

PART B

ATTACHMENTS

PRCP SCHEDULE

Appendix 1 – PRCP Schedule
Appendix 2 – EPML00634213 – Land Outcome Document
Appendix 3 – Geotechnical Investigation Reports
Appendix 4 – Topsoil Survey Report
Appendix 5 – Contaminated Land Investigation Document

Chum Street Pty Ltd; ML 4553, ML 4559, ML 4714, ML 50077

Appendix 4 – Topsoil Survey Report



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TOPSOIL ASSESSMENT

CHUM STREET PTY LTD

MINING LEASE (ML) 4559

JULY 2024

QPG003

Document Control Sheet

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Project:	QPG003	Issue Date:	12 July 2024
Title:	Topsoil Assessment		
Project Manager:	Joanne Salmon		
Author:	Joanne Salmon / Tommi Mason		
Client:	Chum Street Pty Ltd		
Client Contact:	Con Bassili		

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Revision Number	A	B	C	D	01	02	03	04	05
Ardent Group File	1				1				
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Contents

1. Introduction	3
1.1 Scope of work	3
1.2 Previous Sampling	3
1.3 Experience and Qualifications	3
2. Field Investigation	4
2.1 Method	4
2.2 Field Observations	6
3. Laboratory Results and Discussion	7
3.1 2024 Sampling Results	7
3.2 Discussion of Results	9
4. Conclusion	11

Figures

Figure 1 ML 4559 Topsoil Sample Locations	5
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Tables

Table 1 2024 Soil Sample Locations	4
Table 2 Topsoil Description	6
Table 3 2024 Soil Sampling Laboratory Results	8
Table 4 Soil Analysis Results Comparison	10

Appendices

Appendix 1 Field Records (photos)

Appendix 2 Laboratory results and documentation

1. Introduction

1.1 Scope of work

A limited topsoil survey was undertaken on 27 June 2024 by Ardent Group Pty Ltd (Ardent Group), on behalf of Chum Street Pty Ltd. The objective of the topsoil survey was to understand the chemistry and characteristics of the topsoil stockpiled on Mining Lease (ML) 4559, for the purpose of determining topsoil characteristics for later revegetation works.

The survey was undertaken with reference to Australian Standard (AS) 1726:2017 *“Geotechnical Site Investigations”* and the *“Australian Soil and Land Survey Field Handbook”* (“yellow book”).

1.2 Previous Sampling

There has not been any previous topsoil sampling for rehabilitation characterisation.

1.3 Experience and Qualifications

Soil sampling was undertaken by Jacob Arnold and Joshua Jarvis-Fix. Jacob Arnold has a BEnvSc (Hons) in Ecology and Conservation with 6 years consulting experience and is suitably qualified and experienced for the scope of this work. Joshua Jarvis-Fix is a Graduate Environmental Consultant with a Master’s in Environmental Management.

Soil analysis was conducted by Australian Laboratory Services Pty Ltd (ALS) Environmental Brisbane. ALS is accredited by National Association of Testing Authorities (NATA) (#825) for the analysis undertaken.

2. Field Investigation

2.1 Method

Twelve soil survey sites were identified across the area; with six located in the topsoil stockpile to the north (TS-N) and another six in the topsoil stockpile to the south (TS-S). These locations are detailed in **Table 1** and shown in **Figure 1**. A hand shovel was used to retrieve soil samples at surface (between 0 and 30cm) at each location, with sub-samples combined to produce representative composite samples.

Observations on soil characteristics were recorded at each location. Samples of the identified topsoil layer were placed into the appropriate sampling containers and delivered to the laboratory. ALS analysed the soil samples for the following parameters:

- pH;
- Electrical conductivity (EC)
- Moisture content
- Exchange acidity;
- Exchangeable cations;
- Inorganic nitrogen;
- Bicarbonate extractable phosphorus; and
- Organic matter.

During sampling, the following actions were taken to ensure appropriate quality control (QC)/quality assurance (QA):

- Nitrile gloves were worn by the sampler, with a new pair of gloves donned at each site;
- Sample sites were recorded on paper;
- A NATA accredited laboratory was selected to complete the analysis.

In addition, the laboratory undertakes internal QA/QC checks, as part of their NATA accreditation.

Table 1 2024 Soil Sample Locations

Sample ID	Easting	Northing
TS-N-1	482962	6946048
TS-N-2	482953	6946057
TS-N-3	482948	6946062
TS-N-4	482973	6946046
TS-N-5	482968	6946059
TS-N-6	482977	6946061
TS-S-1	482640	6945714
TS-S-2	482616	6945726
TS-S-3	482646	6945694
TS-S-4	482667	6945674
TS-S-5	482635	6945665
TS-S-6	482581	6945691

Coordinates are GDA2020 MGA Zone 56



0 20 40 60 80 100
m

QUEENSLAND PROPERTY GROUP PTY LTD

New Chum

GDA2020, MGA Zone 56



**ML4559
Topsoil Stockpile Locations**

Legend

- Mining Lease Boundary
- Property Boundary
- Topsoil Stockpile

Figure 1

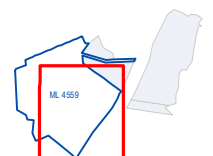
Sheet No.

RTPL_ARD_QPG003_PRCMAP_0012_A

Drawn By: Chris Schlebusch

Requested by: Joanne Salmon

Date: 19/07/2024



Data sources:
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2.2 Field Observations

A brief description of the topsoil and its depth recorded at each site during the sampling has been included in **Table 2**. The field observation photos for each site sampled during the 2024 survey have been attached at **Appendix 1**.

Table 2 Topsoil Description

Sample ID	Soil Description
TS-N-1	Brown to dark brown fine grained and dry topsoil with some organic content.
TS-N-2	Dark brown fine grained and dry topsoil with some organic content.
TS-N-3	Dark brown fine grained, clumpy and moist topsoil with some organic content.
TS-N-4	Dark brown fine grained and slightly moist topsoil with some organic content.
TS-N-5	Dark brown fine grained and slightly moist topsoil with high organic content.
TS-N-6	Dark grey fine grained and dry topsoil with some organic content.
TS-S-1	Dark yellow-brown fine grained and dry topsoil with some organic content.
TS-S-2	Yellow-brown fine grained and dry topsoil with some organic content, stones and sand.
TS-S-3	Yellow-brown fine grained, slightly moist topsoil with some organic content and stones
TS-S-4	Dark brown fine grained, clumpy and moist topsoil with high organic content.
TS-S-5	Dark brown fine grained and slightly moist topsoil with some organic content.
TS-S-6	Yellow-brown fine grained and dry topsoil with some organic content.

3. Laboratory Results and Discussion

3.1 2024 Sampling Results

The laboratory results for the 2024 soil sampling have been summarised in **Table 3**, with the complete laboratory reports attached at **Appendix 2**.

Review of the QA/QC results reported by the laboratory has indicated:

- No Method Blank value outliers occur;
- No Duplicate outliers occur;
- No Laboratory Control outliers occur;
- No Matrix Spike outliers occur;
- For all regular sample matrices, no surrogate recovery outliers occur;
- Analysis holding times exist for pH, EC and moisture content; and
- No Quality Control Sample Frequency Outliers exist.

Table 3 2024 Soil Sampling Laboratory Results

Analyte	Unit	LOR	Topsoil Stockpile North						Topsoil Stockpile North					
			TS-N-1	TS-N-2	TS-N-3	TS-N-4	TS-N-5	TS-N-6	TS-S-1	TS-S-2	TS-S-3	TS-S-4	TS-S-5	TS-S-6
pH	pH Unit	0.1	5.8	6.2	5.9	6.1	6.1	4.8	6.5	6.3	6.5	7.0	5.6	5.9
Electrical Conductivity	µS/cm	1	35	39	36	57	58	408	67	88	56	83	251	61
Moisture Content	%	0.1	14.1	14.0	13.2	8.9	10.4	4.6	12.2	10.4	11.8	13.2	8.6	11.2
Inorganic Nitrogen as N	mg/kg	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Bicarbonate Extractable Phosphorus	mg/kg	5	9	9	8	10	<5	<5	<5	<5	<5	<5	<5	<5
Organic Matter	%	0.5	4.2	5.1	4.8	8.7	7.6	22.0	5.1	5.5	7.2	13.6	3.7	3.6
Exchange Acidity														
Exchange Acidity	meq/100g	0.1	0.5	----	0.4	----	----	0.7	----	----	----	----	0.2	<0.1
Exchangeable Aluminium	meq/100g	0.1	0.2	----	0.2	----	----	0.3	----	----	----	----	<0.1	<0.1
Exchangeable Cations														
Exchangeable Calcium	meq/100g	0.1	4.2	4.8	3.6	5.4	5.0	----	3.8	3.8	4.5	5.2	2.6	1.8
Exchangeable Magnesium	meq/100g	0.1	6.1	6.5	7.1	5.8	5.3	----	4.9	5.1	5.5	5.7	6.3	4.4
Exchangeable Potassium	meq/100g	0.1	0.7	0.7	0.8	0.8	0.6	----	0.5	0.5	0.6	0.6	0.4	0.5
Exchangeable Sodium	meq/100g	0.1	0.5	0.4	0.5	0.5	0.3	----	0.3	0.5	0.5	0.2	1.7	0.7
Cation Exchange Capacity	meq/100g	0.1	12.0	12.5	12.4	12.7	11.3	----	9.7	10.1	11.3	11.8	11.2	7.4
Exchangeable Sodium Percent	%	0.1	4.6	3.4	4.3	3.8	2.9	----	3.5	5.0	4.4	1.5	15.4	9.1
Calcium/Magnesium Ratio	-	0.1	0.7	0.7	0.5	0.9	0.9	----	0.8	0.7	0.8	0.9	0.4	0.4
Magnesium/Potassium Ratio	-	0.1	8.3	9.5	9.4	7.4	8.7	----	10.1	9.8	9.0	8.7	13.9	9.4

*LOR = Limit of Reporting.

3.2 Discussion of Results

Soils in the area are mapped primarily as a Kurosol in the Australian Soil Classification (ASC) Mapping (CSIRO) on the Australian Soil Resource Information System (ASRIS). Due to the mining history, earthworks and nature of the site, the soils are also likely to also contain some tenosol. The dominant entity for the area is primarily hard-setting surface condition and hard pedal mottled-red duplex soils with a in hilly country, as well as the likelihood of some hard pedal mottled-yellow duplex soils on rolling to hilly terrain with gentle to moderate slopes.

Kurosols have a moderate to high water holding capacity due to the texture contrast and high clay content. Tenosols are poorly developed soils which generally, have low fertility and low water-holding capacity.

The results have been reviewed against relevant criteria from 'AS 4419-2018: *Soils for Landscaping and Garden Use*', as shown in **Table 4**. The comparison shows that the soil in the area naturally has very low electrical conductivity, and the exchangeable sodium and potassium are in the correct range. However, the existing soils are naturally calcium deficient and low in available nitrogen with variable levels of organic matter.

Table 4 Soil Analysis Results Comparison

Property		Low OM, Low P Soils ²								Medium OM, Low P Soils ³				High OM Soils ⁴		
		CV ¹	TS-N-1	TS-N-2	TS-N-3	TS-S-1	TS-S-2	TS-S-5	TS-S-6	CV ¹	TS-N-4	TS-N-5	TS-S-3	TS-S-4	CV ¹	TS-N-6
EC (µS/cm)		<750	35	39	36	67	88	251	61	<175	57	58	56	83	<25	408
Na (% of ECEC)	No pre-treatment for soluble salts	<20	4.6	3.4	4.3	3.5	5.0	15.4	9.1	<20	3.8	2.9	4.4	1.5	<20	----
K (% of ECEC)		3-15	5.8	5.6	6.5	5.2	5.0	3.6	6.8	5-15	6.3	5.3	5.3	5.1	5-18	----
Ca (% of ECEC)	Acid and neutral soils	50-80	35	38	29	39	38	23	24	50-80	43	44	40	44	50-80	----
Mg (% of ECEC)		10-30	51	52	57	51	51	56	60	10-30	46	47	49	48	10-30	----
Available P (mg/kg)		<30	9	9	8	<5	<5	<5	<5	<30	10	<5	<5	<5	<300	<5
Organic Matter (%dwb)		3-6	4.2	5.1	4.8	5.1	5.5	3.7	3.6	6-15	8.7	7.6	7.2	13.6	15-25	22
Total available N (NO3 + NH4) (mg/kg)		>20	<20	<20	<20	<20	<20	<20	<20	>30	<20	<20	<20	<20	>50	<20

¹Criteria Value for the relevant landscape soil type in Table 1 of AS 4419:2018 - *Soils for Landscaping and Garden Use*.

²Low organic matter low phosphorous soils where % OM is <6.0, and P is <10 mg/kg.

³Medium organic matter low phosphorous soils where % OM is >6.0 and <15, and P is <10 mg/kg.

⁴High organic matter soils where % OM is >15.

Key: Within CV range, Outside CV range, Below Limit of Reporting (LOR), No data.

4. Conclusion

Topsoil has been progressively stripped from the rehabilitation area on ML 4559 and stockpiled in two locations ahead of revegetation works. These stockpiles were sampled using the composite sampling method and submitted for analysis.

Laboratory analysis of the topsoil has been compared against the relevant criteria from 'AS 4419-2018: *Soils for Landscaping and Garden Use*'. The comparison shows that the soil in the area naturally has very low electrical conductivity, and the exchangeable sodium and potassium are in the correct range. However, the existing soils are naturally calcium deficient and low in available nitrogen with variable levels of organic matter.

TOPSOIL ASSESSMENT
CHUM STREET PTY LTD

Appendix 1 Field Records (photos)

Field Observations – Site Photos

Topsoil Stockpile North (TS-N)

TS-N-1



TS-N-2

Date & Time: Thu, 27 Jun 2024, 12:24:39 AEST
 Position: 56 J 482953 6946057 ($\pm 9.6\text{m}$)
 Altitude: 82m ($\pm 6.8\text{m}$)
 Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
 Azimuth/Bearing: 077° N77E 1369mils True ($\pm 16^\circ$)
 Elevation Angle: -84.7°
 Horizon Angle: +76.3°
 Zoom: 0.5X
 TS-N-2



TS-N-3

Date & Time: Thu, 27 Jun 2024, 12:55:04 AEST
 Position: 56 J 482948 6946062 ($\pm 9.9\text{m}$)
 Altitude: 81m ($\pm 6.8\text{m}$)
 Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
 Azimuth/Bearing: 116° S64E 2062mils True ($\pm 16^\circ$)
 Elevation Angle: -66.7°
 Horizon Angle: +05.5°
 Zoom: 0.5X
 TS-N-3



TS-N-4

Date & Time: Thu, 27 Jun 2024, 13:14:14 AEST
Position: 56 J 482973 6946046 ($\pm 6.9\text{m}$)
Altitude: 80m ($\pm 6.6\text{m}$)
Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
Azimuth/Bearing: 211° S31W 3751mils True ($\pm 18^\circ$)
Elevation Angle: -66.1°
Horizon Angle: -45.0°
Zoom: 0.5X
TS-N-4



TS-N-5

Date & Time: Thu, 27 Jun 2024, 13:28:15 AEST
Position: 56 J 482968 6946059 ($\pm 7.1\text{m}$)
Altitude: 78m ($\pm 8.2\text{m}$)
Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
Azimuth/Bearing: 208° S28W 3698mils True ($\pm 18^\circ$)
Elevation Angle: -35.1°
Horizon Angle: -20.2°
Zoom: 0.5X
TS-N-5



TS-N-6

Date & Time: Thu, 27 Jun 2024, 13:33:49 AEST
Position: 56 J 482977 6946061 ($\pm 8.4\text{m}$)
Altitude: 76m ($\pm 7.5\text{m}$)
Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
Azimuth/Bearing: 082° N82E 1458mils True ($\pm 18^\circ$)
Elevation Angle: -61.2°
Horizon Angle: +34.7°
Zoom: 0.5X
TS-N-6



Topsoil Stockpile South (TS-S)

TS-S-1

Date & Time: Thu, 27 Jun 2024, 14:01:48 AEST
Position: 56 J 482640 6945714 ($\pm 14.0\text{m}$)
Altitude: 69m ($\pm 13.0\text{m}$)
Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
Azimuth/Bearing: 127° S53E 2258mils True ($\pm 16^\circ$)
Elevation Angle: -33.3°
Horizon Angle: -01.3°
Zoom: 0.5X
TS-S-1



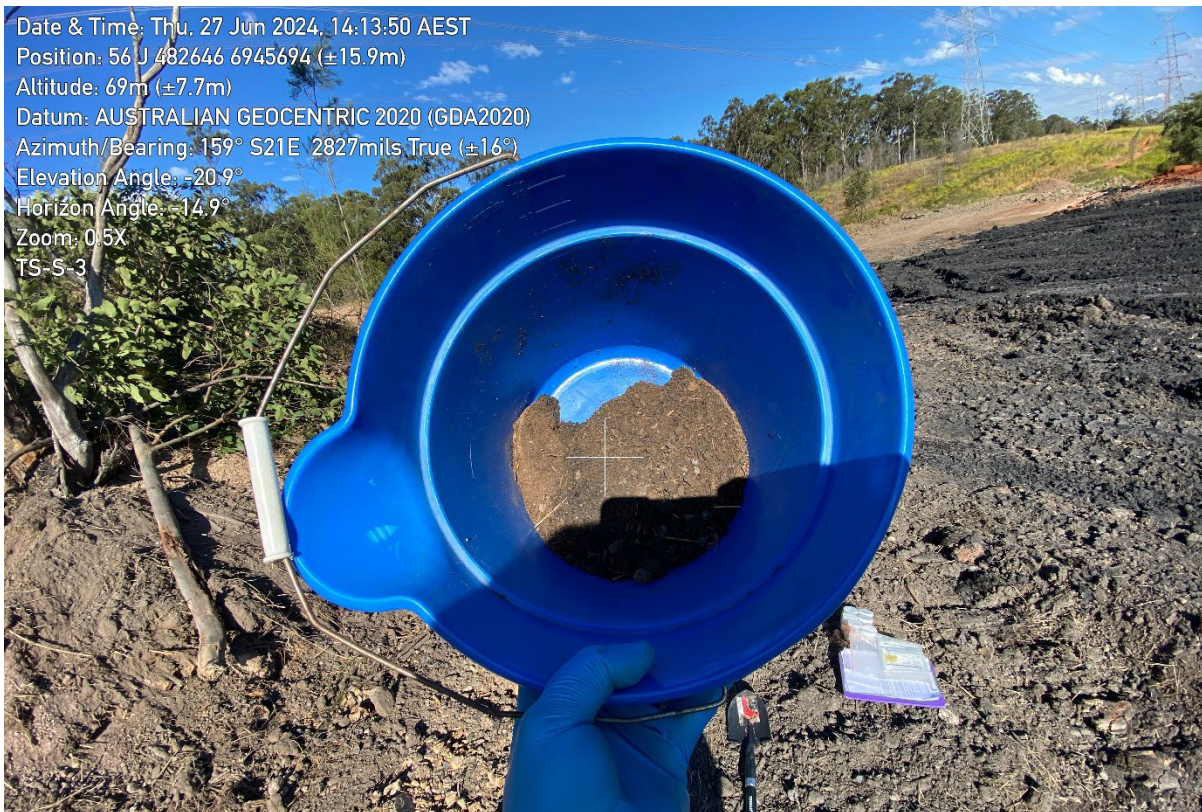
TS-S-2

Date & Time: Thu, 27 Jun 2024, 14:04:06 AEST
 Position: 56 J 482616 6945726 ($\pm 37.8\text{m}$)
 Altitude: 67m ($\pm 23.1\text{m}$)
 Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
 Azimuth/Bearing: 140° S40E 2489mils True ($\pm 16^\circ$)
 Elevation Angle: -35.4°
 Horizon Angle: -04.0°
 Zoom: 0.5X
 TS-S-2



TS-S-3

Date & Time: Thu, 27 Jun 2024, 14:13:50 AEST
 Position: 56 J 482646 6945694 ($\pm 15.9\text{m}$)
 Altitude: 69m ($\pm 7.7\text{m}$)
 Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
 Azimuth/Bearing: 159° S21E 2827mils True ($\pm 16^\circ$)
 Elevation Angle: -20.9°
 Horizon Angle: -14.9°
 Zoom: 0.5X
 TS-S-3



TS-S-4

Date & Time: Thu, 27 Jun 2024 14:22:28 AEST
Position: 56 J 482667 6945674 ($\pm 17.8\text{m}$)
Altitude: 68m ($\pm 9.1\text{m}$)
Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
Azimuth/Bearing: 231° S51W 4107mils True ($\pm 16^\circ$)
Elevation Angle: -53.4°
Horizon Angle: -23.1°
Zoom: 0.5X
TS-S-4



TS-S-5

Date & Time: Thu, 27 Jun 2024, 14:31:44 AEST
 Position: 56 J 482635 6945665 ($\pm 10.3\text{m}$)
 Altitude: 70m ($\pm 6.5\text{m}$)
 Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
 Azimuth/Bearing: 022° N22E 0391mils True ($\pm 16^\circ$)
 Elevation Angle: -83.9°
 Horizon Angle: -02.5°
 Zoom: 0.5X
 TS-S-5



TS-S-6

Date & Time: Thu, 27 Jun 2024, 14:43:16 AEST
 Position: 56 J 482581 6945691 ($\pm 28.2\text{m}$)
 Altitude: 67m ($\pm 14.5\text{m}$)
 Datum: AUSTRALIAN GEOCENTRIC 2020 (GDA2020)
 Azimuth/Bearing: 137° S43E 2436mils True ($\pm 17^\circ$)
 Elevation Angle: -62.4°
 Horizon Angle: $+20.0^\circ$
 Zoom: 0.5X
 TS-S-6



TOPSOIL ASSESSMENT
CHUM STREET PTY LTD

Appendix 2 Laboratory results and documentation



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EB2422295	Page	: 1 of 7
Client	: ARDENT GROUP	Laboratory	: Environmental Division Brisbane
Contact	: MS JOANNE SALMON	Telephone	: +61-7-3243 7222
Project	: QPG	Date Samples Received	: 01-Jul-2024
Site	: ----	Issue Date	: 09-Jul-2024
Sampler	: JACOB ARNOLD	No. of samples received	: 14
Order number	: ----	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- NO Method Blank value outliers occur.
- NO Duplicate outliers occur.
- NO Laboratory Control outliers occur.
- NO Matrix Spike outliers occur.
- For all regular sample matrices, where applicable to the methodology, NO surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- NO Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- NO Quality Control Sample Frequency Outliers exist.

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results. This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein. Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters. Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)		27-Jun-2024	02-Jul-2024	04-Jul-2024	✓	02-Jul-2024	02-Jul-2024	✓
TS-N-1,	TS-N-2,							
TS-N-3,	TS-N-4,							
TS-N-5,	TS-N-6,							
TS-N-QC,	TS-S-1,							
TS-S-2,	TS-S-3,							
TS-S-4,	TS-S-5,							
TS-S-6,	TS-S-QC							
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)		27-Jun-2024	02-Jul-2024	04-Jul-2024	✓	02-Jul-2024	30-Jul-2024	✓
TS-N-1,	TS-N-2,							
TS-N-3,	TS-N-4,							
TS-N-5,	TS-N-6,							
TS-N-QC,	TS-S-1,							
TS-S-2,	TS-S-3,							
TS-S-4,	TS-S-5,							
TS-S-6,	TS-S-QC							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)		27-Jun-2024	----	---	---	02-Jul-2024	11-Jul-2024	✓
TS-N-1,	TS-N-2,							
TS-N-3,	TS-N-4,							
TS-N-5,	TS-N-6,							
TS-N-QC,	TS-S-1,							
TS-S-2,	TS-S-3,							
TS-S-4,	TS-S-5,							
TS-S-6,	TS-S-QC							

Evaluation: ✖ = Holding time breach : ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED005: Exchange Acidity								
Soil Glass Jar - Unpreserved (ED005) TS-N-2, TS-N-4, TS-N-5, TS-S-1, TS-S-2, TS-S-3, TS-S-4, TS-S-QC		27-Jun-2024	03-Jul-2024	25-Jul-2024	✓	04-Jul-2024	25-Jul-2024	✓
Soil Glass Jar - Unpreserved (ED005) TS-N-1, TS-N-3, TS-N-6, TS-N-QC, TS-S-5, TS-S-6		27-Jun-2024	03-Jul-2024	25-Jul-2024	✓	05-Jul-2024	25-Jul-2024	✓
ED006: Exchangeable Cations on Alkaline Soils								
Soil Glass Jar - Unpreserved (ED006) TS-N-1, TS-N-3, TS-N-6, TS-N-QC, TS-S-5, TS-S-6		27-Jun-2024	04-Jul-2024	25-Jul-2024	✓	04-Jul-2024	25-Jul-2024	✓
Soil Glass Jar - Unpreserved (ED006) TS-N-2, TS-N-4, TS-N-5, TS-S-1, TS-S-2, TS-S-3, TS-S-4, TS-S-QC		27-Jun-2024	05-Jul-2024	25-Jul-2024	✓	05-Jul-2024	25-Jul-2024	✓
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007) TS-N-2, TS-N-4, TS-N-5, TS-S-1, TS-S-2, TS-S-3, TS-S-4, TS-S-QC		27-Jun-2024	03-Jul-2024	25-Jul-2024	✓	04-Jul-2024	25-Jul-2024	✓
Soil Glass Jar - Unpreserved (ED007) TS-N-1, TS-N-3, TS-N-6, TS-N-QC, TS-S-5, TS-S-6		27-Jun-2024	03-Jul-2024	25-Jul-2024	✓	05-Jul-2024	25-Jul-2024	✓
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008) TS-N-2, TS-N-4, TS-N-5, TS-S-1, TS-S-2, TS-S-3, TS-S-4, TS-S-QC		27-Jun-2024	03-Jul-2024	25-Jul-2024	✓	04-Jul-2024	25-Jul-2024	✓
Soil Glass Jar - Unpreserved (ED008) TS-N-1, TS-N-3, TS-N-6, TS-N-QC, TS-S-5, TS-S-6		27-Jun-2024	03-Jul-2024	25-Jul-2024	✓	05-Jul-2024	25-Jul-2024	✓

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Soil Glass Jar - Unpreserved (EK080)		27-Jun-2024	04-Jul-2024	24-Dec-2024	✓	09-Jul-2024	24-Dec-2024	✓
TS-N-1,	TS-N-2,							
TS-N-3,	TS-N-4,							
TS-N-5,	TS-N-6,							
TS-N-QC,	TS-S-1,							
TS-S-2,	TS-S-3,							
TS-S-4,	TS-S-5,							
TS-S-6,	TS-S-QC							
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)		27-Jun-2024	08-Jul-2024	25-Jul-2024	✓	08-Jul-2024	25-Jul-2024	✓
TS-N-1,	TS-N-2,							
TS-N-3,	TS-N-4,							
TS-N-5,	TS-N-6,							
TS-N-QC,	TS-S-1,							
TS-S-2,	TS-S-3,							
TS-S-4,	TS-S-5,							
TS-S-6,	TS-S-QC							



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Bicarbonate Extractable P (Colwell)	EK080	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchange Acidity by 1M Potassium Chloride	ED005	3	20	15.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	3	23	13.04	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Bicarbonate Extractable P (Colwell)	EK080	3	14	21.43	15.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Bicarbonate Extractable P (Colwell)	EK080	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchange Acidity by 1M Potassium Chloride	ED005	2	20	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Bicarbonate Extractable P (Colwell)	EK080	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchange Acidity by 1M Potassium Chloride	* ED005	SOIL	In house: referenced to Rayment and Lyons, method 15G1. This method is unsuitable for near neutral and alkaline soils. NATA accreditation does not cover performance of this service.
Exchangeable Cations on Alkaline Soils	* ED006	SOIL	In house: Referenced to Soil Survey Test Method C5. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with alcoholic ammonium chloride at pH 8.5. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil.
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Inorganic Nitrogen as N (NH ₃ + NO _x) by Discrete Analyser	EK063G	SOIL	In house: Referenced to APHA 4500 NH ₃ / NO ₃ - Inorganic Nitrogen is determined as the sum of Ammonia and Oxidised Nitrogen each determined seperately as N.
Bicarbonate Extractable P (Colwell)	EK080	SOIL	In house: Referenced to Rayment & Lyons Method 9B1 Phosphorus is extracted from the soil using 0.5M NaHCO ₃ at a 1:100 soil:solution ratio and determined by FIA.
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method (Alkaline Soils)	* ED006PR	SOIL	In house: Referenced to Rayment and Lyons method 15C1.
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH ₄ Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
Sample Preparation for Bicarbonate Extractable P (Colwell)	EK080-PR	SOIL	In house: Referenced to Rayment & Lyons Method 9B1 Phosphorus is extracted from the soil using 0.5M NaHCO ₃ at a 1:100 soil:solution ratio.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).

Page : 7 of 7
Work Order : EB2422295
Client : ARDENT GROUP
Project : QPG





QUALITY CONTROL REPORT

Work Order : **EB2422295**

Page : 1 of 5

Client : **ARDENT GROUP**

Laboratory : Environmental Division Brisbane

Contact : **MS JOANNE SALMON**

Contact : Customer Services EB

Address : 3 WATER STREET
REDHILL 4059

Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : 07 3368 1033

Telephone : +61-7-3243 7222

Project : QPG

Date Samples Received : 01-Jul-2024

Order number : ----

Date Analysis Commenced : 02-Jul-2024

C-O-C number : ----

Issue Date : 09-Jul-2024

Sampler : JACOB ARNOLD

Site : ----

Quote number : EN/222

No. of samples received : 14

No. of samples analysed : 14



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Soil Preparation, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Soil Preparation, Stafford, QLD

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Laboratory Duplicate (DUP) Report

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 5895728)									
EB2422295-001	TS-N-1	EA002: pH Value	----	0.1	pH Unit	5.8	5.8	0.0	0% - 20%
EB2422295-011	TS-S-4	EA002: pH Value	----	0.1	pH Unit	7.0	6.7	4.4	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 5895727)									
EB2422295-001	TS-N-1	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	35	33	4.5	0% - 20%
EB2422295-011	TS-S-4	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	83	86	3.1	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5895734)									
EB2422295-001	TS-N-1	EA055: Moisture Content	----	0.1	%	14.1	13.6	3.1	0% - 20%
EB2422295-011	TS-S-4	EA055: Moisture Content	----	0.1	%	13.2	12.4	6.0	0% - 20%
ED005: Exchange Acidity (QC Lot: 5900230)									
EB2421154-010	Anonymous	ED005: Exchange Acidity	----	0.1	meq/100g	5.9	5.8	0.0	0% - 20%
		ED005: Exchangeable Aluminium	----	0.1	meq/100g	1.7	1.8	0.0	0% - 50%
EB2422341-008	Anonymous	ED005: Exchange Acidity	----	0.1	meq/100g	1.6	1.5	0.0	0% - 50%
		ED005: Exchangeable Aluminium	----	0.1	meq/100g	0.7	0.7	0.0	No Limit
ED005: Exchange Acidity (QC Lot: 5900235)									
EB2422041-001	Anonymous	ED005: Exchange Acidity	----	0.1	meq/100g	1.1	1.1	0.0	0% - 50%
		ED005: Exchangeable Aluminium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
ED007: Exchangeable Cations (QC Lot: 5900216)									
EB2422109-001	Anonymous	ED007: Exchangeable Calcium	----	0.1	meq/100g	9.1	9.0	1.7	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	5.9	5.8	0.0	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.5	0.4	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
ED007: Exchangeable Cations (QC Lot: 5900229)									

Page : 3 of 5
 Work Order : EB2422295
 Client : ARDENT GROUP
 Project : QPG



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED007: Exchangeable Cations (QC Lot: 5900229) - continued									
EB2421154-010	Anonymous	ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	4.8	4.9	2.9	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	1.7	1.8	0.0	0% - 50%
EB2422341-008	Anonymous	ED007: Exchangeable Calcium	----	0.1	meq/100g	1.7	1.6	0.0	0% - 50%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	7.8	7.6	3.5	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	4.0	3.9	0.0	0% - 20%
ED008: Exchangeable Cations (QC Lot: 5900236)									
EB2422041-001	Anonymous	ED008: Exchangeable Calcium	----	0.1	meq/100g	1.4	1.4	0.0	0% - 50%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	5.3	5.4	0.0	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	1.2	1.3	0.0	0% - 50%
EK080: Bicarbonate Extractable Phosphorus (Colwell) (QC Lot: 5902891)									
EB2422295-001	TS-N-1	EK080: Bicarbonate Ext. P (Colwell)	----	5	mg/kg	9	10	0.0	No Limit
EB2422295-011	TS-S-4	EK080: Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	<5	0.0	No Limit
EP004: Organic Matter (QC Lot: 5893762)									
EB2422295-001	TS-N-1	EP004: Organic Matter	----	0.5	%	4.2	4.2	0.0	No Limit
EB2422295-010	TS-S-3	EP004: Organic Matter	----	0.5	%	7.2	7.2	0.0	0% - 50%

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 5895728)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.0	102
				----	7 pH Unit	100	98.0	102
EA010: Conductivity (1:5) (QCLot: 5895727)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	95.0	105
ED005: Exchange Acidity (QCLot: 5900230)								
ED005: Exchange Acidity	----	0.1	meq/100g	<0.1	----	----	----	----
ED005: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	----
ED005: Exchange Acidity (QCLot: 5900235)								
ED005: Exchange Acidity	----	0.1	meq/100g	<0.1	----	----	----	----
ED005: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	----
ED007: Exchangeable Cations (QCLot: 5900216)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	8.9 meq/100g	100	79.0	113
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	9.52 meq/100g	94.7	85.0	115
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1.49 meq/100g	95.2	70.0	122
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	1.3726 meq/100g	95.2	76.0	112
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	21.283 meq/100g	96.9	82.0	112
ED007: Exchangeable Cations (QCLot: 5900229)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	8.9 meq/100g	98.6	79.0	113
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	9.52 meq/100g	97.4	85.0	115
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1.49 meq/100g	103	70.0	122
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	1.3726 meq/100g	105	76.0	112
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	21.283 meq/100g	98.8	82.0	112
ED008: Exchangeable Cations (QCLot: 5900236)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	8.141 meq/100g	95.5	91.0	109
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	7.968 meq/100g	94.8	89.0	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1.197 meq/100g	99.3	79.0	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.3456 meq/100g	115	75.0	118
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	17.659 meq/100g	95.6	88.0	110
EK080: Bicarbonate Extractable Phosphorus (Colwell) (QCLot: 5902891)								

Page : 5 of 5
 Work Order : EB2422295
 Client : ARDENT GROUP
 Project : QPG



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EK080: Bicarbonate Extractable Phosphorus (Colwell) (QCLot: 5902891) - continued								
EK080: Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	100 mg/kg	102	90.0	110
				<5	20.7 mg/kg	91.3	70.0	130
				<5	155 mg/kg	91.4	80.0	120
EP004: Organic Matter (QCLot: 5893762)								
EP004: Organic Matter	----	0.5	%	<0.5	80 %	95.3	83.0	115

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK080: Bicarbonate Extractable Phosphorus (Colwell) (QCLot: 5902891)							
EB2422295-002	TS-N-2	EK080: Bicarbonate Ext. P (Colwell)	----	40 mg/kg	91.5	70.0	130
EP004: Organic Matter (QCLot: 5893762)							
EB2422295-002	TS-N-2	EP004: Organic Matter	----	1.6 %	95.0	70.0	130



CERTIFICATE OF ANALYSIS

Work Order	: EB2422295	Page	: 1 of 6
Client	: ARDENT GROUP	Laboratory	: Environmental Division Brisbane
Contact	: MS JOANNE SALMON	Contact	: Customer Services EB
Address	: 3 WATER STREET REDHILL 4059	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3368 1033	Telephone	: +61-7-3243 7222
Project	: QPG	Date Samples Received	: 01-Jul-2024 11:11
Order number	: ----	Date Analysis Commenced	: 02-Jul-2024
C-O-C number	: ----	Issue Date	: 09-Jul-2024 12:43
Sampler	: JACOB ARNOLD		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 14		
No. of samples analysed	: 14		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Soil Preparation, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Soil Preparation, Stafford, QLD

Page : 2 of 6
Work Order : EB2422295
Client : ARDENT GROUP
Project : QPG



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
Ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ALS is not NATA accredited for the analysis of Exchangeable Aluminium and Exchange Acidity in soils when performed under ALS Method ED005.
- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H^+ + Al^{3+}).



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TS-N-1	TS-N-2	TS-N-3	TS-N-4	TS-N-5
Sampling date / time					27-Jun-2024 12:10	27-Jun-2024 12:25	27-Jun-2024 12:55	27-Jun-2024 13:05	27-Jun-2024 13:25
Compound	CAS Number	LOR	Unit		EB2422295-001	EB2422295-002	EB2422295-003	EB2422295-004	EB2422295-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		5.8	6.2	5.9	6.1	6.1
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		35	39	36	57	58
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		14.1	14.0	13.2	8.9	10.4
ED005: Exchange Acidity									
ø Exchange Acidity	----	0.1	meq/100g		0.5	----	0.4	----	----
ø Exchangeable Aluminium	----	0.1	meq/100g		0.2	----	0.2	----	----
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		4.2	4.8	3.6	5.4	5.0
Exchangeable Magnesium	----	0.1	meq/100g		6.1	6.5	7.1	5.8	5.3
Exchangeable Potassium	----	0.1	meq/100g		0.7	0.7	0.8	0.8	0.6
Exchangeable Sodium	----	0.1	meq/100g		0.5	0.4	0.5	0.5	0.3
Cation Exchange Capacity	----	0.1	meq/100g		12.0	----	12.4	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	12.5	----	12.7	11.3
Exchangeable Sodium Percent	----	0.1	%		4.6	3.4	4.3	3.8	2.9
Calcium/Magnesium Ratio	----	0.1	-		0.7	0.7	0.5	0.9	0.9
Magnesium/Potassium Ratio	----	0.1	-		8.3	9.5	9.4	7.4	8.7
EK063: Inorganic Nitrogen as N (Ammonia + NOx)									
^A Inorganic Nitrogen as N	----	20	mg/kg		<20	<20	<20	<20	<20
EK080: Bicarbonate Extractable Phosphorus (Colwell)									
Bicarbonate Ext. P (Colwell)	----	5	mg/kg		9	9	8	10	<5
EP004: Organic Matter									
Organic Matter	----	0.5	%		4.2	5.1	4.8	8.7	7.6

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TS-N-6	TS-N-QC	TS-S-1	TS-S-2	TS-S-3
Sampling date / time				27-Jun-2024 13:30	27-Jun-2024 13:30	27-Jun-2024 13:55	27-Jun-2024 14:00	27-Jun-2024 14:10	
Compound	CAS Number	LOR	Unit	EB2422295-006	EB2422295-007	EB2422295-008	EB2422295-009	EB2422295-010	
				Result	Result	Result	Result	Result	
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit	4.8	4.8	6.5	6.3	6.5	
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm	408	402	67	88	56	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%	4.6	4.8	12.2	10.4	11.8	
ED005: Exchange Acidity									
⌀ Exchange Acidity	----	0.1	meq/100g	0.7	0.6	----	----	----	
⌀ Exchangeable Aluminium	----	0.1	meq/100g	0.3	0.3	----	----	----	
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g	----	----	3.8	3.8	4.5	
Exchangeable Magnesium	----	0.1	meq/100g	----	----	4.9	5.1	5.5	
Exchangeable Potassium	----	0.1	meq/100g	----	----	0.5	0.5	0.6	
Exchangeable Sodium	----	0.1	meq/100g	----	----	0.3	0.5	0.5	
Cation Exchange Capacity	----	0.1	meq/100g	----	----	9.7	10.1	11.3	
Exchangeable Sodium Percent	----	0.1	%	----	----	3.5	5.0	4.4	
Calcium/Magnesium Ratio	----	0.1	-	----	----	0.8	0.7	0.8	
Magnesium/Potassium Ratio	----	0.1	-	----	----	10.1	9.8	9.0	
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g	3.0	3.3	----	----	----	
Exchangeable Magnesium	----	0.1	meq/100g	3.4	3.3	----	----	----	
Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	----	----	----	
Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	----	----	----	
Cation Exchange Capacity	----	0.1	meq/100g	7.3	7.4	----	----	----	
Exchangeable Sodium Percent	----	0.1	%	1.0	1.1	----	----	----	
Calcium/Magnesium Ratio	----	0.1	-	0.9	1.0	----	----	----	
Magnesium/Potassium Ratio	----	0.1	-	17.6	17.3	----	----	----	
EK063: Inorganic Nitrogen as N (Ammonia + NOx)									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TS-N-6	TS-N-QC	TS-S-1	TS-S-2	TS-S-3
Sampling date / time					27-Jun-2024 13:30	27-Jun-2024 13:30	27-Jun-2024 13:55	27-Jun-2024 14:00	27-Jun-2024 14:10
Compound	CAS Number	LOR	Unit	EB2422295-006	EB2422295-007	EB2422295-008	EB2422295-009	EB2422295-010	
				Result	Result	Result	Result	Result	
EK063: Inorganic Nitrogen as N (Ammonia + NOx) - Continued									
^ Inorganic Nitrogen as N	----	20	mg/kg	<20	<20	<20	<20	<20	
EK080: Bicarbonate Extractable Phosphorus (Colwell)									
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	<5	<5	<5	<5	
EP004: Organic Matter									
Organic Matter	----	0.5	%	22.0	16.4	5.1	5.5	7.2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TS-S-4	TS-S-5	TS-S-6	TS-S-QC	----
Sampling date / time					27-Jun-2024 14:15	27-Jun-2024 14:30	27-Jun-2024 14:40	27-Jun-2024 13:55	----
Compound	CAS Number	LOR	Unit	EB2422295-011	EB2422295-012	EB2422295-013	EB2422295-014	-----	-----
				Result	Result	Result	Result	-----	-----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit	7.0	5.6	5.9	6.4	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm	83	251	61	70	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%	13.2	8.6	11.2	11.3	----	----
ED005: Exchange Acidity									
ø Exchange Acidity	----	0.1	meq/100g	----	0.2	<0.1	----	----	----
ø Exchangeable Aluminium	----	0.1	meq/100g	----	<0.1	<0.1	----	----	----
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g	5.2	2.6	1.8	4.2	----	----
Exchangeable Magnesium	----	0.1	meq/100g	5.7	6.3	4.4	5.0	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.6	0.4	0.5	0.5	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.2	1.7	0.7	0.3	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	11.2	7.4	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	11.8	----	----	10.1	----	----
Exchangeable Sodium Percent	----	0.1	%	1.5	15.4	9.1	3.4	----	----
Calcium/Magnesium Ratio	----	0.1	-	0.9	0.4	0.4	0.8	----	----
Magnesium/Potassium Ratio	----	0.1	-	8.7	13.9	9.4	10.0	----	----
EK063: Inorganic Nitrogen as N (Ammonia + NOx)									
^A Inorganic Nitrogen as N	----	20	mg/kg	<20	<20	<20	<20	----	----
EK080: Bicarbonate Extractable Phosphorus (Colwell)									
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	<5	<5	<5	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%	13.6	3.7	3.6	5.4	----	----

