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DIANNE COPPER MINE



Recommencement Project Soil Assessment

Report prepared for:
Mineral Projects Pty Ltd

Date:
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Client: Mineral Projects
Project: Dianne Copper Mine
Report: Soil Assessment
Date: August 2025



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TABLE OF CONTENTS

1. INTRODUCTION	4
1.1 SITE SETTING.....	4
2. METHODS.....	6
2.1 2024 SOIL SAMPLING PROGRAM.....	6
2.2 2025 SOIL SAMPLING PROGRAM.....	6
3. RESULTS AND ANALYSIS.....	7
3.1 2024 OBSERVATIONS AND ASSESSMENT.....	7
3.1.1 General	7
3.1.2 Chemical Analysis	9
3.1.3 Erosivity Indicators.....	10
3.2 2025 REQUEST-FOR-INFORMATION ASSESSMENT AND OBSERVATIONS	11
3.2.1 General	11
3.2.2 Chemical Analysis	11
4. SUMMARY	15
5. REFERENCES	16
APPENDIX A – FIELD OBSERVATION	17
APPENDIX B – LABORATORY RESULTS.....	49

LIST OF FIGURES

Figure 1: Location of soil sampling sites.....	5
Figure 2: Mapped soil types within the project site.....	8

LIST OF TABLES

Table 1: Cation exchange capacity results against optimal range for plant growth (from Hazelton, 2016).....	9
Table 2: Soil chemical results.....	13

LIST OF APPENDICES

Appendix A – Field observation.....	17
Appendix B – Laboratory results	49

1. INTRODUCTION

C&R Consulting Pty Ltd (C&R) have been conducting environmental studies to support an environmental authority (EA) amendment application to the administering authority for the Dianne Recommencement Project to allow further development of the Dianne Copper Mine (DCM). As part of these works, C&R Consulting were commissioned to undertake a soil characterisation assessment of the site.

The following scope of works was outlined for this project in early 2024:

- Conduct soil observations at ten (10) locations across the site;
- Collect representative topsoil and subsoil samples at each of these ten sites for physical and chemical analysis; and
- Provide a brief analysis of results.

This report provides site context for the sample locations, soil logs, and a brief analysis of the chemical and physical characteristics of the soil samples.

In August 2025, this report was amended in response to a request for information, issued as part of the development process. Specific items to be addressed include the following:

- Provide soil type information across the site as a colour-coded figure and in accordance with the Australian soil classification (ASC) system (Isbell, 2021); and
- Provide information on the electrical conductivity (EC) level and toxicants such as metals and metalloids from the soil samples in the run-of-mine (ROM) area.

1.1 SITE SETTING

Limited soil information is available for the site. In the absence of detailed local soil mapping, and with the closest known mapping sites located more than 20 km away, the entire site is described as unit Fu25 in the Atlas of Australian soils 1:2,000,000 (Northcote et al., 1960–1968).

Fu25 comprises low to high hilly lands, closely dissected by numerous small streams (Northcote et al., 1960–1968). Some areas of high hills contain very steep slopes, and rock outcrop is common. The Fu25 soil unit is classified as a tenosol, characterised by weak pedologic organisation apart from the A horizons. Locally, the dominant soils are shallow, bleached loams with a conspicuous, bleached, non-calcareous A2 horizon, underlain by a carbonate pan.

The Atlas of Australian soils (Northcote et al., 1960–1968) characterises Fu25 as follows:

- Dominant soils are very shallow, gravelly, bleached loams (Um2.12), with lesser areas of similar loams Um2.21, Um4.1 and Um4.21. Smaller areas of similar sandy loams Uc2 and Uc4 occur locally. Associated throughout the unit are areas of shallow, gravelly duplex soils, particularly on lesser slopes. The chief forms are Dy3.41, Dr2.41 and Dr3.41. In some valley floors, there are small areas of Dy3.43 soils. Small areas of basic volcanic rocks in the unit have deeper red friable clays (Uf6.31). At the northern margin, the unit may be capped by small sandstone mesas of unit Ca35.

Across the DCM site, ten locations were identified by the clients as areas of interest and are thought to be representative of the soils within the site and project disturbance footprint (Figure 1). These sites include areas of historical mine disturbance, creek edge, and moderate to steep slopes. Six additional locations were included in 2025 based on a request for information. Details of each site are provided in Appendix A.

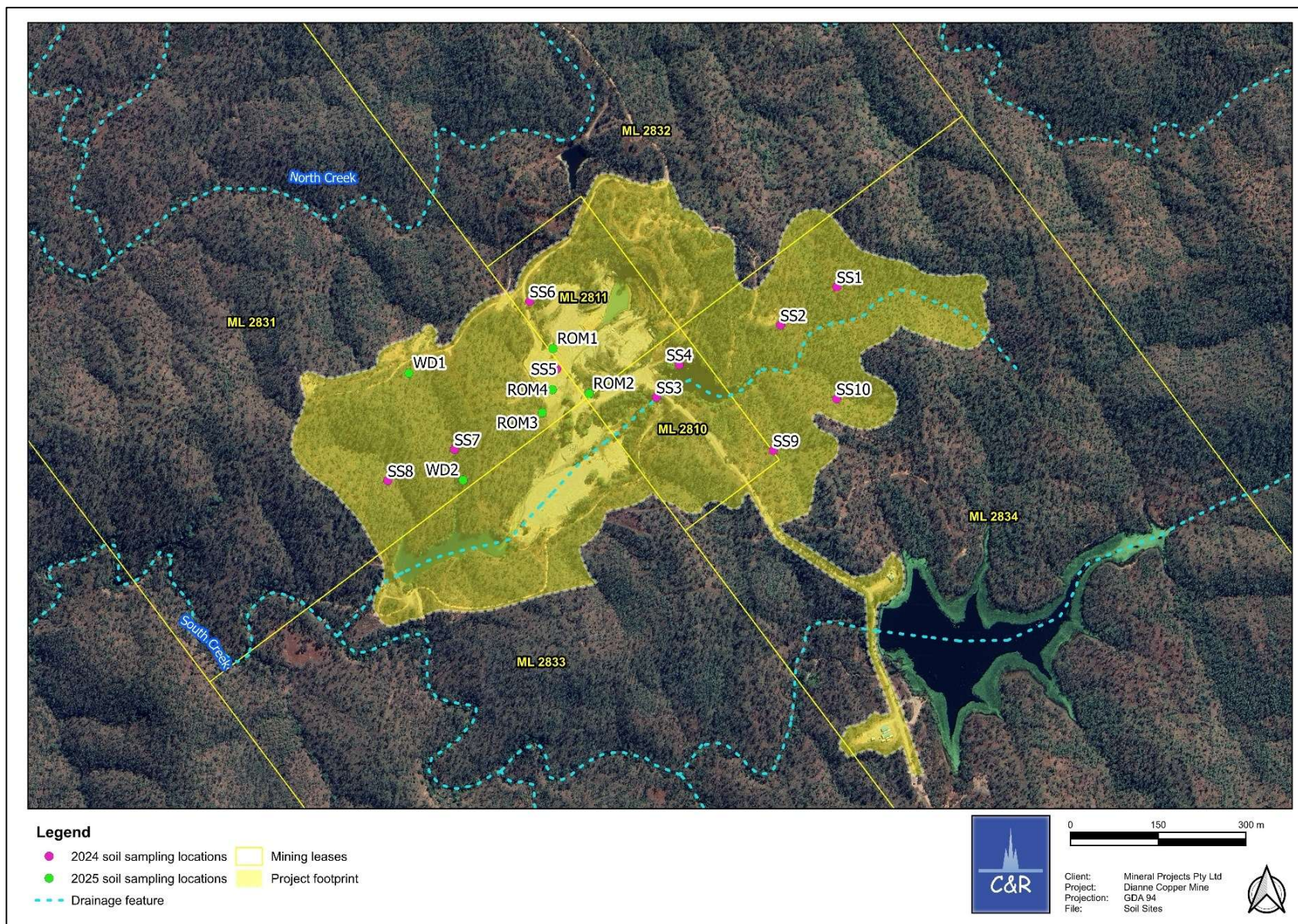


Figure 1: Location of soil sampling sites.

2. METHODS

2.1 2024 SOIL SAMPLING PROGRAM

The 2024 soil sampling sites (Figure 1) were collected in April/May 2024 and, depending on access and terrain, either a soil pit (dug using an excavator) or an auger hole (dug with a hand auger) was excavated. The soil profile was logged at each site, defining the texture and extent of observed horizons. Profiles were categorised into ASC groups. Representative samples of topsoil (a composite of any O, A or E horizons) and subsoil (B2 horizon) were taken. All samples were analysed by a National Association of Testing Authorities–accredited (NATA-accredited) laboratory for the following:

- pH and EC;
- Total soluble salts;
- Nutrients (ammonia, total nitrogen and total phosphorous);
- Cation exchange capacity (CEC) and exchangeable cations/anions;
- Exchangeable sodium percentage (ESP);
- Sodium adsorption ratio (SAR);
- Dispersity (such as Emerson ratings); and
- Total organic matter.

2.2 2025 SOIL SAMPLING PROGRAM

The 2025 sampling sites (Figure 1) were collected in July 2025. At each location, a soil pit was excavated by hand to observe the surface soil horizons. These pits were dug to a maximum depth of 0.45 m and are located in both previously disturbed mine operation areas – described as waste rock pile or a ROM site – and undisturbed areas. Because of the nature of disturbance, profile development is inconsistent with a natural soil profile. Within disturbed areas, sample site material was collected based on the observed soil profile, including samples from the surface and the subsoil. All samples were analysed by a NATA-accredited laboratory for the following:

- pH and EC;
- Metals, including aluminium, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, vanadium and zinc;
- Chloride; and
- Sulphate.

The additional sampling program was completed to provide responses to request for information items as follows:

- Provide soil types information across the site as a colour-coded figure and in accordance with the Australian Soil Classification (ASC) system – Figure 2

Provide information on the EC level and toxicants such as metals/metalloids from the soil samples in the ROM area – Section 3.2.2.



3. RESULTS AND ANALYSIS

Field data, including soil logs for each site, are provided in Appendix A. Laboratory results for surface and subsoil samples from each location are given in Appendix B. The remainder of this section presents a brief analysis of the soils observed during this investigation.

3.1 2024 OBSERVATIONS AND ASSESSMENT

3.1.1 GENERAL

Most of the soil profiles observed as part of this investigation were natural profiles, with local disturbances confined to grazing and adjacent tracks. Site SS5, however, is highly disturbed by anthropogenic activity (i.e. historical mine works) and entirely altered. Thus SS5 is classed as an anthroposol.

All other soils have an A horizon of clayey loam overlying a finer-textured, light- to medium-clay B horizon. In most cases, coarse, angular to sub-angular metamorphic pebble fragments are abundant. These soils would generally be classed as dermosols, which have structured B2 horizons and lack a strong texture contrast between the A and B horizons. Each soil was classified in accordance with the ASC. Their distribution, as allocated under the ASC, was mapped within the project footprint Figure 2.

Because of the disturbed profile at SS5, its samples have in some instances been treated as outliers in the subsequent chemical analysis.

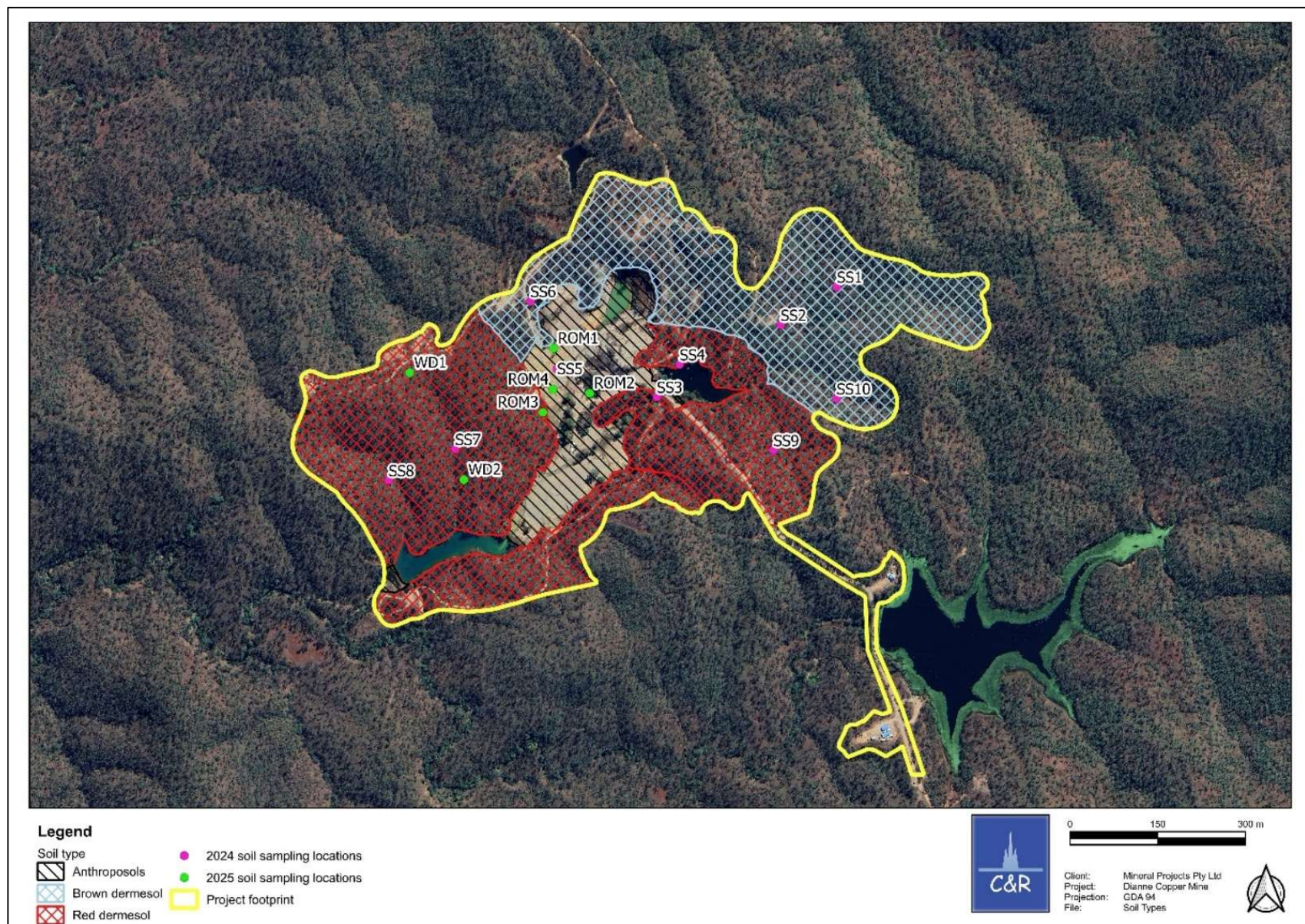


Figure 2: Mapped soil types within the project site.

3.1.2 CHEMICAL ANALYSIS

3.1.2.1 pH

The pH range of analysed soils and subsoils ranged from 4.1 to 8.9. Natural soils excluding the SS5 site were moderate to very slightly acidic (range 5.9–6.8). Subsoils were moderately acidic to moderately alkaline (5.9–8.9), although most samples (8 of 10) ranged from 6 to 7.5, which is slightly acidic to slightly alkaline. The SS5 surface sample pH (4.1) indicates strongly acidic soil. This sample is considered an outlier.

3.1.2.2 Salinity

Salinity levels are usually determined by measuring the EC of soil–water suspensions. Excluding the SS5 surface sample, EC for all samples ranged from 2 $\mu\text{S}/\text{cm}$ to 26 $\mu\text{S}/\text{cm}$, indicating a very low salinity rating (defined as $<70 \mu\text{S}/\text{cm}$; Hazelton, 2016). Adverse plant growth responses are unlikely in soils with this salinity range, even for sensitive plants. EC of the SS5 surface sample was 1,530 $\mu\text{S}/\text{cm}$, indicating salinity levels typically too high for most plants.

3.1.2.3 Cation Exchange Capacity

CEC is the capacity of soils to hold and exchange cations. It provides a buffering effect to changes in pH, available nutrients, calcium levels and soil structural changes. As such, it is a major controlling agent of stability of soil structure, nutrient availability for plant growth, soil pH, and the soil's reaction to fertilisers and other ameliorants. A low CEC means the soil has limited ability to resist changes in soil chemistry resulting from land use.

The CEC of all the soils had a range of 0.8–12.6 meq/100g. This range covers a rating from very low to moderate (Hazelton, 2016). Surface soils have cation exchange values of 3.4–12.6 meq/100g, whereas subsoils have a cation exchange ranging from 0.8 meq/100g to 8.8 meq/100g.

The proportions of various cations (expressed as percentages) can be more relevant to plant performance than the absolute levels of each cation. Table 1 shows the desirable ranges for plant growth (as a percentage of CEC) for each major cation, along with the analytical trends measured for each.

Table 1: Cation exchange capacity results against optimal range for plant growth (from Hazelton, 2016).

Cation	Optimal range	Analytical findings
Calcium	65–80%	- Values for all soils range from 2% to 71%; and 3 of 20 soils are within the optimal range, consistent with the slightly acidic pH.
Magnesium	10–20%	- Values for all soils range from 22% to 100%; and - All soils are above the desirable range.
Potassium	3–8%	- All soils range from 0% to 5.6%; and 6 of 20 soils are within the optimal range.
Sodium	<1%	- All soils range from 0% to 5%; and 3 of 20 samples are within the optimal range.
Aluminium	<1%	- All soils range from 0% to 46%; 15 of 20 samples are within optimal range; and - SS6 subsoil is 39%; SS8 subsoil is 46%.

3.1.2.4 *Nutrients*

Assessment of nutrient requirements is generally tailored to a specific land use outcome. As these are natural soils, they serve as a baseline for the region and for any future remedial works associated with likely project activities. The following is a summary of the nutrient levels found in the tested soils:

- Ammonia: below the limit of reporting (LOR; <20 mg/kg) for all tested soils.
- Nitrite: below the LOR (<0.1 mg/kg) for all tested soils.
- Nitrate: a range of <0.1–0.5 mg/kg.
 - Five of the ten surface samples were at or below the LOR; and
 - Six of the ten sub-surface samples were at or below the LOR.
- Total nitrogen: a range of 220–2,770 mg/kg in surface samples and 60–80 mg/kg in sub-surface samples. This may indicate that nitrogen cycling in the subsoils is somewhat limited, although nitrogen levels are considered low in both surface and sub-surface layers.
- Total phosphorus: a range of 70–226 mg/kg in surface soils and 35–266 mg/kg in subsoils.
- Organic matter: a range of 0.7–8.4% in surface soils and <0.5–1.7% in subsoils.
 - Three (SS4, 5 and 6) of the four surface samples that recorded a low proportion (<1.5%) of organic matter are in areas disturbed by historical mining activities. The other six samples returned higher values, with one in the moderate range (1.5–2.5%) and five in the high range (above 2.5%). Typical of subsoils, the organic matter is considerably lower, with three samples in the moderate range and the remaining seven in the low range.

3.1.3 **EROSIVITY INDICATORS**

3.1.3.1 *Emerson Aggregate Test*

The Emerson aggregate test measures the susceptibility of soil to dispersion in water. Dispersion is the tendency for the clay fraction of a soil to separate into individual particles (colloids) in suspension. The test indicates the friability and structural stability of the soil, as well as its susceptibility to surface sealing under irrigation and rainfall. Soils are divided into eight classes based on the coherence of soil aggregates in water. For further information on the Emerson classes and aggregate test methodology, see <https://www.environment.nsw.gov.au/resources/soils/testmethods/eat.pdf>.

For the purpose of this assessment:

- All surface samples were assigned an Emerson class of 7, indicating that no slaking occurred and the soils were subject to swelling.
- All subsoil samples were assigned an Emerson class of 7, except for SS1 and SS10, which were rated 5, and SS9, which was rated 3.

A rating of 5 indicates that slaking occurred in the natural aggregate, but minimal dispersion was observed. No dispersion occurs after the natural aggregate is remoulded to field capacity and then resubmerged. A 1:5 soil mixture was shaken for 10 minutes, left to stand for 5 minutes, and then assessed as either dispersed (class 5) or flocculated (class 6).

A rating of 3 indicates that slaking occurred in the natural aggregate, with minimal dispersion occurring after remoulding to field capacity and resubmission.

Based on the aggregate testing, soils with an Emerson ranking of

- 7 present a low erosion risk and show good aggregate stability, with minimal to no dispersion when in contact with water

- .3 or 5 have a moderate to low erosion risk, with aggregates having a moderate risk of dispersion or slaking (the collapse of aggregates). whereas soils rated 7 present a low erosion risk.

3.1.3.2 *Exchangeable Sodium Percent and Sodium Adsorption Ratio*

The ESP measures the proportion of cation exchange sites occupied by sodium. Soils are considered sodic when the ESP is greater than 6%, and highly sodic when it is greater than 15%. Soils that are sodic are susceptible to dispersion and erosion. All measured ESP values were less than 6%, with the highest recorded value 2.2%.

The ESP has been replaced by the SAR in most standards of classification. For classification purposes, a soil is considered sodic if SAR levels are above 13. SAR values for all tested soils range from 0.17 to 5.23.

3.2 2025 REQUEST-FOR-INFORMATION ASSESSMENT AND OBSERVATIONS

3.2.1 GENERAL

The overburden stockpile (waste dumps 1 and 2) (WD1 and WD2) and ROM3 are similar to the natural soils described from the 2024 observations (Section 3.1). Generally classed as dermosols, these soils have structured B2 horizons and lack a strong texture contrast between the A and B horizons. In the analysis that follows, these soils are referred to as natural soils.

ROM1, ROM2 and ROM4 are areas that have been significantly reworked by historical mining activities and are therefore classed as anthroposols. In the analysis that follows, they are described as modified soils.

3.2.2 CHEMICAL ANALYSIS

3.2.2.1 *pH*

The pH of all analysed soils and subsoils ranged from 4.2 to 6.7. Natural soils were moderately to slightly acidic, with pH between 5.6 and 6.7. Modified soils had pH from 4.2 to 6.0, indicating moderately to strongly acidic conditions.

3.2.2.2 *Salinity*

Salinity levels are typically assessed by measuring the EC of soil–water suspensions. Across all sampled soils, EC values ranged from 1 $\mu\text{S}/\text{cm}$ to 259 $\mu\text{S}/\text{cm}$.

In natural soils, EC values varied between 1 $\mu\text{S}/\text{cm}$ and 14 $\mu\text{S}/\text{cm}$, which corresponds to a very low salinity rating (defined as $<70 \mu\text{S}/\text{cm}$; Hazelton, 2016). In contrast, EC values in modified soils were more variable. The ROM1 site recorded an EC of 100 $\mu\text{S}/\text{cm}$, indicating low salinity. ROM4 returned a value of 259 $\mu\text{S}/\text{cm}$, indicating medium salinity. ROM2 showed a range of 6–21 $\mu\text{S}/\text{cm}$, consistent with very low salinity..

3.2.2.3 *Metals*

The concentrations of metals from all samples at all sites are presented in Table 2. These results have been compared with the 2025 DCM receiving environment monitoring program (REMP) sediment quality objectives (SQOs) – derived from the DCM EA – and the default guideline values for toxicants in sediment from ANZG (2018). Although these values are not intended for this specific purpose, they are considered the most appropriate available for assessment. Health-based investigation levels were considered inappropriate, and ecological investigation levels are too broad and potentially not relevant to the site. In all

Client: Mineral Projects
Project: Dianne Copper Mine
Report: Soil Assessment
Date: August 2025



instances, the SQOs established as part of the REMP are more stringent and likely to be more relevant to the site. Historical sediment values have also been included in the evaluation.

Table 2: Soil chemical results.

Analyte	Units	LOR	Natural profiles / background					Modified/disturbed soils				SQO		Historical background range	
			WD1		WD2		ROM3	ROM2		ROM4	ROM1				
			WDS001	WDS002	WDS003	WDS004	WDS005	WDS006	WDS007	WDS008	WDS009	Low	High	Low	High
Chloride	mg/kg	10	<10	<10	<10	<10	<10	10	<10	210	<10	–	–	–	–
Aluminium	mg/kg	50	3,540	4,140	5,420	5,520	4,610	4,840	5,850	5,080	5,750	10,660	31,980	5,760	12,600
Arsenic	mg/kg	5	<5	<5	<5	<5	<5	<5	5	<5	7	20	70	<5	7
Barium	mg/kg	10	50	30	60	50	40	60	80	30	50	–	–	–	–
Beryllium	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	–	–	–
Boron	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	25	50	–	–
Cadmium	mg/kg	1	<1	<1	<1	<1	<1	1	<1	<1	<1	1.5	10	<1	<1
Chromium	mg/kg	2	4	6	6	6	7	6	7	6	15	80	370	–	–
Cobalt	mg/kg	2	4	5	6	6	4	22	20	5	3	–	–	–	–
Copper	mg/kg	5	10	8	13	10	33	195	366	503	1,030	114	351	35	133
Iron	mg/kg	50	12,300	16,200	15,800	15,500	15,300	18,300	22,000	18,900	25,200	–	–	–	–
Lead	mg/kg	5	10	12	14	14	12	19	18	15	19	50	220	12	23
Manganese	mg/kg	5	321	169	346	232	243	348	300	86	99	202	608	152	239
Nickel	mg/kg	2	5	6	7	7	7	10	11	7	7	21	52	7	17
Selenium	mg/kg	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	–	–	–	–
Vanadium	mg/kg	5	5	7	6	6	7	5	6	6	10	–	–	–	–
Zinc	mg/kg	5	15	15	26	24	25	241	211	68	150	200	410	29	63
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	1.2	0.15	1	<0.1	<0.1
Sulphate	mg/kg	100	<100	<100	100	<100	110	210	<100	580	1,250	200	400	220	270

Indicates exceedance of SQO – low.

Indicates exceedance of SQO – high.

*SQO extracted from Schedule C – Table 3 of the DCM EA, unless otherwise specified.

The following observations are highlighted:

- Copper in natural profiles ranges from 8 mg/kg to 33 mg/kg, which is below both the SQOs and historical background values. In modified profiles, copper concentrations span from 195 mg/kg to 1,030 mg/kg. All results are above the low SQO, with three of the four samples also exceeding the high SQO. All soil samples from modified profiles are above the historical sediment values.
- Manganese levels in natural soil profiles exceed the low SQO, except for the WRD1 subsoil (WDS002), which is below. In modified soils, ROM2 surpasses the low SQO in both topsoil and subsoil, whereas ROM4 and ROM1 fall below. Although some results are non-compliant with the low SQO, they are typical of those observed in tropical soils.
- Zinc concentrations in natural profiles lie between 15 mg/kg and 26 mg/kg, below both SQOs and historical background values. In modified profiles, values range from 68 mg/kg to 241 mg/kg. Both ROM2 results exceed the low SQO, whereas ROM4 and ROM1 remain below. All soil samples from modified profiles surpass historical sediment levels.
- Sulphate levels in natural profiles narrowly ranges from less than 100 mg/kg to 110 mg/kg, below SQOs and historical values. In modified profiles, concentrations extend from less than 100 mg/kg to 1,250 mg/kg. Except for the ROM2 subsoil, all results exceed the low SQO, with ROM4 and ROM1 also surpassing the high SQO and historical values.
- Mercury at ROM1 is 1.2 mg/kg, exceeding both the high SQO and background levels. All other mercury results are below the low SQO.
- All other tested analytes are below the low SQO.

4. SUMMARY

The information contained in this report and the associated appendices provides baseline data for the project and the broader region, and can serve as a reference point for future mine planning, operations and rehabilitation.

In 2024, ten soil sampling locations were assessed, with samples collected from both surface and sub-surface layers. Nine of these sites comprised natural soil profiles, whereas one (SS5) was of anthropogenic origin. With the exception of SS5, soils across the mine site were generally within nutrient and salinity ranges conducive to the successful growth of endemic plant species. Most sampled soils are not overly susceptible to erosion based on their physical and chemical properties.

In 2025, nine additional soil samples were collected from six locations, representing a mixture of disturbed and undisturbed sites. In both site types, salinity ranged from very low to medium. The maximum recorded EC was 259 $\mu\text{S}/\text{cm}$, substantially lower than the 1,530 $\mu\text{S}/\text{cm}$ recorded in the 2024 SS5 sample. However, two disturbed profiles – ROM1 (100 $\mu\text{S}/\text{cm}$) and ROM4 (259 $\mu\text{S}/\text{cm}$) – had ECs substantially higher than any of the natural soils from either sampling round (maximum of 26 $\mu\text{S}/\text{cm}$).

At disturbed sites, concentrations of copper, zinc, mercury and sulphate exceeded SQOs. Manganese concentrations were above SQOs at both undisturbed and disturbed sites.

5. REFERENCES

- ANZG (2018). *Australian and New Zealand guidelines for fresh and marine water quality*. Australian and New Zealand governments and Australian state and territory governments, Canberra, Australia. Available at <https://www.waterquality.gov.au/anz-guidelines>.
- Hazelton, P., Murphy, B. (2016). *Interpreting soil test results: What do all the numbers mean?* (3rd edition). CSIRO Publishing, pp. 200.
- Isbell, R.F. (2021). *The Australian soil classification* (3rd edition). National Committee on Soil and Terrain, CSIRO Publishing, pp. 192.
- Northcote, K.H., Beckmann, G.G., Bettenay, E., Churchward, H.M., Van Dijk, D.C., Dimmock, G.M., Hubble, G.D., Isbell, R.F., McArthur, W.M., Murtha, G.G., Nicolls, K.D., Paton, T.R., Thompson, C.H., Webb, A.A., Wright, M.J. (1960–1968). *Atlas of Australian soils*. Sheets 1 to 10. With explanatory data (CSIRO, Melbourne).

Client: Mineral Projects
Project: Dianne Copper Mine
Report: Soil Assessment
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Appendix A – Field observation

Project description								
Project name	DCM soil assessment							
Location	SS3							
Site description								
Date	01.05.24	Observation type	Excavation pit					
Site type		Observation class	Description and chemistry					
Slope	Level	Morphological type	Creek					
Slope type	NA	Landform element:	Small creek at base of valley					
Geology	Metamorphic	Landform pattern:	Alluvial/colluvial					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage	Well drained	Microrelief type	None					
Disturbance	Small amount of disturbance next to track edge	Vertical interval (m)	NA					
Rock outcrop:	Not at site but 20m south	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	No coarse fragments at surface							
Vegetation								
Community name	Mixed riparian and woodland community							
Stratum								
EDL	<i>Iophostemon grandiflorus</i>	<i>Erythrophleum chlorostachys</i>	<i>Eucalyptus cullenii</i>					
	<i>Acacia species</i>							
Lowest	<i>Themeda quadrivalvis</i>	<i>Heteropogon triticeus</i>						
Soils								
Australian soil classification (ASC)								
Acidic, mesotrophic, red dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS3-Surf	A1	0	5	Greyish-brown (2.5Y 5/2)	No mottles or other colour patterns mottles	Light medium clay	Moderate 2–5 mm subangular blocky structure	Absent at surface
	A2	5	12	Light brownish-grey (10YR 6/2)	No mottles or other colour patterns mottles	Medium clay	Moderate 2–5 mm subangular blocky structure	Absent at surface
SS3-Sub	B2	12	40	Pale brown (10YR 6/3)	No mottles or other colour patterns mottles	Light medium clay	Strong 2–5 mm polyhedral structure	Abundant (50–90%) angular metamorphic rock (unidentified) small

								pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles (6–20 mm)
	B3	40	80	Reddish-brown (2.5YR 4/4)	No mottles or other colour patterns mottles	Medium clay	Strong 2–5 mm polyhedral structure	Abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles (6–20 mm)

Notes

	
SS3 site setting	SS3 soil pit

Project description								
Project name	DCM soil assessment							
Location	SS4							
Site description								
Date	01.05.24	Observation type	Excavation pit					
Site type		Observation class	Description and chemistry					
Slope	Level	Morphological type	Creek/dam					
Slope type	NA	Landform element:	Small creek at base of valley					
Geology	Metamorphic	Landform pattern:	Alluvial/colluvial					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion	Sheet erosion from road disturbance					
Drainage	Well drained	Microrelief type	None					
Disturbance	Moderate disturbance at edge road cutting and dam slope	Vertical interval (m)	NA					
Rock outcrop:	Not at site but 10 m north.	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	No coarse fragments at surface							
Vegetation								
Community name	Mixed riparian and woodland community							
Stratum								
EDL	<i>Lophostemon grandiflorus</i>	<i>Eucalyptus tereticornis</i>						
	<i>Acacia species</i>							
Lowest	<i>Themeda quadrivalvis</i>							
Soils								
Australian soil classification (ASC)								
Acidic, mesotrophic, red dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS4-Surf	A1	0	15	Pale brown (10YR 6/3)	No mottles or other colour patterns mottles	Sandy clay loam	Moderate 2–5 mm subangular blocky structure	Absent at surface
SS4-Sub	B2	15	45	Light brownish-grey (10YR 6/2)	No mottles or other colour patterns mottles	Light medium clay loam	Strong 2–5 mm polyhedral structure	Abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified)

								medium pebbles (6–20 mm)
	B3	45	80	Reddish-brown (2.5YR 4/4)	No mottles or other colour patterns	Medium clay	Strong 2–5 mm polyhedral structure	abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles (6–20 mm)

Notes

	
SS4 site setting	SS4 soil pit

Project description								
Project name	DCM soil assessment							
Location	SS5							
Site description								
Date	01.05.24	Observation type	Excavation pit					
Site type		Observation class	Description and chemistry					
Slope	Level	Morphological type	Midslope					
Slope type	NA	Landform element:	Hillslope					
Geology	Metamorphic	Landform pattern:	Rise					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion	Sheet erosion					
Drainage	Well drained	Microrelief type	None					
Disturbance	Highly disturbed from mine workings	Vertical interval (m)	NA					
Rock outcrop:	30 m to north west	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	Common (50-70%), angular, metamorphic rock (unidentified), medium pebbles to stone (6–80 mm)							
Vegetation								
Community name	Disturbed area no vegetation present within mine workings area.							
Stratum								
EDL	NA							
Lowest	Bare							
Soils								
Australian soil classification (ASC)								
Highly disturbed anthroposol								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS5-Surf	A1	0	17	Light brownish-grey (10YR 6/2)	No mottles or other colour patterns mottles	Clay loam sandy	Moderate 2–5 mm subangular blocky structure	Common (10–20%) subangular medium pebbles (6–20 mm)
SS5-Sub	B2	17	35	Light brown (7.5YR 6/4)	No mottles or other colour patterns mottles	Clay loam sandy	Strong 2–5 mm polyhedral structure	Abundant (50–90%) angular metamorphic rock (unidentified) small

								pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles (6– 20 mm)
	B3	35	100	Brown (7.5YR 5/3)	No mottles or other colour patterns mottles	Medium clay	Strong 2–5 mm polyhedral structure	abundant (50– 90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles (6– 20 mm)

Notes

	
SS5 site setting	SS5 soil pit

Project description								
Project name	DCM soil assessment							
Location	SS6							
Site description								
Date	01.05.24	Observation type	Excavation pit					
Site type		Observation class	Description and chemistry					
Slope	Level	Morphological type	Crest					
Slope type	NA	Landform element:	Hillcrest					
Geology	Metamorphic	Landform pattern:	Hill					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage	Well drained	Microrelief type	None					
Disturbance	Small amount of disturbance next to track edge.	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	No coarse fragments at surface							
Vegetation								
Community name	Eucalyptus woodland							
Stratum								
EDL	<i>Eucalyptus cullenii</i>	<i>Erythrophleum chlorostachys</i>	<i>Corymbia clarksoniana</i>					
	<i>Acacia species</i>							
Lowest	<i>Themeda quadrivalvis</i>	<i>Heteropogon triticeus</i>						
Soils								
Australian soil classification (ASC)								
Acidic, mesotrophic, brown dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS6-Surf	A1	0	5	Dark greyish-brown (10YR 4/2)	No mottles or other colour patterns mottles	Sandy loam	Moderate 2–5 mm subangular blocky structure	Absent at surface
	A2	5	18	Pale brown (10YR 6/3)	No mottles or other colour patterns mottles	Sandy loam	Moderate 2–5 mm subangular blocky structure	Absent
SS6-Sub	B2	18	45	Reddish yellow (7.5YR 6/6)	No mottles or other colour patterns mottles	Sandy clay loam	Strong 2–5 mm polyhedral structure	Abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular

								metamorphic rock (unidentified) medium pebbles (6–20 mm)
	B3	45	80	Reddish-brown (2.5YR 4/4)	No mottles or other colour patterns mottles	Medium clay	Strong 2–5 mm polyhedral structure	abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles (6–20 mm)

Notes

	
SS6 Site setting	SS6 soil pit

Project description								
Project name	DCM soil assessment							
Location	SS1							
Site description								
Date	01.05.24	Observation type	Excavation pit					
Site type		Observation class	Description and chemistry					
Slope	Steep	Morphological type	Midslope					
Slope type	Concave	Landform element:	Hillcrest					
Geology	Metamorphic	Landform pattern:	Hill					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage	Well drained	Microrelief type	None					
Disturbance	Minimal disturbance	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	Abundant (50–90%), angular, metamorphic rock (unidentified), medium pebbles (6–20 mm)							
Vegetation								
Community name	Eucalyptus woodland							
Stratum								
EDL	<i>Eucalyptus cullenii</i>	<i>Erythrophleum chlorostachys</i>	<i>Corymbia clarksoniana</i>					
	<i>Acacia species</i>							
Lowest	<i>Heteropogon triticeus</i>	<i>Themeda quadrivalvis</i>						
Soils								
Australian soil classification (ASC)								
Acidic, mesotrophic, red/brown dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS1-Surf	A1	0	5	Brown (7.5YR 5/3)	No mottles or other colour patterns	Sandy clayey loam	Moderate 2–5 mm subangular blocky structure	Abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
	A2	5	30	Pale brown (10YR 6/3)	No mottles or other colour patterns	Clayey loam	Moderate 2–5 mm subangular	Abundant (50–90%) angular

					mottles		blocky structure	metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
SS1-Sub	B2	30	60	Yellowish-red (5YR 5/8)	No mottles or other colour patterns mottles	Medium heavy clay	Strong 2–5 mm polyhedral structure	Many (20–50%) angular metamorphic rock (unidentified) small pebbles (2–6 mm)
	B3	60	100	Reddish-brown (2.5YR 4/4)	No mottles or other colour patterns mottles	Medium clay	Strong 2–5 mm polyhedral structure	Many (20–50%) angular metamorphic rock (unidentified) small pebbles (2–6 mm)

Notes



Project description								
Project name	DCM soil assessment							
Location	SS2							
Site description								
Date	01.05.24	Observation type	Excavation pit					
Site type		Observation class	Description and chemistry					
Slope	Steep	Morphological type	Midslope					
Slope type	Straight	Landform element:	Hillcrest					
Geology	Metamorphic	Landform pattern:	Hill					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage	Well drained	Microrelief type	None					
Disturbance	Minimal disturbance	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	Abundant (50–90%), angular, metamorphic rock (unidentified), medium pebbles (6–20 mm)							
Vegetation								
Community name	Eucalyptus woodland							
Stratum								
EDL	<i>Eucalyptus cullenii</i>	<i>Erythrophleum chlorostachys</i>	<i>Corymbia clarksoniana</i>					
	<i>Acacia species</i>							
Lowest	<i>Heteropogon triticeus</i>	<i>Themeda quadrivalvis</i>						
Soils								
Australian soil classification (ASC)								
Acidic, mesotrophic, brown dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS2-Surf	A1	0	2	Brown (7.5YR 5/2)	No mottles or other colour patterns mottles	Sandy loam	Moderate 2–5 mm subangular blocky structure	Abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
	A2	2	8	Pale brown (10YR 6/3)	No mottles or other colour patterns mottles	Sandy clayey loam	Moderate 2–5 mm subangular blocky	Abundant (50–90%) angular metamorphic rock

							structure	(unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
SS2-Sub	B2	8	32	Brown (7.5YR 5/4)	No mottles or other colour patterns mottles	Sandy loam	Massive structure	Many (20–50%) angular metamorphic rock (unidentified) small pebbles (2–6 mm)
	B3	60	100	Reddish-brown (2.5YR 4/4)	No mottles or other colour patterns mottles	Medium clay	Massive structure	Many (20–50%) angular metamorphic rock (unidentified) small pebbles (2–6 mm)

Notes

	
SS2 site setting	SS2 soil pit

Project description								
Project name	DCM soil assessment							
Location	SS10							
Site description								
Date	02.05.24	Observation type	Soil auger					
Site type		Observation class	Description and chemistry					
Slope	Very steep	Morphological type	Midslope					
Slope type	Concave lower	Landform element:	Hillcrest					
Geology	Metamorphic	Landform pattern:	Hill					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage	Well drained	Microrelief type	None					
Disturbance	Minimal disturbance	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	Abundant (50–90%), angular, metamorphic rock (unidentified), medium pebbles (6–20 mm)							
Vegetation								
Community name	Eucalyptus woodland							
Stratum								
EDL	<i>Corymbia clarksoniana</i>	<i>Eucalyptus cullenii</i>	<i>Erythrophleum chlorostachys</i>					
	<i>Acacia species</i>							
Lowest	<i>Heteropogon triticeus</i>	<i>Themeda quadrivalvis</i>						
Soils								
Australian soil classification (ASC)								
Acidic, Mesotrophic, brown Dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS1 0-Surf	A1	0	5	Dark brown (7.5YR 3/2)	No mottles or other colour patterns mottles	Clay loam	Moderate 2–5 mm subangular blocky structure	Abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
	A2	5	12	Pale brown (10YR 6/3)	No mottles or other colour patterns mottles	Sandy clayey loam	Moderate 2–5 mm subangular blocky	Abundant (50–90%) angular metamorphic rock

							structure	(unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
SS1 0- Sub	B2	12	55	Red (2.5YR 5/6)	No mottles or other colour patterns mottles	Medium clay	Massive structure	Many (20–50%) angular metamorphic rock (unidentified) small pebbles (2–6 mm)

Notes

		
SS10 site setting		No soil pit due to sampling method

Project description								
Project name	DCM soil assessment							
Location	SS09							
Site description								
Date	02.05.24	Observation type	Soil auger					
Site type		Observation class	Description and chemistry					
Slope	Very steep	Morphological type	Midslope					
Slope type	Concave lower	Landform element:	Hillcrest					
Geology	Metamorphic	Landform pattern:	Hill					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage	Well drained	Microrelief type	None					
Disturbance	Minimal disturbance	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	Abundant (50–90%), angular, metamorphic rock (unidentified), medium pebbles (6–20 mm)							
Vegetation								
Community name	Eucalyptus woodland							
Stratum								
EDL	<i>Eucalyptus cullenii</i>	<i>Erythrophleum chlorostachys</i>	<i>Corymbia clarksoniana</i>					
	<i>Acacia species</i>							
Lowest	<i>Heteropogon triticeus</i>	<i>Themeda quadrivalvis</i>						
Soils								
Australian soil classification (ASC)								
Acidic, mesotrophic, red dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS0 9-Surf	A1	0	5	Pinkish-grey (7.5YR 6/2)	No mottles or other colour patterns mottles	Medium clay	Moderate 2–5 mm subangular blocky structure	Abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
	A2	5	15	Greyish brown (2.5Y 5/2)	No mottles or other colour patterns mottles	Medium clay	Moderate 2–5 mm subangular blocky structure	Abundant (50–90%) angular metamorphic rock

								(unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
SS09Sub	B2	15	60	Reddish-brown (5YR 5/3)	No mottles or other colour patterns mottles	Medium clay	Massive structure	Many (20–50%) angular metamorphic rock (unidentified) small pebbles (2–6 mm)

Notes

		
SS09 site setting		No soil pit due to sampling method

Project description								
Project name	DCM soil assessment							
Location	SS07							
Site description								
Date	02.05.24	Observation type	Soil auger					
Site type		Observation class	Description and chemistry					
Slope	Very steep	Morphological type	Midslope					
Slope type	Concave lower	Landform element:	Hillcrest					
Geology	Metamorphic	Landform pattern:	Hill					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage	Well drained	Microrelief type	None					
Disturbance	Minimal disturbance	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	Abundant (50–90%), angular, metamorphic rock (unidentified), medium pebbles (6–20 mm)							
Vegetation								
Community name	Eucalyptus woodland							
Stratum								
EDL	<i>Eucalyptus cullenii</i>	<i>Erythrophleum chlorostachys</i>	<i>Corymbia clarksoniana</i>					
	<i>Acacia species</i>							
Lowest	<i>Heteropogon triticeus</i>	<i>Themeda quadrivalvis</i>						
Soils								
Australian soil classification (ASC)								
Acidic, mesotrophic, red dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS0 7- Surf	A1	0	7	Dark grey (5YR 4/1)	No mottles or other colour patterns mottles	loam	Moderate 2–5 mm subangular blocky structure	Abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
	A2	7	20	Greyish-brown (2.5Y 5/2)	No mottles or other colour patterns mottles	Clay loam	Moderate 2–5 mm subangular blocky structure	Abundant (50–90%) angular metamorphic rock (unidentified)

								small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
SS0 9Sub	B2	20	65	Brown (7.5YR 5/3)	No mottles or other colour patterns mottles	Medium clay	Massive structure	Many (20–50%) Angular metamorphic rock (unidentified) small pebbles (2–6 mm)

Notes

		
SS07 site setting		No soil pit due to sampling method

Project description								
Project name	DCM soil assessment							
Location	SS08							
Site description								
Date	02.05.24	Observation type	Soil auger					
Site type		Observation class	Description and chemistry					
Slope	Very steep	Morphological type	Midslope					
Slope type	Concave lower	Landform element:	Hillcrest					
Geology	Metamorphic	Landform pattern:	Hill					
Runoff	Minimal runoff	Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage	Well drained	Microrelief type	None					
Disturbance	Minimal disturbance	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard setting	Microrelief component sampled:	NA					
Surface coarse fragments:	Abundant (50–90%), angular, metamorphic rock (unidentified), medium pebbles (6–20 mm)							
Vegetation								
Community name	Eucalyptus woodland							
Stratum								
EDL	<i>Eucalyptus cullenii</i>	<i>Erythrophleum chlorostachys</i>	<i>Corymbia clarksoniana</i>					
	<i>Acacia species</i>							
Lowest	<i>Heteropogon triticeus</i>	<i>Themeda quadrivalvis</i>						
Soils								
Australian soil classification (ASC)								
Mesotrophic, red dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
SS0 8-Surf	A1	0	6	Dark grey (5YR 4/1)	No mottles or other colour patterns mottles	loam	Moderate 2–5 mm subangular blocky structure	Abundant (50–90%) angular metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
	A2	6	18	Greyish-brown	No mottles or other colour	Clay loam	Moderate 2–5	Abundant (50–90%) angular

				(2.5Y 5/2)	patterns mottles		mm subangular blocky structure	metamorphic rock (unidentified) small pebbles (2–6 mm); few (2–10%) angular metamorphic rock (unidentified) medium pebbles
SS0 8Sub	B2	18	60	Pinkish- grey (7.5YR 6/2)	No mottles or other colour patterns mottles	Light clay	Massive structure	Many (20–50%) angular metamorphic rock (unidentified) small pebbles (2–6 mm)

Notes

		
SS08 site setting		No soil pit due to sampling method

Project description								
Project name	DCM soil assessment							
Location	Waste Dump 01 (234129, 8218573)							
Site description								
Date	5/07/2025	Observation type	Hand dug pit					
Site type		Observation class	Description and chemistry					
Slope	Moderate	Morphological type	Hill					
Slope type		Landform element:	Hillside, part way up moderate slope					
Geology	Metaseds	Landform pattern:	Colluvium/ talus on slope					
Runoff		Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage		Microrelief type	None					
Disturbance	Near track, historical disturbance nearby	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard and rocky	Microrelief component sampled:	NA					
Surface coarse fragments:	Abundant (50–90%), angular, metamorphic rock (unidentified), medium pebbles (6–20 mm)							
Vegetation								
Community name	Eucalyptus woodland							
Stratum								
EDL	<i>Eucalyptus cullenii</i>	<i>Erythrophleum chlorostachys</i>	<i>Corymbia clarksoniana</i>					
	<i>Acacia species</i>							
Lowest	<i>Heteropogon triticeus</i>	<i>Themeda quadrivalvis</i>						
Soils								
Australian soil classification (ASC)								
Mesotrophic, red dermosol; very gravelly								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
WDS 001 (surface)	O + A + B1	0	2	Greyish brown	No mottles or other colour patterns mottles	Sandy loam	Polyhedral <10mm	Some metased fragments
WDS 002 (sub surface)	B3 - C	2	30	Brown orange	No	Sandy loam		Large - small saprock with minor soil present

Notes. very thin soil profile. O+A+B1 only a few cm thick maximum. Doesn't appear to be a properly defined B2 horizon, rather straight into B3-C Horizon of weathered meta sedimentary saprock.
Photos 4271 - 4275

	
Waste dump 01 site setting	soil pit

Project description								
Project name	DCM soil assessment							
Location	Waste Dump 02 (234227, 8218393)							
Site description								
Date	5/07/2025	Observation type	Hand dug pit					
Site type		Observation class	Description and chemistry					
Slope	Steep	Morphological type	Hill					
Slope type		Landform element:	Hillside, part way up moderate slope					
Geology	Metaseds	Landform pattern:	Colluvium/ talus on slope					
Runoff		Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage		Microrelief type	None					
Disturbance	Downslope from old, fairly disused track	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard	Microrelief component sampled:	NA					
Surface coarse fragments:								
Vegetation								
Community name	Riparian + woodland							
Stratum								
EDL								
Lowest								
Soils								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
WDS 003 (surface)	O+A +B1	0	5	Greyish brown	No	Loam	Polyheadral <30mm	Some fragments of metaseds
	B2	5	10	Greyish brown	No	Loam	Polyheadral <30mm	Metaseds
	B3	10	30	Orange brown	No	Sandy Loam	Blocky	Saprock and saprolite from metaseds

Notes. Very thin soil profile, no well defined horizons. Photos 4276 - 4278

	
Waste dump 01 site setting	soil pit

Project description								
Project name	Dianne Mine							
Location	ROM 01 (234374, 8218622)							
Site description								
Date	5/07/2025	Observation type	Hand dug pit					
Site type		Observation class	Description					
Slope	Nil	Morphological type	Historical Waste pile					
Slope type		Landform element:	Waste material pile associated with old Dianne Mine					
Geology	Metaseds	Landform pattern:						
Runoff		Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage		Microrelief type	None					
Disturbance	Downslope from old, fairly disused track	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:	Hard	Microrelief component sampled:	NA					
Surface coarse fragments:								
Vegetation								
Community name	Absent							
Stratum								
EDL								
Lowest								
Soils								
Anthroposol								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
WDS 009	C	0	30	brownish grey	No	Sandy loam	-	Waste material from old Dianne mine - mostly metaseds

Notes :Entirely in waste pile, no O, A or B horizons. Photos 4289 - 4292

	
ROM01	soil pit

Project description								
Project name	Dianne Mine							
Location	ROM 02 (234438, 8218547)							
Site description								
Date	06/07/2025	Observation type	Hand dug pit					
Site type		Observation class	Description					
Slope	Moderate	Morphological type	Historical Waste pile					
Slope type		Landform element:	Waste material pile associated with old Dianne Mine					
Geology	Waste Rockpile	Landform pattern:	Slope near base of historical waste pile					
Runoff		Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage		Microrelief type	None					
Disturbance	Downslope from old, fairly disused track	Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:		Microrelief component sampled:	NA					
Surface coarse fragments:								
Vegetation								
Community name	Absent							
Stratum								
EDL								
Lowest								
Soils								
Anthroposol								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
WDS 006	O+A	0	5	Brown grey	No	Sandy Loam	Polyhedral + Granular	Mine waste - metaseds + sed
WDS 007	C	5	20	Grey yellow	No	Sandy Loam	Blocky?	This is waste rock from historical Dianne Mine activity
NA	C	20	45	Grey yellow	No	Sandy Loam	Blocky?	This is waste rock from historical Dianne Mine activity

Notes :Entirely V thin <= 5cm of brown organic material + A horizon overlying old waste pile from mine. Photos 4282 - 4285

	
ROM02	soil pit

Project description			
Project name	Dianne Mine		
Location	ROM 03 (234438, 8218547)		
Site description			
Date	06/07/2025	Observation type	Hand dug pit
Site type		Observation class	Description
Slope	Steep	Morphological type	Hill
Slope type		Landform element:	Towards base of steep slope, down towards old waste rock pile
Geology		Landform pattern:	Colluvium/ Talus
Runoff		Depth to free water	Not encountered
Permeability	Not recorded	Erosion	
Drainage		Microrelief type	None
Disturbance		Vertical interval (m)	NA
Rock outcrop:	None observed	Horizontal interval (m)	NA
Surface condition:		Microrelief component sampled:	NA
Surface coarse fragments:			
Vegetation			
Community name	Sparse woodland		

Stratum								
EDL								
Lowest								
Soils								
Anthroposol								
Profile morphology								
S#	Horiz	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
WD S00 5	O+A +B	0	5	Grey Brown	No	Sandy Loam	Polyhedral to Granular	Metaseds
No sample	C	5	20	Grey Orange	No	-	-	Saprock. Insitu weathered metasedimentary rock

Notes : Very thin soil profile. O + A + B in one sample. Horizons not well defined and very thin.
Photos 4279 - 4281

	
ROM03	soil pit

Project description			
Project name	Dianne Mine		
Location	ROM 04 (234375, 8218552)		
Site description			
Date	06/07/2025	Observation type	Hand dug pit
Site type		Observation class	Description

Slope	Gentle	Morphological type	Historical Waste pile					
Slope type		Landform element:	Gentle slope					
Geology	Waste rockpile	Landform pattern:						
Runoff		Depth to free water	Not encountered					
Permeability	Not recorded	Erosion						
Drainage		Microrelief type	None					
Disturbance		Vertical interval (m)	NA					
Rock outcrop:	None observed	Horizontal interval (m)	NA					
Surface condition:		Microrelief component sampled:	NA					
Surface coarse fragments:								
Vegetation								
Community name	Nil							
Stratum								
EDL								
Lowest								
Soils								
Anthroposol								
Profile morphology								
S#	Hori z	Upper	Lower	Colour	Mottles	Texture	Structure	Coarse fragments
Gent le slop e	C	0	25	Brown grey	No	Sandy loam	-	Waste material pile from old Dianne mine activity. Mostly metaseds

Notes : Entirely in waste pile. Zero organic material/ veg, no A or B horizon. Photos 4286 - 4288

	
ROM04	soil pit

Appendix B – Laboratory results



CERTIFICATE OF ANALYSIS

Work Order : **EB2415198**
Client : **C & R CONSULTING PTY LTD**
Contact : MR BEN CUFF
Address : 188 ROSS RIVER ROAD
AITKENVALE QUEENSLAND 4812
Telephone : +61 07 47253751
Project : dcm soils
Order number : ----
C-O-C number : ----
Sampler : BEN CUFF
Site : ----
Quote number : EN/222
No. of samples received : 20
No. of samples analysed : 20

Page : 1 of 11
Laboratory : Environmental Division Brisbane
Contact : Madison Forster
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61-7-3243 7222
Date Samples Received : 09-May-2024 07:40
Date Analysis Commenced : 09-May-2024
Issue Date : 22-May-2024 09:22



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
Layla Hafner	Acid Sulphate Soils - Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Layla Hafner	Acid Sulphate Soils - Chemist	Brisbane Soil Preparation, Stafford, QLD
Vincent Muller	Chemist - Inorganics	Brisbane Inorganics, Stafford, QLD



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.
- EK061G (Total Kjeldahl Nitrogen as N): Sample SS1-Surf (EB2415198-001) shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- EK067G (Total Phosphorous as P): Sample SS6-Surf (EB2415198-011) shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- ED007 (Exchangeable Cations): Unable to calculate Magnesium/Potassium Ratio result as required Exchangeable Potassium results are less than the limit of reporting.
- ED008 (Exchangeable Cations with pre-treatment): Unable to calculate Magnesium/Potassium Ratio results for some samples as required Exchangeable Potassium results are less than the limit of reporting.
- ED006 (Exchangeable Cations on Alkaline Soils): Unable to calculate Magnesium/Potassium Ratio results for some samples as required Exchangeable Potassium results are less than the limit of reporting.
- ED006 (Exchangeable Cations on Alkaline Soils): EB2414660-003 shows poor duplicate results due to sample heterogeneity. This has been confirmed by visual inspection.
- EA058 Emerson: V. = Very, D. = Dark, L. = Light, VD. = Very Dark
- 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⁺ + Al³⁺).
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SS1-Surf	SS1-Sub	SS2-Surf	SS2-Sub	SS3-Surf
Sampling date / time				01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00
Compound	CAS Number	LOR	Unit	EB2415198-001	EB2415198-002	EB2415198-003	EB2415198-004	EB2415198-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	5.9	6.4	6.0	6.1	6.0
EA006: Sodium Adsorption Ratio (SAR)								
ø Sodium Adsorption Ratio	----	0.01	-	0.80	0.87	0.37	0.71	0.49
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	9	3	5	2	13
EA014 Total Soluble Salts								
Total Soluble Salts	----	5	mg/kg	30	10	16	8	44
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	9.9	16.0	8.4	5.2	10.2
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	Brown (7.5YR 5/3)	Yellowish Red (5YR 5/8)	Brown (7.5YR 5/2)	Brown (7.5YR 5/4)	Grayish Brown (2.5Y 5/2)
Texture	----	-	-	Clay Loam Sandy	Medium Heavy Clay	Sandy Loam	Sandy Loam	Light Medium Clay
Emerson Class Number	EC/TC	-	-	7	5	7	7	7
ED005: Exchange Acidity								
ø Exchange Acidity	----	0.1	meq/100g	0.2	----	0.2	----	<0.1
ø Exchangeable Aluminium	----	0.1	meq/100g	0.1	----	0.2	----	<0.1
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	1.7	2.2	1.4	0.1	5.2
Exchangeable Magnesium	----	0.1	meq/100g	2.3	6.3	1.7	1.8	3.9
Exchangeable Potassium	----	0.1	meq/100g	0.1	<0.1	0.2	<0.1	0.2
Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.1	<0.1	<0.1	<0.1
Cation Exchange Capacity	----	0.1	meq/100g	4.3	----	3.5	----	9.3
Cation Exchange Capacity	----	0.1	meq/100g	----	8.8	----	2.2	----
Exchangeable Sodium Percent	----	0.1	%	1.6	1.5	0.9	1.7	0.4
Calcium/Magnesium Ratio	----	0.1	-	0.7	0.3	0.8	<0.1	1.3
Magnesium/Potassium Ratio	----	0.1	-	15.5	----	9.8	----	18.0
EK055-P: Ammonia as N								



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS1-Surf	SS1-Sub	SS2-Surf	SS2-Sub	SS3-Surf
Sampling date / time					01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00
Compound	CAS Number	LOR	Unit		EB2415198-001	EB2415198-002	EB2415198-003	EB2415198-004	EB2415198-005
					Result	Result	Result	Result	Result
EK055-P: Ammonia as N - Continued									
Ammonia as N	7664-41-7	20	mg/kg		<20	<20	<20	<20	<20
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		0.5	<0.1	<0.1	0.1	0.4
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		0.5	<0.1	<0.1	0.1	0.4
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		2770	260	810	260	1610
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		2770	260	810	260	1610
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		180	156	85	55	175
EP004: Organic Matter									
Organic Matter	----	0.5	%		5.1	0.9	1.4	<0.5	2.2



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS3-Sub	SS4-Surf	SS4-Sub	SS5-Surf	SS5-Sub
Sampling date / time					01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00
Compound	CAS Number	LOR	Unit		EB2415198-006	EB2415198-007	EB2415198-008	EB2415198-009	EB2415198-010
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		6.7	6.8	8.9	4.1	7.4
EA006: Sodium Adsorption Ratio (SAR)									
☐ Sodium Adsorption Ratio	----	0.01	-		1.18	0.21	2.62	5.23	3.10
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		8	9	26	1530	26
EA014 Total Soluble Salts									
Total Soluble Salts	----	5	mg/kg		26	30	88	5190	87
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		7.9	2.1	3.2	6.2	12.9
EA058: Emerson Aggregate Test									
Color (Munsell)	----	-	-		Pale Brown (10YR 6/3)	Pale Brown (10YR 6/3)	Light Brownish Gray (10YR 6/2)	Light Brownish Gray (10YR 6/2)	Light Brown (7.5YR 6/4)
Texture	----	-	-		Light Medium Clay	Sandy Clay Loam	Light Clay	Clay Loam Sandy	Clay Loam Sandy
Emerson Class Number	EC/TC	-	-		7	7	7	7	7
ED005: Exchange Acidity									
☐ Exchange Acidity	----	0.1	meq/100g		----	----	----	<0.1	----
☐ Exchangeable Aluminium	----	0.1	meq/100g		----	----	----	<0.1	----
ED006: Exchangeable Cations on Alkaline Soils									
☐ Exchangeable Calcium	----	0.2	meq/100g		----	----	2.0	----	<0.2
☐ Exchangeable Magnesium	----	0.2	meq/100g		----	----	1.2	----	0.8
☐ Exchangeable Potassium	----	0.2	meq/100g		----	----	<0.2	----	<0.2
☐ Exchangeable Sodium	----	0.2	meq/100g		----	----	<0.2	----	<0.2
☐ Cation Exchange Capacity	----	0.2	meq/100g		----	----	3.2	----	0.8
☐ Exchangeable Sodium Percent	----	0.2	%		----	----	<0.2	----	<0.2
☐ Calcium/Magnesium Ratio	----	0.2	-		----	----	1.7	----	<0.2
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		3.5	3.5	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		3.9	3.5	----	----	----

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS3-Sub	SS4-Surf	SS4-Sub	SS5-Surf	SS5-Sub
Sampling date / time				01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	
Compound	CAS Number	LOR	Unit	EB2415198-006	EB2415198-007	EB2415198-008	EB2415198-009	EB2415198-010	
				Result	Result	Result	Result	Result	
ED007: Exchangeable Cations - Continued									
Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	----	----	----	
Exchangeable Sodium	----	0.1	meq/100g	0.1	<0.1	----	----	----	
Cation Exchange Capacity	----	0.1	meq/100g	7.7	7.3	----	----	----	
Exchangeable Sodium Percent	----	0.1	%	1.8	0.9	----	----	----	
Calcium/Magnesium Ratio	----	0.1	-	0.9	1.0	----	----	----	
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	1.3	----	
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	4.0	----	
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	<0.1	----	
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	<0.1	----	
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	5.3	----	
Exchangeable Sodium Percent	----	0.1	%	----	----	----	0.5	----	
Calcium/Magnesium Ratio	----	0.1	-	----	----	----	0.3	----	
EK055-P: Ammonia as N									
Ammonia as N	7664-41-7	20	mg/kg	<20	<20	<20	<20	<20	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	0.2	<0.1	<0.1	<0.1	0.3	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	0.2	<0.1	<0.1	<0.1	0.3	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg	250	330	400	220	180	
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg	250	330	400	220	180	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg	58	177	211	124	266	
EP004: Organic Matter									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS3-Sub	SS4-Surf	SS4-Sub	SS5-Surf	SS5-Sub
Sampling date / time					01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00	01-May-2024 00:00
Compound	CAS Number	LOR	Unit		EB2415198-006	EB2415198-007	EB2415198-008	EB2415198-009	EB2415198-010
					Result	Result	Result	Result	Result
EP004: Organic Matter - Continued									
Organic Matter	-----	0.5	%		1.7	0.7	<0.5	<0.5	<0.5

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SS6-Surf	SS6-Sub	SS7-Surf	SS7-Sub	SS8-Surf
Sampling date / time				01-May-2024 00:00	01-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00
Compound	CAS Number	LOR	Unit	EB2415198-011	EB2415198-012	EB2415198-013	EB2415198-014	EB2415198-015
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	6.0	5.9	6.5	6.1	6.3
EA006: Sodium Adsorption Ratio (SAR)								
ø Sodium Adsorption Ratio	----	0.01	-	0.32	0.74	0.17	0.33	0.53
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	6	2	7	2	9
EA014 Total Soluble Salts								
Total Soluble Salts	----	5	mg/kg	20	7	25	8	30
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	3.3	3.4	13.2	10.7	13.6
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	Dark Grayish Brown (10YR 4/2)	Reddish Yellow (7.5YR 6/6)	Dark Gray (5YR 4/1)	Brown (7.5YR 5/3)	Dark Gray (5YR 4/1)
Texture	----	-	-	Sandy Loam	Sandy Clay Loam	Loam	Medium Clay	Loam
Emerson Class Number	EC/TC	-	-	7	7	7	7	7
ED005: Exchange Acidity								
ø Exchange Acidity	----	0.1	meq/100g	0.3	2.6	----	----	----
ø Exchangeable Aluminium	----	0.1	meq/100g	0.1	1.7	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	1.6	<0.1	5.1	2.0	5.4
Exchangeable Magnesium	----	0.1	meq/100g	1.4	1.7	1.6	0.8	2.0
Exchangeable Potassium	----	0.1	meq/100g	0.1	<0.1	0.3	0.1	0.2
Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	<0.1	<0.1	<0.1
Cation Exchange Capacity	----	0.1	meq/100g	3.4	4.3	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	----	7.1	3.0	7.7
Exchangeable Sodium Percent	----	0.1	%	1.9	2.2	0.2	0.3	0.5
Calcium/Magnesium Ratio	----	0.1	-	1.1	<0.1	3.2	2.5	2.7
Magnesium/Potassium Ratio	----	0.1	-	9.8	----	5.4	7.5	8.1
EK055-P: Ammonia as N								



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS6-Surf	SS6-Sub	SS7-Surf	SS7-Sub	SS8-Surf
Sampling date / time					01-May-2024 00:00	01-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00
Compound	CAS Number	LOR	Unit		EB2415198-011	EB2415198-012	EB2415198-013	EB2415198-014	EB2415198-015
					Result	Result	Result	Result	Result
EK055-P: Ammonia as N - Continued									
Ammonia as N	7664-41-7	20	mg/kg		<20	<20	<20	<20	<20
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		<0.1	<0.1	0.3	0.4	0.2
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		<0.1	<0.1	0.3	0.4	0.2
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		530	60	670	460	1370
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		530	60	670	460	1370
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		139	35	70	114	147
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.2	<0.5	3.8	1.3	6.3

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS8-Sub	SS9-Surf	SS9-Sub	SS10-Surf	SS10-Sub
Sampling date / time				02-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00	
Compound	CAS Number	LOR	Unit	EB2415198-016	EB2415198-017	EB2415198-018	EB2415198-019	EB2415198-020	
				Result	Result	Result	Result	Result	
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit	6.0	6.3	6.2	6.2	6.2	
EA006: Sodium Adsorption Ratio (SAR)									
ø Sodium Adsorption Ratio	----	0.01	-	0.60	0.49	0.65	0.23	0.33	
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm	2	13	4	11	3	
EA014 Total Soluble Salts									
Total Soluble Salts	----	5	mg/kg	7	44	13	39	10	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	10.2	13.7	11.1	11.1	11.8	
EA058: Emerson Aggregate Test									
Color (Munsell)	----	-	-	Pinkish Gray (7.5YR 6/2)	Pinkish Gray (7.5YR 6/2)	Reddish Brown (5YR 5/3)	Dark Brown (7.5YR 3/2)	Red (2.5YR 5/6)	
Texture	----	-	-	Light Clay	Medium Clay	Light Medium Clay	Clay Loam	Medium Clay	
Emerson Class Number	EC/TC	-	-	7	7	3	7	5	
ED005: Exchange Acidity									
ø Exchange Acidity	----	0.1	meq/100g	2.6	----	----	----	----	
ø Exchangeable Aluminium	----	0.1	meq/100g	1.9	----	----	----	----	
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g	0.3	1.8	0.7	7.4	1.6	
Exchangeable Magnesium	----	0.1	meq/100g	1.1	2.1	1.7	4.7	3.3	
Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	<0.1	0.4	<0.1	
Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	<0.1	<0.1	<0.1	
Cation Exchange Capacity	----	0.1	meq/100g	4.1	----	----	----	----	
Cation Exchange Capacity	----	0.1	meq/100g	----	4.1	2.5	12.6	5.1	
Exchangeable Sodium Percent	----	0.1	%	1.2	0.9	1.4	0.2	0.8	
Calcium/Magnesium Ratio	----	0.1	-	0.3	0.8	0.4	1.6	0.5	
Magnesium/Potassium Ratio	----	0.1	-	9.9	16.8	----	12.6	----	
EK055-P: Ammonia as N									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS8-Sub	SS9-Surf	SS9-Sub	SS10-Surf	SS10-Sub
Sampling date / time					02-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00	02-May-2024 00:00
Compound	CAS Number	LOR	Unit		EB2415198-016	EB2415198-017	EB2415198-018	EB2415198-019	EB2415198-020
					Result	Result	Result	Result	Result
EK055-P: Ammonia as N - Continued									
Ammonia as N	7664-41-7	20	mg/kg		<20	<20	<20	<20	<20
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		0.1	0.1	0.1	<0.1	0.2
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		0.1	0.1	0.1	<0.1	0.2
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		350	1960	610	1760	800
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		350	1960	610	1760	800
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		70	195	135	226	173
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.1	7.3	1.6	8.4	1.6



CERTIFICATE OF ANALYSIS

Work Order : **EB2525331**
Client : **C & R CONSULTING PTY LTD**
Contact : **MR BEN CUFF**
Address : **188 ROSS RIVER ROAD**
AITKENVALE QUEENSLAND 4812
Telephone : **+61 07 47253751**
Project : **DCM ROM soils**
Order number : **----**
C-O-C number : **----**
Sampler : **BEN CUFF**
Site : **----**
Quote number : **EN/222**
No. of samples received : **9**
No. of samples analysed : **9**

Page : **1 of 6**
Laboratory : **Environmental Division Brisbane**
Contact : **Stephanie Jimenez**
Address : **2 Byth Street Stafford QLD Australia 4053**
Telephone : **+61-7-3552-8685**
Date Samples Received : **23-Jul-2025 08:50**
Date Analysis Commenced : **23-Jul-2025**
Issue Date : **29-Jul-2025 12:27**



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
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



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.

- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	WDS001	WDS002	WDS003	WDS004	WDS005
Sampling date / time				22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00	
Compound	CAS Number	LOR	Unit	EB2525331-001	EB2525331-002	EB2525331-003	EB2525331-004	EB2525331-005	
				Result	Result	Result	Result	Result	
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit	6.1	6.7	6.3	6.1	5.6	
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm	14	1	12	2	14	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	1.5	2.4	3.9	3.6	<1.0	
ED040: Sulfur as SO4 2-									
Sulfate as SO4 2-	14808-79-8	100	mg/kg	<100	<100	100	<100	110	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg	<10	<10	<10	<10	<10	
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg	3540	4140	5420	5520	4610	
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5	
Barium	7440-39-3	10	mg/kg	50	30	60	50	40	
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1	
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50	
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1	
Chromium	7440-47-3	2	mg/kg	4	6	6	6	7	
Cobalt	7440-48-4	2	mg/kg	4	5	6	6	4	
Copper	7440-50-8	5	mg/kg	10	8	13	10	33	
Iron	7439-89-6	50	mg/kg	12300	16200	15800	15500	15300	
Lead	7439-92-1	5	mg/kg	10	12	14	14	12	
Manganese	7439-96-5	5	mg/kg	321	169	346	232	243	
Nickel	7440-02-0	2	mg/kg	5	6	7	7	7	
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5	
Vanadium	7440-62-2	5	mg/kg	5	7	6	6	7	
Zinc	7440-66-6	5	mg/kg	15	15	26	24	25	
EG035T: Total Recoverable Mercury by FIMS									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	WDS001	WDS002	WDS003	WDS004	WDS005
Sampling date / time					22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00
Compound	CAS Number	LOR	Unit		EB2525331-001	EB2525331-002	EB2525331-003	EB2525331-004	EB2525331-005
					Result	Result	Result	Result	Result
EG035T: Total Recoverable Mercury by FIMS - Continued									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	WDS006	WDS007	WDS008	WDS009	----
Sampling date / time				22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00	----	
Compound	CAS Number	LOR	Unit	EB2525331-006	EB2525331-007	EB2525331-008	EB2525331-009	-----	
				Result	Result	Result	Result	----	
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit	5.0	6.0	4.4	4.2	----	
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm	21	6	259	100	----	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	1.6	2.4	1.1	6.1	----	
ED040: Sulfur as SO4 2-									
Sulfate as SO4 2-	14808-79-8	100	mg/kg	210	<100	580	1250	----	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg	10	<10	210	<10	----	
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg	4840	5850	5080	5750	----	
Arsenic	7440-38-2	5	mg/kg	<5	5	<5	7	----	
Barium	7440-39-3	10	mg/kg	60	80	30	50	----	
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	----	
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	----	
Cadmium	7440-43-9	1	mg/kg	1	<1	<1	<1	----	
Chromium	7440-47-3	2	mg/kg	6	7	6	15	----	
Cobalt	7440-48-4	2	mg/kg	22	20	5	3	----	
Copper	7440-50-8	5	mg/kg	195	366	503	1030	----	
Iron	7439-89-6	50	mg/kg	18300	22000	18900	25200	----	
Lead	7439-92-1	5	mg/kg	19	18	15	19	----	
Manganese	7439-96-5	5	mg/kg	348	300	86	99	----	
Nickel	7440-02-0	2	mg/kg	10	11	7	7	----	
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	----	
Vanadium	7440-62-2	5	mg/kg	5	6	6	10	----	
Zinc	7440-66-6	5	mg/kg	241	211	68	150	----	
EG035T: Total Recoverable Mercury by FIMS									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	WDS006	WDS007	WDS008	WDS009	----
Sampling date / time					22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00	22-Jul-2025 09:00	----
Compound	CAS Number	LOR	Unit		EB2525331-006	EB2525331-007	EB2525331-008	EB2525331-009	-----
					Result	Result	Result	Result	----
EG035T: Total Recoverable Mercury by FIMS - Continued									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	0.1	1.2	----