR) which are weighted and lead to an average risk rating (ARR). The individual risk ratings and final value of (ϕ_g) depend on the following factors:

- Site: the type, quantity and quality of testing.
- Design: design methods and parameter selection.
- Installation: construction control and monitoring.
- Pile testing regime.
- Redundancy.

Without clear details about the pile type, design method, testing regime and other construction factors it is not possible to calculate the appropriate (ϕ_g) value. Assuming no pile testing, limited specialist geotechnical supervision during construction, and the limited/basic investigation and testing, a ϕ_g value of 0.48 is considered appropriate.

8.2.4 Aggressive Soils

We refer to Table 6.4.2 (c) Exposure Classification for Concrete Piles AS2159 – 2009 'Piling – Design and Installation'.

The soil condition is classified as 'Condition – B'. In addition the test results indicate low levels of sulfates and chlorides and normal pH. Therefore the soil at this site is non-aggressive. If groundwater is encountered then it would be classified as Mild.

8.2.5 Earthquake Classification

The Australian Standard 'Structural Design Actions – Earthquake Actions in Australia' (AS 1170.4-2007) gives guidance on the design standards for earthquake loading. Based on the above Australian Standard and the results of the investigation, the following subsoil classification is recommended for design:

- Class Ce – Shallow Soil Site

8.2.6 Soil Dispersion

Based on the laboratory test results the soils are potentially dispersive.

8.2.7 California Bearing Ratio (CBR)

One lab CBR was undertaken giving CBR=5% at SBH04. This is further to the east than Sheds 3 & 4. However, the shallow ground conditions appear fairly uniform as a very stiff clay. A design CBR of 3% is recommended.

9 EXCAVATION AND STABILITY

The soils at the site comprise Fill material over Alluvial Clay and excavation should be achievable using standard conventional earthmoving equipment (e.g. excavators and scrapers). Rock was not encountered.

9.1 Cut Batters

The following cut batter angles are recommended for temporary and permanent conditions.

	Temporary	Permanent
Sands or Fill	1V:2H	1V:3H
Stiff/Hard Clay	1V:1H	1V:2H

9.2 Drainage

Drainage should be installed at the top of the cuttings to divert surface water runoff from the excavation and cut face during rainfall events.

10 EARTHWORKS

10.1 Site Preparation

The following scope of work is required as a minimum to prepare the site prior to construction:

- Prior to construction and placement of any fill, the proposed areas should be stripped to remove all vegetation, topsoil, uncontrolled fill, organic, root affected or other potentially deleterious material;
- Boxed-out excavations should be drained permanently to allow any infiltration from subsequent fill to escape the excavation profile.
- Where the ground slopes at more than 1V:10H (6°), the ground profile should be benched in 200mm vertical steps to create near-level platforms for filling. The platforms should be graded with a cross fall no steeper than 2% downslope to allow drainage of any infiltration to the fill and to prevent pooling of subsurface moisture.
- Following stripping, the exposed subgrade materials should be proof rolled in the presence of a suitably qualified and experienced Geotechnical Engineer to identify any wet or excessively deflecting material.
- Proof rolling should utilise an 8-tonne non-vibrating roller, trimming the rolled surface to level and clean finish; where there are areas indicating excessive deflection then these may require over-excavation and backfilling with an approved select material.
- Site filling should be undertaken to the provisions of AS3798-2007: "Earthworks for Residential and Commercial Developments".
- Fill for support of structures or equipment should be placed to Level 1 inspection and testing requirements as per the standard.

10.2 Re-use of Site Material

With the exception of the topsoil/thin fill cover, the majority of the site won soil material from excavations is considered suitable for use as general fill material. If the material is proposed to be used as engineered fill within the permanent works then some blending of the material with coarser particle sizes may be required to comply with specification grading requirements.

It should be appreciated that clay soils will require appropriate moisture conditioning (to be determined from standard compaction tests) to achieve optimum compaction.

Careful extraction and stockpile management will be required to optimise the potential volume of site won materials. Where feasible, material should be trucked directly to the placement site to avoid double handling and associated time and cost implications.

10.3 Trafficability

The clay subgrades would be trafficable during dry periods. Some desiccation of exposed surfaces can be expected and large quantities of dust may be generated during dry periods under traffic. The

soils may be soft and difficult to traverse following wet weather or inundation. Drying out of these soils could take several days or weeks before being able to accommodate construction traffic.

11 CONTAMINATION

Ten samples were submitted for a suite of contamination tests comprising Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn), Hydrocarbons (TRH, PAH, BTEX), PCBs, OC/OP Pesticides and Phenols. The contamination testing results are attached in Appendix D.

11.1 Human Health

Soil contamination results were compared against the HILs (Human Investigation Levels) and HSLs (Health Screening Levels) for a commercial/industrial end use – Class D as described in detail in Schedule B7 Section 3 of NEPM (National Environmental Protection Measures).

11.1.1 Heavy Metals

None of the samples tested exceeded the HILs for a NEPM Class D site.

11.1.2 Hydrocarbons

None of the samples tested for TRH (Total Recoverable Hydrocarbons) or BTEX (Benzene, Toluene, Ethylbenzene, Xylene) exceeded the HSLs (vapour intrusion) for a NEPM Class D site. The results were generally below detection limits.

None of the samples tested for PAH (Polycyclic Aromatic Hydrocarbons) exceeded the HILs for a NEPM Class D site. The results were generally below detection limits.

11.1.3 PCBs, OC/OP Pesticides, Phenols

None of the samples tested for PCBs, OC/OP Pesticides, Phenols exceeded laboratory detection limits.

11.2 VENM/ENM

Results were compared against the NSW EPA (Environmental Protection Agency) 'The excavated natural material order' 2014.

None of the samples tested exceeded the ENM (Excavated Natural Material) contaminant levels.

11.3 Acid Sulphate Soils

Five samples were tested for pH/pH_{fox} to assess for Potential Acid Sulphate Soils (PASS). All the samples tested showed a pH shift of >1 when hydrogen peroxide was introduced to oxidise the samples. Consequently, the samples are considered as PASS.

In order to determine if the samples are actual Acid Sulphate Soils (ASS), further Chromium Reducible Sulphur testing would be required.

It is noted that if soils prove to be ASS, then the soils cannot be classified as ENM/VENM, and even after acid nuetralisation using lime, would be classified as GSW (General Solid Waste).

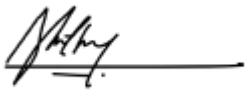
Table 10: sPOCAS field test (pH units)

Borehole ID	EBH02	EBH04	EBH06	EBH08	EBH10
Depth	0.3-0.5	0.3-0.5	1.3-1.5	0.3-0.5	0.3-0.5
pHF (field pH test)	6.8	5.9	7.4	6.7	7.1
pHFOX (field peroxide test)	4.6	4.6	6.6	6.3	5
Reaction Rate*	High reaction	High reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction

12 CONCLUSION

The findings of our report were based on our fieldwork, in-situ testing, laboratory testing, technical assessment and local knowledge for this site.

We trust the foregoing is sufficient for your present purposes, and if you have any questions please contact the undersigned.



Pathum Lakruwan
Geotechnical Engineer

Martin Williams
Principal Geotechnical Engineer
MSc CGeol CPEng

Attached: Limitations of Geotechnical Site Investigation

References: Australia Standard 2870-2011 Residential slabs and footings

Australian Standard 1726 – 2017 Geotechnical Site Investigations

Australian Standard 3798 – 2007 Earthworks for Residential and Commercial Developments

Australian Standard 2159 – 2009 Piling – Design and Installation

LIMITATIONS OF GEOTECHNICAL SITE INVESTIGATION

Scope of Services

This report has been prepared for the Client in accordance with the Services Engagement Form (SEF), between the Client and Macquarie Geotechnical.

Reliance on Data

Macquarie Geotechnical has relied upon data and other information provided by the Client and other individuals. Macquarie Geotechnical has not verified the accuracy or completeness of the data, except as otherwise stated in the report. Recommendations in the report are based on the data.

Macquarie Geotechnical will not be liable in relation to incorrect recommendations should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed.

Geotechnical Investigation

Findings of Geotechnical Investigations are based extensively on judgment and experience. Geotechnical reports are prepared to meet the specific needs of individual clients. This report was prepared expressly for the Client and expressly for the Clients purposes.

This report is based on a subsurface investigation, which was designed for project-specific factors. Unless further geotechnical advice is obtained this report cannot be applied to an adjacent site nor can it be used when the nature of any proposed development is changed.

Limitations of Site investigation

As a result of the limited number of sub-surface excavations or boreholes there is the possibility that variations may occur between test locations. The investigation undertaken is an estimate of the general profile of the subsurface conditions. The data derived from the investigation and laboratory testing are extrapolated across the site to form a geological model. This geological model infers the subsurface conditions and their likely behavior with regard to the proposed development.

The actual conditions at the site might differ from those inferred to exist.

No subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

Time Dependence

This report is based on conditions, which existed at the time of subsurface exploration. Construction operations at or adjacent to the site, and natural events such as floods, or groundwater fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report.

Macquarie Geotechnical should be kept appraised of any such events, and should be consulted for further geotechnical advice if any changes are noted.

Avoid Misinterpretation

A geotechnical engineer or engineering geologist should be retained to work with other design professionals explaining relevant geotechnical findings and in reviewing the adequacy of their plans and specifications relative to geotechnical issues.

No part of this report should be separated from the Final Report.

Sub-surface Logs

Sub-surface logs are developed by geoscientific professionals based upon their interpretation of field logs and laboratory evaluation of field samples. These logs should not under any circumstances be redrawn for inclusion in any drawings.

Geotechnical Involvement During Construction

During construction, excavation frequently exposes subsurface conditions. Geotechnical consultants should be retained through the construction stage, to identify variations if they are exposed.

Report for Benefit of Client

The report has been prepared for the benefit of the Client and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendations and should make their own enquiries and obtain independent advice in relation to such matters

Macquarie Geotechnical assumes no responsibility and will not be liable to any other person or organisations for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisations arising from matters dealt with or conclusions expressed in the report.

Other limitations

Macquarie Geotechnical will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

Other Information

For further information reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by the Institution of Engineers Australia, 1987.

Appendix A – Geotechnical Explanatory Notes

MACQUARIE GEOTECH

Geotechnical Explanatory Notes

Soil Description

In engineering terms soil includes every type of uncemented or partially cemented inorganic material found in the ground. In practice, if the material can be remoulded by hand in its field condition or in water it is described as a soil. The dominant soil constituent is given in capital letters, with secondary textures in lower case. The dominant feature is assessed from the Unified Soil Classification system and a soil symbol is used to define a soil layer as follows:

UNIFIED SOIL CLASSIFICATION

The appropriate symbols are selected on the result of visual examination, field tests and available laboratory tests, such as, sieve analysis, liquid limit and plasticity index.

USC Symbol	Description
GW	Well graded gravel
GP	Poorly graded gravel
GM	Silty gravel
GC	Clayey gravel
SW	Well graded sand
SP	Poorly graded sand
SM	Silty sand
SC	Clayey sand
ML	Silt of low plasticity
CL	Clay of low plasticity
OL	Organic soil of low plasticity
MH	Silt of high plasticity
CH	Clay of high plasticity
OH	Organic soil of high plasticity
Pt	Peaty Soil

MOISTURE CONDITION

Dry – Cohesive soils are friable or powdery
Cohesionless soil grains are free-running

Moist – Soil feels cool, darkened in colour
Cohesive soils can be moulded
Cohesionless soil grains tend to adhere

Wet – Cohesive soils usually weakened
Free water forms on hands when handling

For cohesive soils the following codes may also be used:

MC>PL Moisture Content greater than the Plastic Limit.
MC~PL Moisture Content near the Plastic Limit.
MC<PL Moisture Content less than the Plastic Limit.

PLASTICITY

The potential for soil to undergo change in volume with moisture change is assessed from its degree of plasticity. The classification of the degree of plasticity in terms of the Liquid Limit (LL) is as follows:

Description of Plasticity	LL (%)
Low	<35
Medium	35 to 50
High	>50

COHESIVE SOILS – CONSISTENCY

The consistency of a cohesive soil is defined by descriptive terminology such as very soft, soft, firm, stiff, very stiff and hard. These terms are assessed by the shear strength of the soil as observed visually, by the pocket penetrometer values and by resistance to deformation to hand moulding.

A Pocket Penetrometer may be used in the field or the laboratory to provide approximate assessment of unconfined compressive strength of cohesive soils. The values are recorded in kPa, as follows:

Strength	Symbol	Pocket Penetrometer Reading (kPa)
Very Soft	VS	< 25
Soft	S	20 to 50
Firm	F	50 to 100
Stiff	St	100 to 200
Very Stiff	VSt	200 to 400
Hard	H	> 400

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COHESIONLESS SOILS – RELATIVE DENSITY

Relative density terms such as very loose, loose, medium, dense and very dense are used to describe silty and sandy material, and these are usually based on resistance to drilling penetration or the Standard Penetration Test (SPT) 'N' values. Other condition terms, such as friable, powdery or crumbly may also be used.

The Standard Penetration Test (SPT) is carried out in accordance with AS 1289, 6.3.1. For completed tests the number of blows required to drive the split spoon sampler 300 mm are recorded as the N value. For incomplete tests the number of blows and the penetration beyond the seating depth of 150 mm are recorded. If the 150 mm seating penetration is not achieved the number of blows to achieve the measured penetration is recorded. SPT correlations may be subject to corrections for overburden pressure and equipment type.

Term	Symbol	Density Index	N Value (blows/0.3 m)
Very Loose	VL	0 to 15	0 to 4
Loose	L	15 to 35	4 to 10
Medium Dense	MD	35 to 65	10 to 30
Dense	D	65 to 85	30 to 50
Very Dense	VD	>85	>50

COHESIONLESS SOILS PARTICLE SIZE DESCRIPTIVE TERMS

Name	Subdivision	Size
Boulders		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	19 mm to 63 mm
	medium	6.7 mm to 19 mm
	fine	2.36 mm to 6.7 mm
Sand	coarse	600 μm to 2.36 mm
	medium	210 μm to 600 μm
	fine	75 μm to 210 μm

Rock Description

The rock is described with strength and weathering symbols as shown below. Other features such as bedding and dip angle are given.

ROCK QUALITY

The fracture spacing is shown where applicable and the Rock Quality Designation (RQD) or Total Core Recovery (TCR) is given where:

$$\text{RQD (\%)} = \frac{\text{Sum of Axial lengths of core > 100mm long}}{\text{total length considered}}$$

$$\text{TCR (\%)} = \frac{\text{length of core recovered}}{\text{length of core run}}$$

ROCK STRENGTH

Rock strength is described using AS1726 and ISRM – Commission on Standardisation of Laboratory and Field Tests, "Suggested method of determining the Uniaxial Compressive Strength of Rock materials and the Point Load Index", as follows:

Term	Symbol	Point Load Index $I_{s(50)}$ (MPa)
Very Low	VL	0.03 to 0.1
Low	L	0.1 to 0.3
Medium	M	0.3 to 1
High	H	1 to 3
Very High	VH	3 to 10
Extremely High	EH	>10

ROCK MATERIAL WEATHERING

Rock weathering is described using the following abbreviation and definitions used in AS1726:

Abbreviation	Term
RS	Residual soil
XW	Extremely weathered
DW	Distinctly weathered
HW	Highly weathered
MW	Moderately weathered
SW	Slightly weathered
FR	Fresh

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DEFECT SPACING/BEDDING THICKNESS

Measured at right angles to defects of same set or bedding.

Term	Defect Spacing	Bedding
Extremely closely spaced	<6 mm	Thinly Laminated
	6 to 20 mm	Laminated
Very closely spaced	20 to 60 mm	Very Thin
Closely spaced	0.06 to 0.2 m	Thin
Moderately widely spaced	0.2 to 0.6 m	Medium
Widely spaced	0.6 to 2 m	Thick
Very widely spaced	>2 m	Very Thick

DEFECT DESCRIPTION

Type:	Description
B	Bedding
F	Fault
C	Cleavage
J	Joint
S	Shear Zone
D	Drill break

Planarity/Roughness:

Class	Description
I	rough or irregular, stepped
II	smooth, stepped
III	slickensided, stepped
IV	rough or irregular, undulating
V	smooth, undulating
VI	slickensided, undulating
VII	rough or irregular, planar
VIII	smooth, planar
IX	slickensided, planar

The inclination if defects are measured from perpendicular to the core axis.

WATER


Water level at date shown


Partial water loss


Water inflow


Complete water loss

Groundwater not observed: The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.

Groundwater not encountered: The borehole/test pit was dry soon after excavation, however groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

Graphic Symbols for Soils and Rocks

Typical symbols for soils and rocks are as follows. Combinations of these symbols may be used to indicated mixed materials such as clayey sand.

Soil Symbols

Main components


CLAY - CL


CLAY - CH


SAND


GRAVEL


BOULDERS / COBBLES


TOPSOIL


SILT

Minor Components


Clayey


Silty


Sandy


Gravelly

Other


FILL


BITUMEN


CONCRETE

Rock Symbols

Sedimentary Rocks


SANDSTONE


SILTSTONE


CLAYSTONE, MUDSTONE


SHALE


LAMINITE


ASPHALT


LIMESTONE


CONGLOMERATE

Igneous Rocks


GRANITE


BASALT


UNDIFFERENTIATED IGNEOUS

Metamorphic Rocks


SLATE, PHYLLITE, SCHIST


GNEISS

QUARTZITE

MACQUARIE GEOTECH

Engineering Classification of Shales and Sandstones in the Sydney Region – A Summary Guide

The Sydney Rock Class classification system is based on rock strength, defect spacing and allowable seams as set out below. All three factors must be satisfied.

CLASSIFICATION FOR SANDSTONE

Class	Uniaxial Compressive Strength (MPa)	Defect Spacing (mm)	Allowable Seams (%)
I	>24	>600	<1.5
II	>12	>600	<3
III	>7	>200	<5
IV	>2	>60	<10
V	>1	N.A.	N.A.

CLASSIFICATION FOR SHALE

Class	Uniaxial Compressive Strength (MPa)	Defect Spacing (mm)	Allowable Seams (%)
I	>16	>600	<2
II	>7	>200	<4
III	>2	>60	<8
IV	>1	>20	<25
V	>1	N.A.	N.A.

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UNIAXIAL COMPRESSIVE STRENGTH (UCS)

For expedience in field/construction situations the uniaxial (unconfined) compressive strength of the rock is often inferred, or assessed using the point load strength index (Is_{50}) test (AS 4133.4.1 – 1993). For Sydney Basin sedimentary rocks the uniaxial compressive strength is typically about 20 x (Is_{50}) but the multiplier may range from about 10 to 30 depending on the rock type and characteristics. In the absence of UCS tests, the assigned Sydney Rock Class classification may therefore include rock strengths outside the nominated UCS range.

DEFECT SPACING

The terms relate to spacing of natural fractures in NMLC, NQ and HQ diamond drill cores and have the following definitions:

Defect Spacing (mm)	Terms Used to Describe Defect Spacing[1]
>2000	Very widely spaced
600 – 2000	Widely spaced
200 – 600	Moderately spaced
60 – 200	Closely spaced
20 – 60	Very closely spaced
<20	Extremely closely spaced

[1]After ISO/CD14689 and ISRM.

ALLOWABLE SEAMS

Seams include clay, fragmented, highly weathered or similar zones, usually sub-parallel to the loaded surface. The limits suggested in the tables relate to a defined zone of influence. For pad footings, the zone of influence is defined as 1.5 times the least footing dimension. For socketed footings, the zone includes the length of the socket plus a further depth equal to the width of the footing. For tunnel or excavation assessment purposes the defects are assessed over a length of core of similar characteristics.

Source: Based on Pells et al (1978), as revised by Pells et al (1998).
Pells, P.J.N, Mostyn, G. and Walker, B.F. – Foundations on Sandstone and Shale in the Sydney Region. Australian Geomechanics Journal, No 33 Part 3, December 1998.

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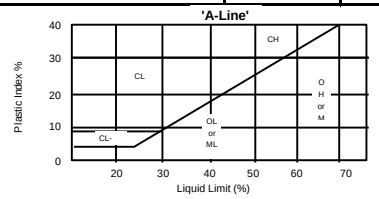
Summary of Soil Logging Procedures

Coarse Material: grain size - colour - particle shape - secondary components - minor constituents - moisture condition - relative density - origin - additional observations.

Fine Material: plasticity - colour - secondary components - minor constituents - moisture w.r.t. plasticity - consistency - origin - additional observations.

Guide to the Description, Identification and Classification of Soils

Major Divisions				SYMBOL	Typical Names
> 200mm	BOULDERS				
60 to 200mm	COBBLES				
COARSE GRAINED SOILS	More than 65% by dry mass less than 63mm is greater that 0.075mm	GRAVEL	More than 50% of coarse fraction > 2.36mm	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
				GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels.
		Gravelly Soils		GM	Silty gravels, gravel-sand-silt mixtures.
				GC	Clayey gravels, gravel-sand-clay mixtures
		SANDS	More than 50% of coarse fraction < 2.36mm	SW	Well-graded sands, gravelly sands, little or no fines.
				SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands.
		Sandy Soils		SM	Silty sands, sand-silt mixtures.
				SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	More than 35% by dry mass less than 60mm is less than 0.076mm	Liquid Limit < 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
				OL	Organic silts and organic silty clays of low plasticity.
		Liquid Limit > 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
				CH	Inorganic clays of high plasticity, fat clays.
				OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS				Pt	Peat and other highly organic soils.



Grain sizes			
Gravel		Sand	
Coarse -	63 to 19mm	Coarse -	2.36 to 0.6mm
Medium -	19 to 6.7 mm	Medium -	0.6 to 0.21mm
Fine -	6.7 to 2.36mm	Fine -	0.21 to 0.075mm

GEOLOGICAL ORIGIN:-

Fill - artificial soils / deposits
Alluvial - soils deposited by the action of water
Aeolian - soils deposited by the action of wind
Topsoil - soils supporting plant life containing significant organic content
Residual - soils derived from insitu weathering of parent rock.
Colluvial - transported debris usually unsorted, loose and deposited

Field Identification of Fine Grained Soils - Silt or Clay?

Dry Strength - Allow the soil to dry completely and then test its strength by breaking and crumbling between the fingers.
High dry strength - Clays; Very slight dry strength - Silts.

Toughness Test - the soil is rolled by hand into a thread about 3mm in diameter. The thread is then folded and re-rolled repeatedly until it has dried sufficiently to break into lumps. In this condition inorganic clays are fairly stiff and tough while inorganic silts produce a weak and often soft thread which may be difficult to form and readily breaks and crumbles.

Dilatancy Test - Add sufficient water to the soil, held in the palm of the hand, to make it soft but not sticky. Shake horizontally, striking vigorously against the other hand several times. Dilatancy is indicated by the appearance of a shiny film on the surface of the soil. If the soil is then squeezed or pressed with the fingers, the surface becomes dull as the soil stiffens and eventually crumbles. These reactions are pronounced only for predominantly silt size material. Plastic clays give no reaction.

Descriptive Terms for Material Portions

COARSE GRAINED SOILS		FINE GRAINED SOILS	
% Fines	*Term/Modifier*	*% Coarse*	*Term/Modifier*
≤ 5	Omit, or use "trace"	≤ 15	Omit, or use "trace"
> 5, ≤ 12	"with clay/silt" as applicable	> 15, ≤ 30	"with sand/gravel" as applicable
> 12	Prefix soil as "silty/clayey"	> 30	Prefix as "sandy/gravelly"

Moisture Condition

for non-cohesive soils:

Dry -	runs freely through fingers.
Moist -	does not run freely but no free water visible on soil surface.
Wet -	free water visible on soil surface.

for cohesive soils:

MC > PL	Moisture content estimated to be greater than the plastic limit.
MC ~ PL	Moisture content estimated to be approximately equal to the plastic limit. The soil can be moulded
MC < PL	Moisture content estimated to be less than the plastic limit. The soil is hard and friable, or powdery.

The plastic limit (PL) is defined as the moisture content (percentage) at which the soil crumbles when rolled into threads of 3mm dia.

Consistency - For Clays & Silts

Description	*UCS(kPa)*	*Field guide to consistency*
Very soft	< 25	Exudes between the fingers when squeezed in hand
Soft	25 - 50	Can be moulded by light finger pressure
Firm	50 - 100	Can be moulded by strong finger pressure
Stiff	100 - 200	Cannot be moulded by fingers. Can be indented by thumb.
Very stiff	200 - 400	Can be indented by thumb nail
Hard	> 400	Can be indented with difficulty by thumb nail
Friable	-	Crumbles or powders when scraped by thumbnail

Relative Density for Gravels and Sands

Description	*SPT "N" Value*	*Density Index (ID) Range %*
Very loose	0 - 4	< 15
Loose	4 - 10	15 - 35
Medium dense	10 - 30	35 - 65
Dense	30 - 50	65 - 85
Very dense	> 50	> 85

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Summary of Rock Logging Procedures

Description order: constituents - rock name - grain size - colour - weathering - strength - minor constituents - additional observations.
- minor constituents - moisture w.r.t. plasticity - consistency - origin - additional observations.

Definition - Sedimentary Rock

Conglomerate	more than 50% of the rock consists of gravel (>2mm) sized fragments
Sandstone	more than 50% of the rock consists of sand (0.06 to 2mm) sized grains
Siltstone	more than 50% of the rock consists of silt sized granular particles and the rock is not laminated
Claystone	more than 50% of the rock consists of clay or mica material and the rock is not laminated
Shale	more than 50% of the rock consists of clay or silt sized particles and the rock is laminated

Weathering

Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a change in volume but the soil has not significantly transported.
Extremely Weathered	EW	Rock is weathered to such an extent that it has 'soil' properties; ie. it either disintegrates or can be remoulded, in water.
Distinctly Weathered	DW	**Highly Weathered (HW)** - Rock is wholly discoloured and rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals **Moderately Weathered (MW)** - The whole of the rock is discoloured, usually by iron staining and bleaching. Shows little or no change in rock strength.
Slightly Weathered	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition or staining.

Stratification

thinly laminated	<6mm	medium bedded	0.2 - 0.6m
laminated	6 - 20mm	thickly bedded	0.6 - 2m
very thinly bedded	20 - 60mm	very thickly bedded	>2m
thinly bedded	60mm - 0.2m		

Discontinuities

order of description: depth - type - orientation - spacing - roughness / planarity - thickness - coating

	Type	Class	Roughness/Planarity	Class	Roughness/Planarity
B	Bedding	I	rough or irregular, stepped	VI	slickensided, undulating
F	Fault	II	smooth, stepped	VII	rough or irregular, planar
C	Cleavage	III	slickensided, stepped	VIII	smooth, planar
J	Joint	IV	rough or irregular, undulating	IX	slickensided, planar
S	Shear Zone	V	smooth, undulating		
D	Drill break				

Rock Strength

Term		Is (50)	Field Guide
		0.03	
Very low	VL		Material crumbles under firm blows with sharp end of pick; can be peeled with knive. Pieces up to 30mm thick can be broken by finger pressure.
		0.1	
Low	L		A piece of core 150 mm long x 50 mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
		0.3	
Medium	M		A piece of core 150 mm long x 50 mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.
		1	
High	H		A piece of core 150 mm long x 50 mm dia. core cannot be broken by unaided hands, can be slightly scratched or scored with knife.
		3	
Very High	VH		A piece of core 150 mm long x 50 mm dia. May be broken readily with hand held hammer. Cannot be scratched with pen knife.
		10	
Extremely High	EH		A piece of core 150 mm long x 50 mm dia. Is difficult to break with hand held hammer. Rings when struck with a hammer.

* - rock strength defined by point load strength (Is 50) in direction normal to bedding

Degree of fracturing

fragmented	The core is comprised primarily of fragments of length less than 20mm, and mostly of width less than the core diameter
highly fractured	Core lengths are generally less than 20mm - 40mm with occasional fragments.
fractured	Core lengths are mainly 30mm - 100mm with occasional shorter and longer lengths
slightly fractured	Core lengths are generally 300mm - 1000mm with occasional longer sections and shorter sections of 100mm -- 300mm.
unbroken	The core does not contain any fracture.

- spacing of all types of natural fractures, but not artificial breaks, in cored bores.

The fracture spacing is shown where applicable and the Rock Quality Designation is given by: RQD (%) = sum of unbroken core pieces 100 mm or longer

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Appendix B – Site Plan

MACQUARIE GEOTECH 3 Watt Drive, Bathurst NSW 2795 P: 02 6332 2011 F: 02 6334 4213 E: macgeo@macgeo.com.au	Client: Phillip Yates Family Holdings Pvt Ltd Project: Narromine Facility Upgrade Location: Narromine, NSW Drawn: P. Lakruwan — Checked: M. Williams — 17-05-2024	0 50 100 150 200 Metres - Scale 1:2000 Vertical to Horizontal Scale 1 : 1 Co-ordinate Reference System - EPSG: 4326 WGS: 84	**JOB NO** G24049 Macquarie Geotechnical Ltd Geotechnical Investigation Locality Map Drawing Number: G24049 - Rev(0)

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Appendix C – Borehole Logs

MACQUARIE GEOTECH

Borehole No.

EBH01

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	08/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	08/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615040.0 m E 6430545.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information | ***Soil Description*** | ***Observations***

Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m ES 0.30-0.50 m D 0.50-1.00 m D 1.00-1.50 m			0.10m 0.5 1.0 1.50m		CI	FILL GRAVEL with sand: fine to coarse grained, sub-angular to angular, black; sand fine to coarse grained. Sandy CLAY: medium plasticity, brown, red and orange; sand fine to coarse grained.	NA w<PL	NA VSt VSt H			FILL ALLUVIAL SOIL
							1.5 2.0 2.5 3.0 3.5			Hole Terminated at 1.50 m Criteria Satisfied					

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

MACQUARIE GEOTECH

Borehole No.

EBH02

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	08/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	08/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615084.0 m E 6430528.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information | ***Soil Description*** | ***Observations***

Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m ES 0.30-0.50 m D 0.50-1.00 m D 1.00-1.50 m			0.10m 0.5 1.0 1.50m		CI-CH	FILL Silty CLAY with gravel with sand: low to medium plasticity, pale yellow; gravel fine to coarse, rounded to sub-rounded; sand fine to coarse grained. Silty CLAY trace sand: medium to high plasticity, brown, red and orange; sand fine grained.	NA w<PL	NA VSt H			FILL ALLUVIAL SOIL
							1.5 2.0 2.5 3.0 3.5			Hole Terminated at 1.50 m Criteria Satisfied					

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

MACQUARIE GEOTECH

Borehole No.

EBH03

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615152.0 m E 6430529.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information							Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m ES 0.30-0.50 m D 0.50-1.00 m D 1.00-1.50 m			0.10m		NA	FILL	NA				FILL
									CI-CH	Silty CLAY with gravel with sand: low to medium plasticity, pale yellow, red; gravel fine to coarse; sand fine to coarse grained.		VSt			ALLUVIAL SOIL
										Silty CLAY with sand: medium to high plasticity, dark brown; sand fine to coarse grained.					
							0.50m 0.5		CI-CH	Silty CLAY trace sand: medium to high plasticity, red, orange; sand fine to coarse grained.		VSt			
											w<PL	H			
							1.0					VSt			
							1.50m 1.5			Hole Terminated at 1.50 m Criteria Satisfied					
							2.0								
							2.5								
							3.0								
							3.5								

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

MACQUARIE GEOTECH

Borehole No.

EBH04

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615247.0 m E 6430503.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information									Soil Description				Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m ES 0.30-0.50 m D 0.50-1.00 m D 1.00-1.50 m			0.10m		NA CI-CH	FILL Silty CLAY with gravel with sand: low to medium plasticity, pale yellow; gravel fine to coarse sub-rounded; sand fine to coarse grained. Silty CLAY trace sand: medium to high plasticity, red and orange; sand fine to coarse grained.	NA w<PL	NA VSt			FILL ALLUVIAL SOIL
							1.50m			Hole Terminated at 1.50 m Criteria Satisfied					

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

MACQUARIE GEOTECH

Borehole No.

EBH05

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615375.0 m E 6430480.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information									Soil Description				Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m ES 0.30-0.50 m D 0.50-1.00 m D 1.00-1.50 m			0.10m		CI-CH	FILL Silty CLAY with gravel with sand: low to medium plasticity, pale yellow; gravel fine to coarse sub-rounded; sand fine to coarse grained.	NA	NA			FILL
										Silty CLAY trace sand: medium to high plasticity, red and orange; sand fine to coarse grained.					ALLUVIAL SOIL
							0.5								
							1.0				w<PL	VSt			
							1.50m								
							1.5			Hole Terminated at 1.50 m Criteria Satisfied					
							2.0								
							2.5								
							3.0								
							3.5								

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

MACQUARIE GEOTECH

Borehole No.

EBH06

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615412.0 m E 6430542.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information									Soil Description				Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m D 0.50-1.00 m D 1.00-1.50 m ES 1.30-1.50 m			0.10m		CI-CH	FILL Silty CLAY with gravel with sand: low to medium plasticity, pale yellow; gravel fine to coarse sub-rounded; sand fine to coarse grained.	NA	NA			FILL ALLUVIAL SOIL
							0.5			Silty CLAY trace sand: medium to high plasticity, red and orange; sand fine to coarse grained.	w<PL	VSt			
							1.0								
							1.50m			Hole Terminated at 1.50 m Criteria Satisfied					
							1.5								
							2.0								
							2.5								
							3.0								
							3.5								

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Plastic Limit
< PL
= PL
< PL

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

MACQUARIE GEOTECH

Borehole No.

EBH07

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615349.0 m E 6430575.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information							***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m D 0.50-1.00 m ES 0.50-0.70 m D 1.00-1.50 m			0.10m		CI-CH	FILL Silty CLAY with gravel with sand: low to medium plasticity, pale yellow; gravel fine to coarse sub-rounded; sand fine to coarse grained.	NA	NA			FILL ALLUVIAL SOIL
							0.5			Silty CLAY trace sand: medium to high plasticity, red and orange; sand fine to coarse grained.	w<PL	VSt			
							1.0					VSt to H			
							1.50m 1.5			Hole Terminated at 1.50 m Criteria Satisfied					
							2.0								
							2.5								
							3.0								
							3.5								

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

MACQUARIE GEOTECH

Borehole No.

EBH08

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615247.0 m E 6430592.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information									*Soil Description*				*Observations*
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m ES 0.30-0.50 m D 0.50-1.00 m D 1.00-1.50 m			0.10m		CI-CH	FILL Silty CLAY with gravel with sand: low to medium plasticity, pale yellow and brown; gravel fine to coarse sub-rounded; sand fine to coarse grained.	NA	NA			FILL ALLUVIAL SOIL
							0.5			Silty CLAY trace sand: medium to high plasticity, red and orange; sand fine to coarse grained.	w<PL	VSt			
							1.0					H			
							1.50m 1.5			Hole Terminated at 1.50 m Criteria Satisfied		VSt to H			
							2.0								
							2.5								
							3.0								
							3.5								

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

MACQUARIE GEOTECH

Borehole No.

EBH09

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615151.0 m E 6430604.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information	***Soil Description***	***Observations***

Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m ES 0.30-0.50 m D 0.50-1.00 m D 1.00-1.50 m			0.10m		CI-CH	FILL Silty CLAY with gravel: low to medium plasticity, pale yellow; gravel fine to coarse sub-rounded. Silty CLAY trace sand: medium to high plasticity, red and orange; sand fine to coarse grained.	NA w<PL	NA VSt			FILL ALLUVIAL SOIL
							1.50m			Hole Terminated at 1.50 m Criteria Satisfied					

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

MACQUARIE GEOTECH

Borehole No.

EBH10

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615094.0 m E 6430637.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m ES 0.30-0.50 m D 0.50-1.00 m D 1.00-1.50 m			0.10m		CI-CH	TOPSOIL Silty CLAY with sand: medium plasticity, dark brown; sand fine to coarse grained.	NA	NA			TOPSOIL ALLUVIAL SOIL
										Silty CLAY trace sand: medium to high plasticity, dark brown; sand fine to coarse grained.					
							0.50m 0.5		CI-CH	Silty CLAY trace sand: medium to high plasticity, red and orange; sand fine to coarse grained.	w<PL	S to F			
							1.0					St to VSt			
												VSt to H			
							1.50m 1.5			Hole Terminated at 1.50 m Criteria Satisfied					
							2.0								
							2.5								
							3.0								
							3.5								

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

MACQUARIE GEOTECH

Borehole No.

SBH02

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	09/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	09/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	614968.0 m E 6430573.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information									Soil Description			Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
DT							0.18m			FILL Sandy GRAVEL: fine to coarse grained, sub-angular to angular, grey; sand fine to coarse grained.	NA	NA			FILL
				D 0.18-0.50 m					CI						ALLUVIAL SOIL
				D 0.50-1.00 m						Sandy CLAY: medium plasticity, red and orange; sand fine to coarse grained.					
							1								
				SPT 1.50-1.95 m 7,10,13 N=23 1.95 m										×	1.50: HP Samp >600 kPa
				D 2.00-3.00 m			2								
				SPT 3.00-3.45 m 8,9,14 N=23 3.45 m			3				w<PL	VSt		×	3.00: HP Samp >600 kPa
AD/T			Not Observed	D 3.50-4.50 m			3.50m		CI-CH	Silty CLAY trace sand: medium to high plasticity, red, orange and pale yellow; sand fine to coarse grained.					
							4								
							4.50m		CI-CH	Silty trace sand: medium to high plasticity, pale yellow and orange; sand fine to coarse grained.				×	4.50: HP Samp =550 kPa
				SPT 4.50-4.95 m 7,11,14 N=25 4.95 m			5								
				D 5.00-6.00 m											
				SPT 6.00-6.45 m 7,11,14 N=25 6.45 m			6							×	6.00: HP Samp =580 kPa
							6.45m			Hole Terminated at 6.45 m Criteria Satisfied					
							7								

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	09/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	09/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	614968.0 m E 6430573.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

SBH02 Depth Range: 1.50 - 1.95 m

SBH02 Depth Range: 3.00 - 3.45 m

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	09/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	09/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	614968.0 m E 6430573.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

SBH02 Depth Range: 4.50 - 4.95 m

SBH02 Depth Range: 6.00 - 6.45 m

MACQUARIE GEOTECH

Borehole No.

SBH03

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	09/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	09/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615073.0 m E 6430550.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information								Soil Description				Observations			
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
DT				D 0.14-0.50 m			0.14m		CI	FILL Sandy GRAVEL: fine to coarse grained, sub-angular to angular, grey; sand fine to coarse grained.	NA	NA			FILL
				D 0.50-1.50 m						Sandy CLAY trace gravel: medium plasticity, red and orange; sand fine to coarse grained; gravel fine to coarse grained sub-rounded to sub-angular.					ALLUVIAL SOIL
							1								
				SPT 1.50-1.95 m 8,11,13 N=24 1.95 m								VSt			1.50: HP Samp >600 kPa
				D 2.00-3.00 m			2								
AD/T			Not Observed	SPT 3.00-3.45 m 8,12,19 N=31 3.45 m			3				w<PL				3.00: HP Samp >600 kPa
				D 3.50-4.50 m			3.50m		CI-CH	Silty CLAY trace sand: medium to high plasticity, pale yellow and orange; sand fine grained.		H			
				SPT 4.50-4.95 m 8,13,16 N=29 4.95 m			4								4.50: HP Samp >600 kPa
				D 5.00-6.00 m			5					VSt			
				SPT 6.00-6.45 m 9,13,17 N=30 6.45 m			6								6.00: HP Samp >600 kPa
							6.45m			Hole Terminated at 6.45 m Criteria Satisfied					
							7								

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	09/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	09/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615073.0 m E 6430550.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

SBH03 Depth Range: 1.50 - 1.95 m

SBH03 Depth Range: 3.00 - 3.45 m

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	09/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	09/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615073.0 m E 6430550.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

SBH03 Depth Range: 4.50 - 4.95 m

SBH03 Depth Range: 6.00 - 6.45 m

MACQUARIE GEOTECH

Borehole No.

SBH04

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	09/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	09/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615120.0 m E 6430547.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information									Soil Description			Observations		
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m			0.10m		CI	FILL Silty CLAY with gravel with sand: low to medium plasticity, pale yellow; gravel fine to coarse rounded to sub-rounded; sand fine to coarse grained.	NA	NA			FILL ALLUVIAL SOIL
				D 0.50-1.50 m			1			Sandy CLAY: medium plasticity, brown, red and orange; sand fine to coarse grained.					
				SPT 1.50-1.95 m 8,9,10 N=19 1.95 m											1.50: HP Samp >600 kPa
				D 2.00-3.00 m			2								
				SPT 3.00-3.45 m 6,9,13 N=22 3.45 m			3				w<PL	VSt			3.00: HP Samp >600 kPa
				D 3.50-4.50 m			4								
				SPT 4.50-4.95 m 8,11,15 N=26 4.95 m			4.50m 5		CI-CH	Silty CLAY trace sand: medium to high plasticity, pale yellow with mottled grey; sand fine to coarse grained.					4.50: HP Samp >600 kPa
				D 5.00-6.00 m											
				SPT 6.00-6.45 m 10,16,22 N=38 6.45 m			6 6.45m					H			6.00: HP Samp >600 kPa
							7			Hole Terminated at 6.45 m Criteria Satisfied					

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	09/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	09/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615120.0 m E 6430547.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

SBH04 Depth Range: 1.50 - 1.95 m

SBH04 Depth Range: 3.00 - 3.45 m

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	09/04/2024
Project Name:	Narromine Facility Upgrade	Completed:	09/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615120.0 m E 6430547.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

SBH04 Depth Range: 4.50 - 4.95 m

SBH04 Depth Range: 6.00 - 6.45 m

MACQUARIE GEOTECH

Borehole No.

SBH05

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Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/03/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615082.0 m E 6430648.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

Drilling Information									Soil Description			Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	Moisture Condition	Consistency Relative Density	DCP Blows/100mm 5 10 15 20	Pocket Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T			Not Observed	D 0.10-0.50 m			0.10m		CL-CI	TOPSOIL Silty CLAY: medium plasticity, dark brown; with rootlets < 5mm.	NA	NA			TOPSOIL
							0.50m			Sandy CLAY: low to medium plasticity, dark brown; sand fine to coarse grained.					ALLUVIAL SOIL
				SPT 0.50-0.95 m 6,12,14 N=26					CI-CH	Silty CLAY trace sand: medium to high plasticity, brown and orange; sand fine to coarse grained.					0.50: HP Samp >600 kPa
				0.95 m D 1.00-2.00 m			1					VSt			
				SPT 2.00-2.45 m 10,17,18 N=35			2								2.00: HP Samp >600 kPa
				2.45 m D 2.50-3.50 m			2.50m		CI-CH	Silty CLAY trace sand: medium to high plasticity, pale brown, orange and yellow; sand fine to coarse grained.	w<PL				
				SPT 3.50-3.95 m 9,16,23 N=39			3								3.50: HP Samp >600 kPa
				3.95 m D 4.00-5.00 m			4					H			
				SPT 5.00-5.45 m 12,18,27 N=45			5								5.00: HP Samp >600 kPa
				5.45 m D 5.50-6.00 m											
				SPT 6.00-6.45 m 12,21,30 N=51			6								6.00: HP Samp >600 kPa
				6.45 m			6.45m			Hole Terminated at 6.45 m Criteria Satisfied					
							7								

Method
AS - Auger Screwing
RR - Rock Roller
WB- Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/03/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615082.0 m E 6430648.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

SBH05 Depth Range: 0.05 - 0.95 m

SBH05 Depth Range: 2.00 - 2.45 m

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/03/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615082.0 m E 6430648.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

SBH05 Depth Range: 3.50 - 3.95 m

SBH05 Depth Range: 5.00 - 5.45 m

Engineering Log - Borehole

Project No.: G24049

Client:	Phillip Yates Family Holdings Pty Ltd	Commenced:	04/03/2024
Project Name:	Narromine Facility Upgrade	Completed:	04/04/2024
Hole Location:	Narromine NSW	Logged By:	D.O.
Hole Position:	615082.0 m E 6430648.0 m N GDA2020 / Zone 55	Checked By:	P.L.

Drill Model and Mounting:	D4TAPG	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	115 mm	Bearing:		Datum:	AHD	Operator:	A.Moore

SBH05 Depth Range: 6.00 - 6.45 m

Appendix D – Laboratoty Test Results

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

CERTIFICATE OF ANALYSIS 349276

Client Details

Client	Macquarie Geotech
Attention	Pathum Lakruwan
Address	3 Watt Dr, Bathurst, NSW, 2795

Sample Details

Your Reference	**G24049**
Number of Samples	10 Soil
Date samples received	19/04/2024
Date completed instructions received	19/04/2024

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.

Report Details

Date results requested by	29/04/2024
Date of Issue	29/04/2024

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		349276-1	349276-2	349276-3	349276-4	349276-5
Your Reference	UNITS	EBH01	EBH02	EBH03	EBH04	EBH05
Depth		0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	29/04/2024	29/04/2024	29/04/2024	29/04/2024	29/04/2024
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	%	88	88	70	86	86

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		349276-6	349276-7	349276-8	349276-9	349276-10
Your Reference	UNITS	EBH06	EBH07	EBH08	EBH09	EBH10
Depth		1.3-1.5	0.5-0.7	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	29/04/2024	29/04/2024	29/04/2024	29/04/2024	29/04/2024
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	%	86	84	87	83	84

svTRH (C10-C40) in Soil						
Our Reference		349276-1	349276-2	349276-3	349276-4	349276-5
Your Reference	UNITS	EBH01	EBH02	EBH03	EBH04	EBH05
Depth		0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
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	%	84	78	86	78	78

svTRH (C10-C40) in Soil						
Our Reference		349276-6	349276-7	349276-8	349276-9	349276-10
Your Reference	UNITS	EBH06	EBH07	EBH08	EBH09	EBH10
Depth		1.3-1.5	0.5-0.7	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
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	%	83	82	77	83	85

PAHs in Soil						
Our Reference		349276-1	349276-2	349276-3	349276-4	349276-5
Your Reference	UNITS	EBH01	EBH02	EBH03	EBH04	EBH05
Depth		0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
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	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	103	112	102	110	103

PAHs in Soil						
Our Reference		349276-6	349276-7	349276-8	349276-9	349276-10
Your Reference	UNITS	EBH06	EBH07	EBH08	EBH09	EBH10
Depth		1.3-1.5	0.5-0.7	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	24/04/2024	24/04/2024	24/04/2024
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	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	114	110	100	102	95

Organochlorine Pesticides in soil						
Our Reference		349276-1	349276-2	349276-3	349276-4	349276-5
Your Reference	UNITS	EBH01	EBH02	EBH03	EBH04	EBH05
Depth		0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	98	97	96	92	92

Organochlorine Pesticides in soil						
Our Reference		349276-6	349276-7	349276-8	349276-9	349276-10
Your Reference	UNITS	EBH06	EBH07	EBH08	EBH09	EBH10
Depth		1.3-1.5	0.5-0.7	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	24/04/2024	24/04/2024	24/04/2024
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	94	92	74	83	74

Organophosphorus Pesticides in Soil						
Our Reference		349276-1	349276-2	349276-3	349276-4	349276-5
Your Reference	UNITS	EBH01	EBH02	EBH03	EBH04	EBH05
Depth		0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	98	97	96	92	92

Organophosphorus Pesticides in Soil						
Our Reference		349276-6	349276-7	349276-8	349276-9	349276-10
Your Reference	UNITS	EBH06	EBH07	EBH08	EBH09	EBH10
Depth		1.3-1.5	0.5-0.7	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	24/04/2024	24/04/2024	24/04/2024
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	94	92	74	83	74

PCBs in Soil						
Our Reference		349276-1	349276-2	349276-3	349276-4	349276-5
Your Reference	UNITS	EBH01	EBH02	EBH03	EBH04	EBH05
Depth		0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	101	98	98	97	95

PCBs in Soil						
Our Reference		349276-6	349276-7	349276-8	349276-9	349276-10
Your Reference	UNITS	EBH06	EBH07	EBH08	EBH09	EBH10
Depth		1.3-1.5	0.5-0.7	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	24/04/2024	24/04/2024	24/04/2024
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	99	89	79	79	79

Acid Extractable metals in soil						
Our Reference		349276-1	349276-2	349276-3	349276-4	349276-5
Your Reference	UNITS	EBH01	EBH02	EBH03	EBH04	EBH05
Depth		0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	23	26	20	21	22
Copper	mg/kg	15	17	14	14	16
Lead	mg/kg	10	11	8	9	11
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	12	12	10	10	11
Zinc	mg/kg	18	18	14	17	17

Acid Extractable metals in soil						
Our Reference		349276-6	349276-7	349276-8	349276-9	349276-10
Your Reference	UNITS	EBH06	EBH07	EBH08	EBH09	EBH10
Depth		1.3-1.5	0.5-0.7	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Arsenic	mg/kg	4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	26	29	21	17	19
Copper	mg/kg	19	15	14	12	11
Lead	mg/kg	15	13	10	8	8
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	15	15	11	8	9
Zinc	mg/kg	26	22	15	13	14

Misc Soil - Inorg						
Our Reference		349276-1	349276-2	349276-3	349276-4	349276-5
Your Reference	UNITS	EBH01	EBH02	EBH03	EBH04	EBH05
Depth		0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg						
Our Reference		349276-6	349276-7	349276-8	349276-9	349276-10
Your Reference	UNITS	EBH06	EBH07	EBH08	EBH09	EBH10
Depth		1.3-1.5	0.5-0.7	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Moisture						
Our Reference		349276-1	349276-2	349276-3	349276-4	349276-5
Your Reference	UNITS	EBH01	EBH02	EBH03	EBH04	EBH05
Depth		0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Moisture	%	16	20	17	20	17

Moisture						
Our Reference		349276-6	349276-7	349276-8	349276-9	349276-10
Your Reference	UNITS	EBH06	EBH07	EBH08	EBH09	EBH10
Depth		1.3-1.5	0.5-0.7	0.3-0.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/04/2024	22/04/2024	22/04/2024	22/04/2024	22/04/2024
Date analysed	-	23/04/2024	23/04/2024	23/04/2024	23/04/2024	23/04/2024
Moisture	%	17	23	16	11	19

sPOCAS field test						
Our Reference		349276-2	349276-4	349276-6	349276-8	349276-10
Your Reference	UNITS	EBH02	EBH04	EBH06	EBH08	EBH10
Depth		0.3-0.5	0.3-0.5	1.3-1.5	0.3-0.5	0.3-0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024
Date analysed	-	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024
pH_F (field pH test)	pH Units	6.8	5.9	7.4	6.7	7.1
pH_{FOX} (field peroxide test)	pH Units	4.6	4.6	6.6	6.3	5.0
Reaction Rate*	-	High reaction	High reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-063	pH- measured using pH meter and electrode. Soil is oxidised with Hydrogen Peroxide or extracted with water. To ensure accurate results these tests are recommended to be done in the field as pH may change with time thus these results may not be representative of true field conditions.
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.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	349276-2
Date extracted	-			22/04/2024	1	22/04/2024	22/04/2024		22/04/2024	22/04/2024
Date analysed	-			29/04/2024	1	29/04/2024	29/04/2024		29/04/2024	29/04/2024
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	106	109
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	106	109
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	87	89
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	107	106
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	107	111
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	115	119
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	114	119
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	94	1	88	87	1	85	81

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	349276-2
Date extracted	-			22/04/2024	1	22/04/2024	22/04/2024		22/04/2024	22/04/2024
Date analysed	-			23/04/2024	1	23/04/2024	23/04/2024		23/04/2024	23/04/2024
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	111	104
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	126	114
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	<100	<100	0	86	116
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	111	104
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	<100	<100	0	126	114
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	<100	<100	0	86	116
Surrogate o-Terphenyl	%		Org-020	78	1	84	77	9	90	78

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	349276-2
Date extracted	-			22/04/2024	1	22/04/2024	22/04/2024		22/04/2024	22/04/2024
Date analysed	-			24/04/2024	1	23/04/2024	23/04/2024		23/04/2024	23/04/2024
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	68	90
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	70	94
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	64	94
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	100
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	80	102
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	78	98
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	64	86
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	84	118
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	111	1	103	115	11	89	93

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	349276-2
Date extracted	-			22/04/2024	1	22/04/2024	22/04/2024		22/04/2024	22/04/2024
Date analysed	-			24/04/2024	1	23/04/2024	23/04/2024		23/04/2024	23/04/2024
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	70	98
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	76	106
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	78	96
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	82	100
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	84	110
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	76	98
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	120
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	102
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	76	96
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	66	78
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	102	1	98	98	0	82	89

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	349276-2
Date extracted	-			22/04/2024	1	22/04/2024	22/04/2024		22/04/2024	22/04/2024
Date analysed	-			24/04/2024	1	23/04/2024	23/04/2024		23/04/2024	23/04/2024
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	128	132
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	96	120
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	112	136
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	122
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	102	126
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	108	132
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	118	138
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	102	1	98	98	0	82	89

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	349276-2
Date extracted	-			22/04/2024	1	22/04/2024	22/04/2024		22/04/2024	22/04/2024
Date analysed	-			24/04/2024	1	23/04/2024	23/04/2024		23/04/2024	23/04/2024
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	84	100
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	97	1	101	97	4	78	84

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	349276-2
Date prepared	-			23/04/2024	1	23/04/2024	23/04/2024		23/04/2024	23/04/2024
Date analysed	-			23/04/2024	1	23/04/2024	23/04/2024		23/04/2024	23/04/2024
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	117	104
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	109	95
Chromium	mg/kg	1	Metals-020	<1	1	23	20	14	113	100
Copper	mg/kg	1	Metals-020	<1	1	15	14	7	111	103
Lead	mg/kg	1	Metals-020	<1	1	10	9	11	115	102
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	100	99
Nickel	mg/kg	1	Metals-020	<1	1	12	11	9	115	102
Zinc	mg/kg	1	Metals-020	<1	1	18	15	18	108	91

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	349276-2
Date prepared	-			23/04/2024	1	23/04/2024	23/04/2024		23/04/2024	23/04/2024
Date analysed	-			23/04/2024	1	23/04/2024	23/04/2024		23/04/2024	23/04/2024
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	1	<5	<5	0	99	100

QUALITY CONTROL: sPOCAS field test						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			24/04/2024	[NT]	[NT]	[NT]	[NT]	24/04/2024	[NT]
Date analysed	-			24/04/2024	[NT]	[NT]	[NT]	[NT]	24/04/2024	[NT]
pH_F (field pH test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	99	[NT]
pH_{FOX} (field peroxide test)	pH Units		Inorg-063	[NT]	[NT]	[NT]	[NT]	[NT]	99	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Material Test Report

Macquarie Geotechnical Pty Ltd
Dubbo Laboratory
7 Energy Place Dubbo NSW 2830
Phone: (02) 6332 2011
Email: macgeo@macgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: David Webb
NATA Accredited Laboratory Number: 14874

Report Number: **D24010-47**
Issue Number: 1
Date Issued: 09/05/2024
Client: Macquarie Geotechnical
3 Watt Drive, Bathurst NSW 2795
Project Number: D24010
Project Name: Dubbo Laboratory Testing
Client Reference: G24049
Work Request: 2358
Sample Number: DBO-2358A
Date Sampled: 04/04/2024
Dates Tested: 23/04/2024 - 09/05/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location: **Phillip Yates - Narromine Facilty Upgrade**
Lot No: **EBH01 0.50-1.00m**

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	13.8		

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	49		
Plastic Limit (%)	17		
Plasticity Index (%)	**32**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**12.5**		
Cracking Crumbling Curling	Cracking & Curling		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	Sandy CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	19		

Material Test Report

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7 Energy Place Dubbo NSW 2830
Phone: (02) 6332 2011
Email: macgeo@macgeo.com.au

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Report Number:	**D24010-47**
Issue Number:	1
Date Issued:	09/05/2024
Client:	Macquarie Geotechnical 3 Watt Drive, Bathurst NSW 2795
Project Number:	D24010
Project Name:	Dubbo Laboratory Testing
Client Reference:	G24049
Work Request:	2358
Sample Number:	DBO-2358B
Date Sampled:	04/04/2024
Dates Tested:	23/04/2024 - 30/04/2024
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location:	**Phillip Yates - Narromine Facilty Upgrade**
Lot No:	**SBH02 0.18-0.50m**

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	16.3		

Material Test Report

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7 Energy Place Dubbo NSW 2830
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Approved Signatory: David Webb
NATA Accredited Laboratory Number: 14874

Report Number:	**D24010-47**
Issue Number:	1
Date Issued:	09/05/2024
Client:	Macquarie Geotechnical 3 Watt Drive, Bathurst NSW 2795
Project Number:	D24010
Project Name:	Dubbo Laboratory Testing
Client Reference:	G24049
Work Request:	2358
Sample Number:	DBO-2358C
Date Sampled:	04/04/2024
Dates Tested:	23/04/2024 - 09/05/2024
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location:	**Phillip Yates - Narromine Facilty Upgrade**
Lot No:	**SBH02 0.50-1.00m**

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	46		
Plastic Limit (%)	15		
Plasticity Index (%)	**31**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**9.5**		
Cracking Crumbling Curling	Cracking & Curling		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	Sandy CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	19		

Material Test Report

Report Number: **D24010-47**
Issue Number: 1
Date Issued: 09/05/2024
Client: Macquarie Geotechnical
3 Watt Drive, Bathurst NSW 2795
Project Number: D24010
Project Name: Dubbo Laboratory Testing
Client Reference: G24049
Work Request: 2358
Sample Number: DBO-2358D
Date Sampled: 04/04/2024
Dates Tested: 23/04/2024 - 09/05/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location: **Phillip Yates - Narromine Facilty Upgrade**
Lot No: **SBH03 0.50-1.50m**

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Dubbo Laboratory
7 Energy Place Dubbo NSW 2830
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Approved Signatory: David Webb
NATA Accredited Laboratory Number: 14874

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	15.6		

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	50		
Plastic Limit (%)	19		
Plasticity Index (%)	**31**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**11.5**		
Cracking Crumbling Curling	Cracking & Curling		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	Sandy CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	19		

Material Test Report

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Approved Signatory: David Webb
NATA Accredited Laboratory Number: 14874

Report Number: **D24010-47**
Issue Number: 1
Date Issued: 09/05/2024
Client: Macquarie Geotechnical
3 Watt Drive, Bathurst NSW 2795
Project Number: D24010
Project Name: Dubbo Laboratory Testing
Client Reference: G24049
Work Request: 2358
Sample Number: DBO-2358E
Date Sampled: 04/04/2024
Dates Tested: 23/04/2024 - 06/05/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location: **Phillip Yates - Narromine Facilty Upgrade**
Lot No: **SBH04 0.10-0.50m**

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	14.7		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	45		
Plastic Limit (%)	16		
Plasticity Index (%)	**29**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**10.0**		
Cracking Crumbling Curling	Cracking & Curling		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	Sandy CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	19		

Material Test Report

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7 Energy Place Dubbo NSW 2830
Phone: (02) 6332 2011
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Approved Signatory: David Webb
NATA Accredited Laboratory Number: 14874

Report Number:	**D24010-47**
Issue Number:	1
Date Issued:	09/05/2024
Client:	Macquarie Geotechnical 3 Watt Drive, Bathurst NSW 2795
Project Number:	D24010
Project Name:	Dubbo Laboratory Testing
Client Reference:	G24049
Work Request:	2358
Sample Number:	DBO-2358F
Date Sampled:	04/04/2024
Dates Tested:	23/04/2024 - 30/04/2024
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location:	**Phillip Yates - Narromine Facilty Upgrade**
Lot No:	**SBH04 0.50-1.50m**

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	14.7		

Material Test Report

Report Number: **D24010-47**
Issue Number: 1
Date Issued: 09/05/2024
Client: Macquarie Geotechnical
3 Watt Drive, Bathurst NSW 2795
Project Number: D24010
Project Name: Dubbo Laboratory Testing
Client Reference: G24049
Work Request: 2358
Sample Number: DBO-2358H
Date Sampled: 04/04/2024
Dates Tested: 23/04/2024 - 06/05/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location: **Phillip Yates - Narromine Facilty Upgrade**
Lot No: **SBH04 0.10-4.50m**

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Approved Signatory: David Webb
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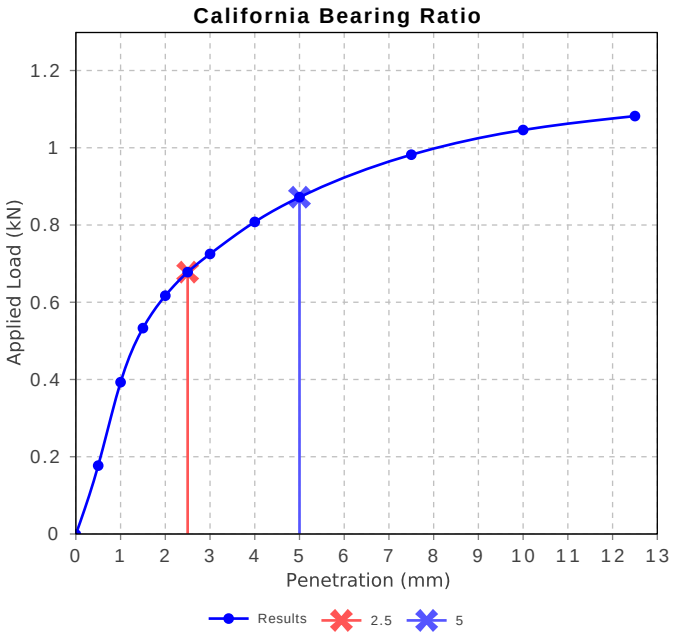
California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Technician Assessment		
Maximum Dry Density (t/m^3)	1.74		
Optimum Moisture Content (%)	17.0		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	99.5		
Dry Density after Soaking (t/m^3)	1.71		
Field Moisture Content (%)	14.7		
Moisture Content at Placement (%)	17.1		
Moisture Content Top 30mm (%)	22.8		
Moisture Content Rest of Sample (%)	18.6		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	196.2		
Swell (%)	1.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Material Test Report

Report Number: D24010-47
Issue Number: 1
Date Issued: 09/05/2024
Client: Macquarie Geotechnical
3 Watt Drive, Bathurst NSW 2795
Project Number: D24010
Project Name: Dubbo Laboratory Testing
Client Reference: G24049
Work Request: 2358
Sample Number: DBO-2358G
Date Sampled: 04/04/2024
Dates Tested: 23/04/2024 - 01/05/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location: **Phillip Yates - Narromine Facilty Upgrade**
Lot No: **SBH05 0.10-0.50m**

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Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	30		
Plastic Limit (%)	13		
Plasticity Index (%)	**17**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**7.0**		
Cracking Crumbling Curling	Cracking & Curling		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**3**		
Soil Description	Sandy CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	18		

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CERTIFICATE OF ANALYSIS 350086

Client Details

Client	Macquarie Geotech (Dubbo)
Attention	D Webb
Address	3 Watt Dr, Bathurst, NSW, 2795

Sample Details

Your Reference	**G24049 DBO-2358 Narromine Facility Upgrade Phillip**
Number of Samples	5 Soil
Date samples received	01/05/2024
Date completed instructions received	01/05/2024

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	08/05/2024
Date of Issue	08/05/2024

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Results Approved By
Diego Bigolin, Inorganics Supervisor

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		350086-1	350086-2	350086-3	350086-4	350086-5
Sample ID	UNITS	DBO-2358 A	DBO-2358 B	DBO-2358 D	DBO-2358 F	DBO-2358 G
Your Reference		G24049 - EBH01	G24049 - SBH02	G24049 - SBH03	G24049 - SBH04	G24049 - SBH05
Depth		0.50-1.00	0.18-0.50	0.50-1.50	0.50-1.50	0.10-0.50
Date Sampled		04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024
Date analysed	-	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024
pH 1:5 soil:water	pH Units	8.8	8.7	8.6	8.6	7.7
Electrical Conductivity 1:5 soil:water	µS/cm	160	140	180	180	65
Chloride, Cl 1:5 soil:water	mg/kg	22	28	26	49	10
Sulphate, SO4 1:5 soil:water	mg/kg	29	22	20	33	10

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			08/05/2024	4	08/05/2024	08/05/2024		08/05/2024	[NT]
Date analysed	-			08/05/2024	4	08/05/2024	08/05/2024		08/05/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	4	8.6	8.7	1	101	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	4	180	200	11	103	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	4	49	58	17	101	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	4	33	41	22	107	[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

pH/EC was analysed outside of recommended holding time