TECHNICAL REPORT

Karara Waste Rock Geochemistry Assessment

Prepared for: **Karara Mining Ltd.**

RGS

MINE WASTE AND
WATER MANAGEMENT

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Executive Summary

Background and Objectives

RGS Environmental Pty Ltd (RGS) was commissioned by Karara Mining Limited (KML) to complete a geochemical and physical assessment of representative waste rock/ potential rehabilitation samples to support long term planning and approvals at Karara (the 'Project') in the Mid-West of Western Australia. The key objective of the assessment was to identify any potential for acid and metalliferous drainage (AMD), including soluble metal/ metalloid and salt release.

The objectives of the RGS scope of work was to complete a geochemical (and selected physical) characterisation of representative samples of waste rock from the Project and use the results obtained to identify any potential for AMD, including soluble metal/metalloid and salt release.

The scope of work involved completing a geochemical (and selected physical) assessment of waste rock materials in accordance with WA mine planning and mine closure guidelines (DMP and EPA, 2015; DMP, 2016a; DMP, 2016b) and other relevant industry guidelines (COA, 2016a; COA, 2016b; COA, 2016c; INAP, 2009). The study included:

- Coordination of sample submission to the relevant laboratory for analysis of the parameters required to confirm the level of risk associated with any geochemical (and selected physical) issues relating to the use of waste rock materials.
- Interpretation of characterisation data and completion of a report presenting the acquired test results and an interpretation of these results in the context of the Project.
- Provision of conclusions and any recommendations.

Sampling and Analytical Plan

RGS developed the sampling and analysis strategy as part of a separate investigation (RGS,2020). KML was responsible for the initial sample selection of 287 samples representative and delivery of these samples to Australian Laboratory Services (ALS) Perth. The consignment was then sent to ALS Brisbane (a NATA accredited laboratory) under the guidance of RGS.

The analytical program was developed by RGS, and designed to quantify the potential for AMD from the presence of reactive sulfides, acid generation, and leaching of soluble metals/metalloids and salts in accordance with relevant mine waste geochemistry and mine closure guidelines (COA, 2016; and DMP and EPA, 2015). A separate physical testing program was undertaken to understand the potential for the waste materials to be used for rehabilitation purposes. The analytical program was separated into two phases of work outlined in **Table A1**.

Table A1: Geochemical and physical analytical program and number of samples

Phase	Parameter	Number of samples
Phase 1	Dry, Crush and Pulverise as/ if required	287
	Paste pH and EC	287
	NAPP (includes Total S and ANC)	287
Phase 2	Sulfur speciation (CRS)	86
	Total organic carbon	86
	Standard Net Acid Generation (NAG)	48
	ABCC	10
	XRD (semi-quantitative)	10
	AMD Material	
	DI water leach (3:1 solid:liquid):	20
	pH, EC, acidity, alkalinity, Cl, SO_4	20
	Nitrogen suite (total N, NO_2, NO_3 and NH_3)	20

Phase	Parameter	Number of samples
	Ca, K, Mg, Na	20
	Metals by ICP-MS (Ag, Al, As, B, Ba, Be, Bi, Cd, Ce, Co, Cr, Cs, Cu, Fe, Ga, Hf, Hg, La, Li, Mn, Mo, Nb, Ni, Pb, Rb, Re, Sb, Se, Si, Sn, Sr, Ta, Th, Tl, Ti, U, V, W, Y, Zn, Zr)	20
	Rehabilitation Material	
	Emerson Aggregate	20
	Particle sizing (coarse and hydrometer)	10
	Bulk Density (composite)	1
	Point load test	10

Key Conclusions

RGS completed a geochemical and physical characterisation program of 287 representative waste rock samples from the Karara pit. The results are summarised below.

- The total sulfur (TS) content of the waste rock samples range from <0.01 %S to 25.5 %S, with mean values of 1.49 %S. Of the 297 samples 89 (31%) have low total sulfur concentrations that are comparable to the average crustal abundance for sulfur of 0.1 % (INAP, 2009). Materials with a sulfur content less than or equal to 0.1 %S are essentially barren of sulfur and have negligible capacity to generate acidity.
- Approximately 52% of total samples have a TS > 0.25% (i.e. the site cut-off for potentially acid forming (PAF) or non-acid forming (NAF) material). With the highest TS concentrations are associated with BIF, Shale, Carbonaceous Shale, Quartz veins, Saprolite (clay) and Mudstone/ Claystone (metapelite).
- Sulfur speciation tests indicate a close positive linear relationship between TS and sulfide sulfur and indicated ~85% of the TS measured in the samples was present as sulfide sulfur.
- The acid neutralising capacity (ANC) for the samples ranges from <0.25 to 97.8 kg H_2SO_4/t and has a mean value of 19.55 kg H_2SO_4/t. The samples with the greatest median ANC are associated with Siltstone, Saprolite (clay) and Dolerite. This is consistent with the carbon speciation tests which indicated the samples were composed almost entirely of inorganic (carbonate) carbon. The lowest median ANC values are associated with Pyroxenite, Saprolite (ferruginous) and Amphibolite samples.
- Classification of the samples according to the AMIRA (2002) (net acid generation (NAG) pH versus net acid production potential (NAPP)) and are displayed indicates the waste rock samples typically fall within the 'PAF' quadrant (25 samples), with 18 samples falling within the 'NAF' quadrant and 4 samples being classified as 'uncertain' though largely falling on the border of 'PAF' and 'uncertain' quadrants. The PAF samples are associated largely with Shale and BIF, Quartzite and Mudstone/ Claystone.
- The TS, NAPP and net potential ratio (NPR) were used to classify the acidic drainage potential of the samples into five waste classes. The classification indicates that 32 % of the 287 samples are NAF-Barren (BAF-B), 22% samples are classified as NAF, 7% samples are classified as Uncertain, 5% samples are classified as PAF-low capacity (-LC) and 31% sample are classified as acid forming (AF).
- The PAF-LC and AF samples are generally associated with Mudstone/ Claystone, Carbonaceous Shale, Shale, BIF (Aegirine rich), Quartzite and Saprolite (clay)) lithologies (**Table A2**). The NAF-B and NAF samples are generally associated with BIF, Saprolite (ferruginous) and Dolerite lithologies (**Table A2**).
- The TS and $EC_{1:2}$ was used as a saline drainage hazard ranking. The samples with a high risk of saline drainage are typically directly associated with AF or PAF-LC samples due to the high TS content (**Table A3**). There were few samples that were classified as NAF-Barren or NAF that also have a high to moderate risk of saline drainage. In these few cases, they were mainly associated with BIF and Saprolite (ferruginous) samples
- Total metal(loid) concentrations in the samples were compared to median crustal abundance for unmineralised soils and the extent of enrichment reported as the geochemical abundance index (GAI).

The GAI indicate some samples were enriched in sulfur (114 samples; typically associate with shales), iron (61 samples; typically associated with BIF ore), magnesium (11 samples), lead (1 sample) and zinc (9 samples).

- The multi-element leach testing of water extracts (1:3 sample:water) showed leached metal(loid)s were typically below instrumental detection limits, with only a few samples that showed elevated leached metal(loid) concentrations for arsenic (two Pyroxenite and a BIF sample). The vast majority of elements are likely to be non-mobile (insoluble) and adsorbed/ structurally incorporated in iron (oxy)hydroxides which are present in the waste rock. The select results verify that the potential for substantial adverse effects from metal(loid)s (i.e. metalliferous drainage) is low.
- The physical analysis of select NAF bedrock samples verifies they are all hard / very hard with an Emerson Class of 3. These rock samples verify that the associated units they were sourced from have the potential to be mined and utilised for construction and rehabilitation. Specific applications for rock with these characteristics may include lining drains, armouring angle of repose slopes or using this rock as a mulch in final slopes with soil cover systems.

Table A1: Acid drainage classification according to lithology

Lithology	NAF (B)	NAF	Uncertain	PAF (LC)	PAF
BIF	44	26	7	0	9
Saprolite (Fe)	34	10			1
Saprolite (clay)	0	0	0	0	4
Pyroxenite	2	1	0	1	1
Siltstone	0	1	0	1	2
Shale	3	9	3	3	48
Quartzite	0	2	4	7	9
Breccia	0	1	0	0	0
Mud/claystone	0	0	1	0	13
Quartz vein	0	0	2	1	1
Dolerite	8	6	2	0	0
Amphibolite	0	2	0	1	0
Carb. shale	3	6	1	1	5
Talc	1	0	0	0	0
Total	**95**	**64**	**20**	**15**	**93**

Table A1: Saline drainage classification according to lithology

Lithology	Negligible	Very Low	Low	Moderate	High
BIF	24	41	6	5	10
Saprolite (Fe)	7	28	5	4	1
Saprolite (clay)	0	0	0	1	3
Pyroxenite	1	2	0	1	1
Siltstone	0	1	0	2	1
Shale	7	17	2	10	30
Quartzite	12	4	0	3	3
Breccia	1	0	0	0	0
Mud/claystone	0	0	0	1	13
Quartz vein	0	3	0	0	1
Dolerite	10	6	0	0	0
Amphibolite	0	0	1	1	1
Carb. shale	10	1	0	3	2
Talc	0	1	0	0	0
Total	**72**	**104**	**14**	**31**	**66**

Recommendations

RGS suggest that KML consider the following recommendations in order to supplement the geochemical testing undertaken as part of this investigation. The additional analyses and programs should include:

- Laboratory kinetic testing (oxygen consumption rate testing and kinetic leach column tests);
- Rehabilitation material sampling and analysis program with a focus on physical testing;
- Develop a waste rock and rehabilitation material classification criteria (i.e. for waste rock and beneficial mine waste that could be used for rehabilitation);
- Develop a waste rock and rehabilitation material block model (or incorporate geochemical and physical properties into the current geological model based on the above classification criteria); and,
- Site surface water and groundwater monitoring.

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1 Introduction

RGS Environmental Pty Ltd (RGS) was commissioned by Karara Mining Limited (KML) to complete a geochemical and physical assessment of representative waste rock/ potential rehabilitation samples to support long term planning and approvals at Karara (the 'Project') in the Mid-West of Western Australia. The key objective of the assessment was to identify any potential for acid and metalliferous drainage (AMD)[1], including soluble metal/ metalloid and salt release.

This factual report summarises the results of static geochemical and physical testing.

1.1 Background

Karara is a magnetite mine located 200 km south-east of Geraldton in the Shire of Perenjori, Western Australia (**Figure 1-1**). It produces a premium, high-grade concentrate product for export (8 Mtpa). With an expected life of more than 30 years, it will underpin a long-term iron ore business. The operation includes a large open pit mine, complex ore processing and beneficiation plant and significant infrastructure and logistics networks.

Magnetite ore is mined from a large-scale open pit mine in a traditional truck-and-shovel mining operation. The magnetite ore, run-of-mine (ROM) material, is direct dumped from the mine into the primary crusher, to crush the ore to a product size of < 60 mm. The crushed ore is then transferred to the coarse ore stockpile (COS), which has a holding capacity of up to 500,000 tonnes. The crushed ore is later transferred to two high-pressure grinding rolls (HPGR's), which grind the ore to a size of < 4 mm and is pumped as a slurry to a magnetic separation, allowing separation of non-magnetic material to tailings. Magnetic material remains as a concentrate and is transferred to the primary grinding plant where the ore material is ground into fine particle sizes (<50 µm) before further magnetic separation to produce a concentrated magnetite ore stream (Fe grades of ~58 %). Finally, the concentrate enters a flotation circuit where it is filtered to produce a premium concentrate product with Fe grades of >65 %. Tailings material generated in the ore treatment process is filtered for dry tails stacking where possible, reducing discharge of tailings to Karara's wet tailings storage facility (TSF), or tailings dam.

The volume of waste rock generated at Karara for a 40-year projected pit shell is expected to be 581.5 million tonnes (GCA, 2008).

1.1.1 Block Model

KML has a block model which consists of 20,045 assay data points from 234 drill holes totalling a drill core length of 37,424.45 m. The assay database includes a comprehensive analysis suite including total sulfur (TS), CaO and MgO which are commonly used to derive a mine waste classification criteria. Within the total database ~2,270 are associated with waste rock. The Karara mine waste classification differentiates potentially acid forming (PAF) waste rock from non-acid forming (NAF) waste rock using a TS cut-off of 0.25%. The TS cut-off value is incorporated in the site block model.

1.1.2 Previous geochemical testing

Several geochemical investigations have been undertaken at KML to characterise the waste rock and assess the risk of waste rock generating acid and metalliferous drainage (AMD). The investigations include:

- Graeme Campbell And Associates Pty Ltd (GCA) (2007a) Karara Magnetite Project. Geochemical Characterisation of Process-Tailings Samples. Implications for Process-Tailings Management, July 2007.

[1] Acid and metalliferous drainage (AMD) refers collectively to acidic, saline and metalliferous (metal(loid)) drainage. AMD is also commonly or formally referred to as acid mine drainage or acid rock drainage (ARD) in other jurisdictions around the world.

- Graeme Campbell and Associates Pty Ltd (2007b) Karara Magnetite Project. Geochemical Characterisation of Topsoil, Regolith, And Waste-Bedrock Samples. Implications for Process-Tailings Management, March 2007.
- Graeme Campbell and Associates Pty Ltd (2008a) Karara Iron Ore Project. Geochemical Characterisation of Mine-Waste And Process-Tailings-Solids Samples. (Static- and Kinetic-Testing) Implications for Mine-Waste Management.
- Graeme Campbell and Associates Pty Ltd (2008b) Mungada Iron Ore Project: Assessment of Mine-Waste Geochemistry – Addendum Report

Soilwater Consultants (SWC) (2013) Hinge deposit Geochemical Characterisation

The earlier waste rock geochemical characterisation investigations by GCA and SWC are associated with the Karara pit shell and neighbouring Hinge Deposit, respectively. The bulk of the samples have been collected from 7 drill holes to provide a total of 95 samples associated with the Karara pit shell. The details of these samples are provided in Table 1.

Table 1: Sample numbers from earlier waste rock characterisation investigations

Lithology types	Additional information	Number samples
Topsoil	NA	1
Regolith	Ferruginous-duricrust; BIF, Shale	20
Bedrock (waste)	Para-amphibolite; BIF-Sulfide; Shale, Other	74
Hinge Deposit	Hinge deposit samples may be related to Karara deposit	20
	Total	**115**

The key waste units contributing to waste rock over the 40-year pit include:

- Reactive waste regolith (i.e. locally pyrite-bearing varieties of the lower-saprolite- and saprock zone oxides); and,
- Reactive waste bedrocks (i.e. sulfide-BIF-, pyritic shale, and pyritic graphitic shale waste bedrocks which generally become more abundant as the BIF/non-BIF contacts are approached).

Approximately 20-25 % of the waste rock is expected to be potentially acid forming (PAF) (namely shale bedrocks) and thus will be contained within isolation PAF cells within the waste rock dump (WRD).

The waste rock estimation as of July 2014 is about 420 million tonnes and approximately 150 million tonnes will be used to backfill pits.

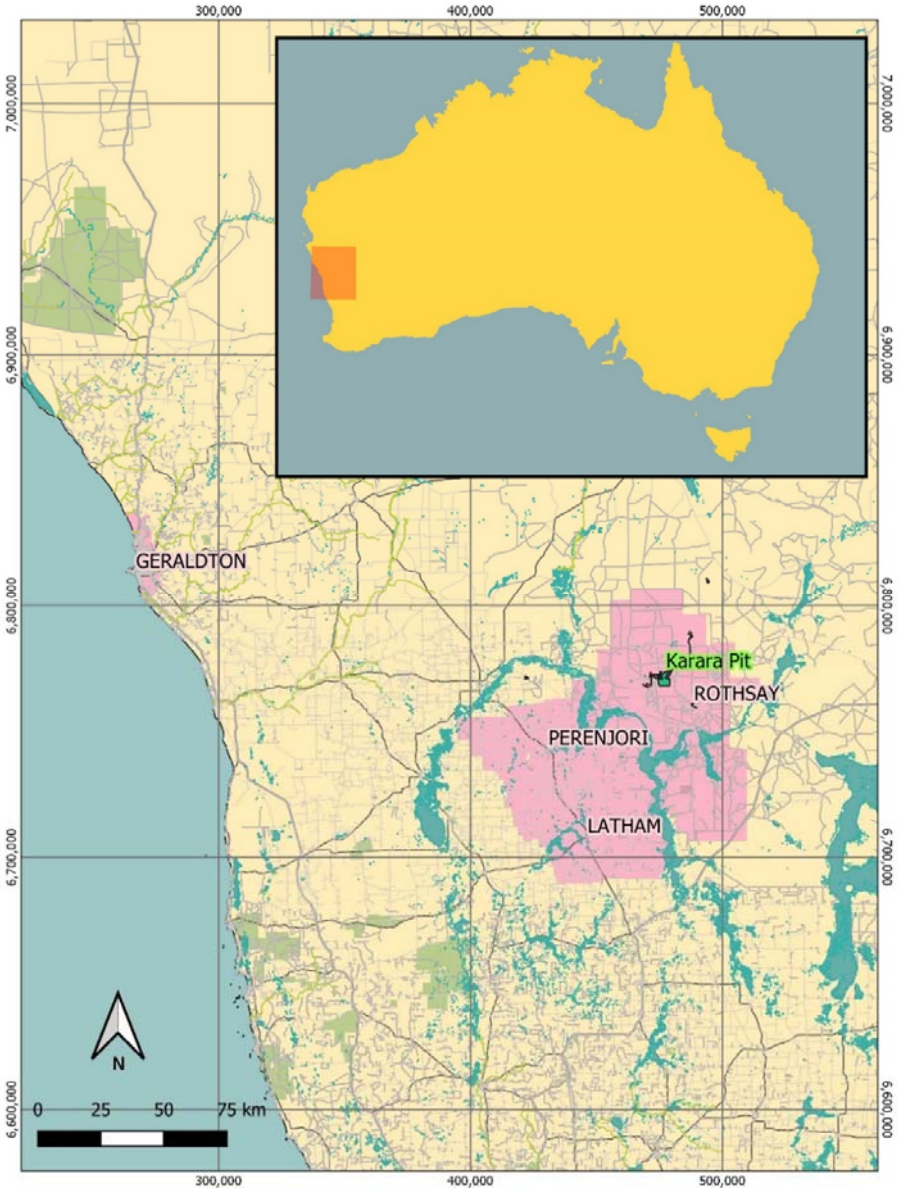


Figure 1-1: Location map for Karara Mine

1.2 Technical guidelines

The waste rock and potential rehabilitation material characterisation program aligns with the requirements of the guidelines listed below and a broader base of guideline information described in the review of existing information (**Section 2.1**).

- Department of Mines and Petroleum (WA) and Environmental Protection Authority (WA). Guidelines for Preparing Mine Closure Plans. May 2015 (DMP and EPA, 2015);
- Department of Mines and Petroleum (WA). Guideline for Mining Proposals in Western Australia. April 2016 (DMP, 2016a); and
- Department of Mines and Petroleum (WA). Draft Guidance. Materials Characterisation Baseline Data Requirements for Mining Proposals. March 2016 (DMP, 2016b).

The objective of the waste rock and potential rehabilitation material program was to assess the potential for mine materials to generate acid and metalliferous drainage (AMD), neutral mine drainage (NMD), saline drainage and/or display dispersive characteristics, in order to minimise the risk of any significant environmental harm to the immediate and downstream environment. Characterisation of waste rock materials was completed to define the geochemical characteristics of these materials and ensure that these materials will perform according to mine planning expectations.

1.3 Geochemical assessment and report structure

The sampling and geochemical test program used for the Project was designed to obtain and characterise representative samples of waste rock material likely to be disturbed as part of the Project. RGS personnel completed a review of existing geochemical information on the Project (RGS, 2020) and coordinated the sampling program with KML personnel. The detailed methodology used for the review and sampling and testing program is described in **Section 2**.

Representative samples of waste rock materials were collected and transferred to ALS Brisbane laboratory (ALS) for static geochemical (and physical) testing. A sub-set of samples was sent to TriLab Laboratory Brisbane for physical analysis.

The material characterisation program was completed to align with the WA mine planning, material characterisation and mine closure guidelines listed in **Section 1.2**.

A review and data gap analysis of existing information on waste rock and soil materials was completed by RGS and is presented in a separate report (RGS, 2020). The geochemical results obtained from the geochemical (and selected physical) test program on the waste rock sample materials are presented at **Section 3**. Classification of the materials in terms of acid, saline and metalliferous drainage is provided in **Section 4**.

The main conclusions and any recommendations from the Project are presented at **Section 5**. A complete list of references relied upon to complete this report are presented at **Section 6**.

1.4 Scope of Work

The objectives of the RGS scope of work was to complete a geochemical (and selected physical) characterisation of representative samples of waste rock from the Project and use the results obtained to identify any potential for AMD, including soluble metal/metalloid and salt release.

The scope of work involved completing a geochemical (and selected physical) assessment of waste rock materials in accordance with WA mine planning and mine closure guidelines (DMP and EPA, 2015; DMP, 2016a; DMP, 2016b) and other relevant industry guidelines (COA, 2016a; COA, 2016b; COA, 2016c; INAP, 2009). The study included:

- A review of existing information to define the level of further geochemical and any other (e.g., physical) characterisation work required for materials likely to be generated at the Project (provided in a separate report; RGS, 2020).
- Provision of advice on any gaps existing for material assessment and selection of representative samples of in-pit materials for characterisation (provided in a separate report; RGS, 2020).
- Coordination of sample submission to the relevant laboratory for analysis of the parameters required to confirm the level of risk associated with any geochemical (and selected physical) issues relating to the use of waste rock materials.
- Interpretation of characterisation data and completion of a report presenting the acquired test results and an interpretation of these results in the context of the Project.
- Provision of conclusions and any recommendations.

2 Methodology

As part of the review and data gap analysis, RGS developed a Geochemical and Physical Sampling and Analysis Plan (GaPSaAP) for waste rock and potential rehabilitation materials in order to address the knowledge gaps (RGS, 2020). The specific samples identified in the GaPSaAP were not available, so RGS worked closely with KML personnel to provide alterative waste rock and potential rehabilitation material samples for the Project.

2.1 Review of existing information

A review of existing information was completed by RGS to understand the level of additional geochemical (and selected physical) characterisation information for materials likely to be required for the Project. The review was completed using information provided by KML personnel including a Project description, assay database, proposed pit shells and disturbance boundary. The review was completed to address part of the objectives and scope of work described in **Section 1.5**, and acknowledged the following requirements and information:

- Department of Mines and Petroleum (WA) and Environmental Protection Authority (WA). *Guidelines for Preparing Mine Closure Plans*. May 2015. (DMP and EPA 2015).
- Department of Mines and Petroleum (WA). *Guideline for Mining Proposals in Western Australia*. April 2016 (DMP, 2016a).
- Department of Mines and Petroleum (WA). Draft Guidance. Materials Characterisation Baseline Data Requirements for Mining Proposals. March 2016 (DMP, 2016b).
- Commonwealth of Australia (2016). Mine Closure. Leading Practice Sustainable Development Program for the Mining Industry, September 2016 (COA, 2016a).
- Commonwealth of Australia (2016). Mine Rehabilitation. Leading Practice Sustainable Development Program for the Mining Industry, September (COA, 2016b).
- Commonwealth of Australia (2016). Preventing Acid and Metalliferous Drainage. Leading Practice Sustainable Development Program for the Mining Industry. September (COA, 2016c).
- INAP 2019, Global Acid Rock Drainage Guide (GARD Guide), International Network for Acid Prevention (http://www.gardguide.com/).

2.2 Sampling Program

The sampling methodology used to obtain representative samples of waste rock materials and was completed in accordance with the WA mine planning (DMP, 2016a; DMP, 2016b) and mine closure (DMP and EPA, 2015) guidelines cited in **Section 2.1**. Whilst there are no specific regulatory requirements regarding the exact number of samples required, existing risk-based technical guidelines for the geochemical assessment of mine rock in Australia (AMIRA, 2002; COA, 2016) and worldwide (INAP, 2019) were utilised by RGS as a framework for the sampling program.

The sampling strategy was based on:

- existing knowledge of the geology/stratigraphy of the site, likely geochemistry of the waste materials and expected low potential for any significant environmental or health impacts;
- size of operation and material volumes;
- sample representation requirements;
- level of confidence in predictive ability; and
- cost.

RGS was provided an excel file containing the associated sampling locations and assay results undertaken by KML. The samples were collected from both historical diamond core stored in a core shed on site and by excavation of fresh waste rock from within the pit.

The drill hole and excavator locations from which samples were selected is in **Figure 2-1**.

KML was responsible for sampling and delivery of samples to Australian Laboratory Services (ALS) Perth. The consignment was then sent to ALS Brisbane (a NATA accredited laboratory) under the guidance of RGS. A sub-set of the samples was also sent to TriLab Brisbane for physical testing. RGS understands that the samples selected are representative of the ores and waste rock material types of the Project.

The total number of samples selected for the geochemical and physical characterisation program was 287; a breakdown of the sample numbers according to lithology and site material types is in **Table 2-1** and **Table 2-2**, respectively. The site classification criteria for high-grade ore, low grade ore and waste rock is also summarised in **Table 2-2**.

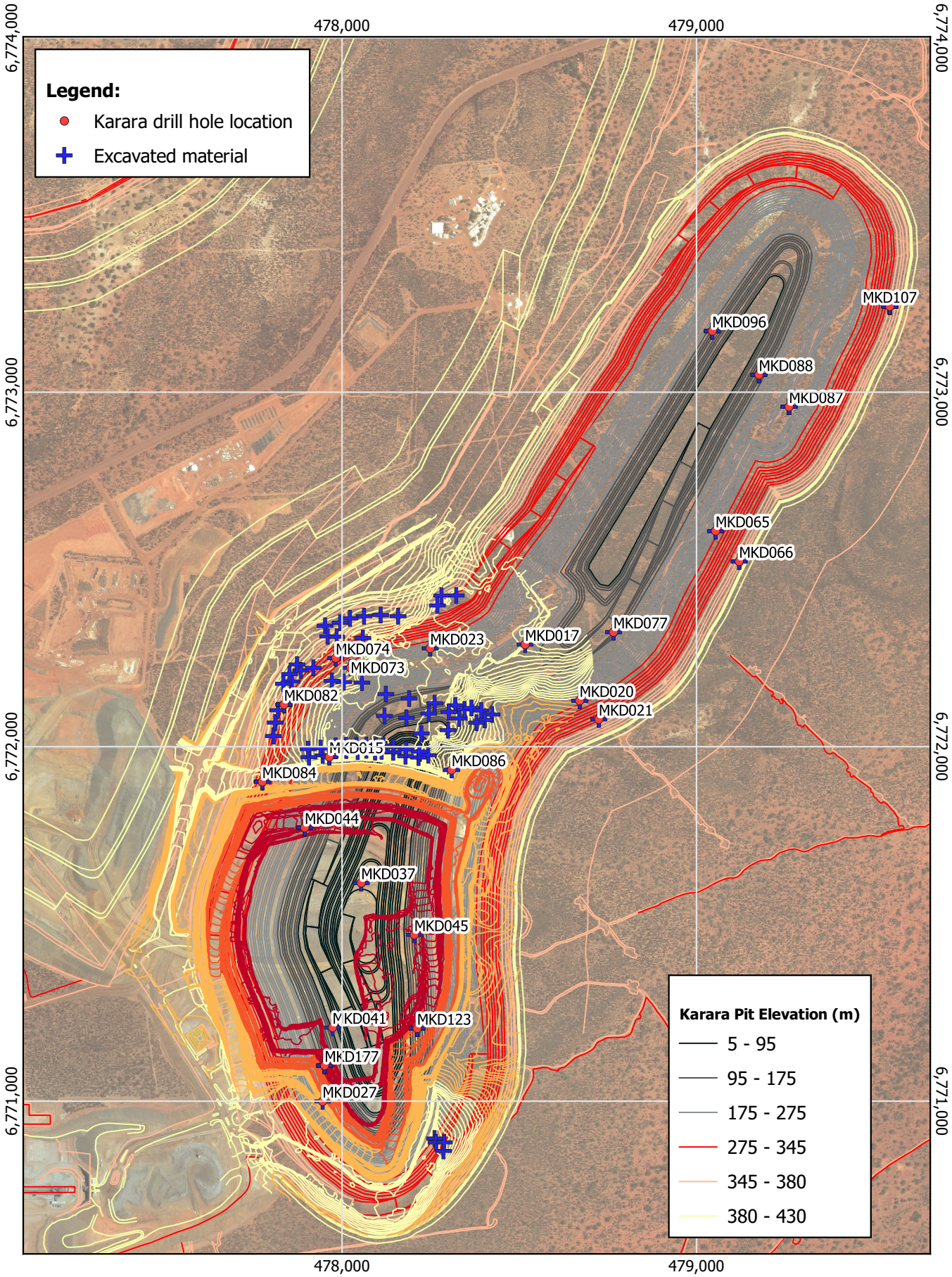
The number of samples in the current assessment was selected to provide a good representation of the waste rock materials likely to be generated by the Project, whilst considering the geochemical testing already undertaken by others (**Section 1.1.2**) and the comprehensive assay database held by KML.

Table 2-1: Summary of samples selected for geochemical and physical testing according to lithology

Lithology	Code	Number of Samples
Banded Iron Formation	BIF	86
Saprolite - ferruginous	Saprolite (Fe)	45
Saprolite - clay	Saprolite (clay)	4
Pyroxenite	Pyroxenite	5
Siltstone	Siltstone	4
Shale	Shale	66
Quartzite	Quartzite	22
Tectonic breccia, cataclasite	Breccia	1
Mudstone, claystone, metapelite - undivided	Mud/claystone	14
Quartz vein	Quartz vein	4
Dolerite	Dolerite	16
Amphibolite	Amphibolite	3
Carbonaceous Shale	Carb. shale	16
Talc-tremolite (-carbonate) schist/ rock	Talc	1
Total		**287**

Table 2-2: Summary of samples selected for geochemical and physical testing according to site classification criteria

Type	Site Material Type (criteria)	Number of Samples
High-grade ore	MGP: Magnetite > 30%, S < 0.05%, Al_2O_3 < 1.1%	43
	MGO: Magnetite > 30%, 0.05% <S <0.16%, Al_2O_3 < 1.1%	4
	MGG: Magnetite > 30%, S < 0.16%, Al_2O_3 < 1.1%	3
	MGY: Magnetite > 30%, S > 0.16%, Al_2O_3 > 1.1%	41
Low grade	MGB: Magnetite 25 - 30%	48
Waste	PAF_{waste}: Magnetite < 25%, S ≥ 0.25%	111
	NAF_{waste}: Magnetite < 25%, S < 0.25%	37
Total		**287**



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RGS MINE WASTE AND WATER MANAGEMENT	Scale: 1: 15,000 Datum: GDA 94, MGA 50	2020009 Karara	0 250 500 m
	2020009_Karara .qgz	**Karara Site Sampling Points**	Figure: 2-1 Job Number: 2020009 15/12/2020 N

2.3 Geochemical Testing

The 287 samples received by ALS laboratory were prepared for geochemical testing by crushing to pass 10 mm (where necessary), sub-sampling and pulverising to ≤ 75 µm particle size. This standard laboratory procedure provides a more homogenous sample but also generates a larger sample surface area in contact with the resultant assay solution, thereby providing greater potential for dissolution and reaction, and represents an assumed initial 'worst case' scenario for these materials.

The analytical program was developed by RGS. A series of analytical methods were completed on the samples. The analytical program was designed to quantify the potential for AMD from the presence of reactive sulfides, acid generation, and leaching of soluble metals/metalloids and salts in accordance with relevant mine waste geochemistry and mine closure guidelines (COA, 2016; and DMP and EPA, 2015). The assessment also included physical characterisation of potential rehabilitation materials.

The analytical program was separated into two phases of work outlined in **The sampling** methodology used to obtain representative samples of waste rock materials and was completed in accordance with the WA mine planning (DMP, 2016a; DMP, 2016b) and mine closure (DMP and EPA, 2015) guidelines cited in **Section 2.1.** Whilst there are no specific regulatory requirements regarding the exact number of samples required, existing risk-based technical guidelines for the geochemical assessment of mine rock in Australia (AMIRA, 2002; COA, 2016) and worldwide (INAP, 2019) were utilised by RGS as a framework for the sampling program.

The sampling strategy was based on:

- existing knowledge of the geology/stratigraphy of the site, likely geochemistry of the waste materials and expected low potential for any significant environmental or health impacts;
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- level of confidence in predictive ability; and
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KML was responsible for sampling and delivery of samples to Australian Laboratory Services (ALS) Perth. The consignment was then sent to ALS Brisbane (a NATA accredited laboratory) under the guidance of RGS. A sub-set of the samples was also sent to TriLab Brisbane for physical testing. RGS understands that the samples selected are representative of the ores and waste rock material types of the Project.

The total number of samples selected for the geochemical and physical characterisation program was 287; a breakdown of the sample numbers according to lithology and site material types is in **Table 2-1** and **Table 2-2,** respectively. The site classification criteria for high-grade ore, low grade ore and waste rock is also summarised in **Table 2-2.**

The number of samples in the current assessment was selected to provide a good representation of the waste rock materials likely to be generated by the Project, whilst considering the geochemical testing already undertaken by others (**Section 1.1.2**) and the comprehensive assay database held by KML.

Table 2-1.

A summary of the parameters typically involved in completing a static geochemical characterisation of mine waste materials is provided in **Attachment A**.

Table 2-3 Geochemical characterisation program and number of samples

Phase	Parameter	Number of samples
Phase 1	Dry, Crush and Pulverise as/ if required	287
	Paste pH and EC	287
	NAPP (includes Total S and ANC)	287
Phase 2	Sulfur speciation (CRS)	86
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	ABCC	10
	XRD (semi-quantitative)	10
	AMD Material	
	DI water leach (3:1 solid:liquid):	20
	pH, EC, acidity, alkalinity, Cl, SO_4	20
	Nitrogen suite (total N, NO_2, NO_3 and NH_3)	20
	Ca, K, Mg, Na	20
	Metals by ICP-MS (Ag, Al, As, B, Ba, Be, Bi, Cd, Ce, Co, Cr, Cs, Cu, Fe, Ga, Hf, Hg, La, Li, Mn, Mo, Nb, Ni, Pb, Rb, Re, Sb, Se, Si, Sn, Sr, Ta, Th, Tl, Ti, U, V, W, Y, Zn, Zr)	20
	Rehabilitation Material	
	Emerson Aggregate	20
	Particle sizing (coarse and hydrometer)	10
	Bulk Density (composite)	1
	Point load test	10

2.3.1 Static geochemical and physical tests

Static geochemical tests were completed to screen all samples before selecting individual samples for more detailed static and mineralogical tests.

Acid Base Accounting (ABA) was undertaken to quantify the pH, electrical conductivity (EC) and net acid producing potential (NAPP) of 297 samples. The ABA screening procedure included static geochemical testing according to the following methods:

- Paste pH and Electrical conductivity (EC) [USEPA 600/2 – 78 - 054];
- Total sulfur [LECO method]; and,
- Acid neutralising capacity (ANC) [AMIRA, 2002 method].

From the total sulfur and ANC results, the maximum potential acidity (MPA) and NAPP values were inferred.

Eighty-six (86) samples with a total sulfur concentration of greater than 0.1 %S were subjected to the Chromium Reducible Sulfur (Scr) test to determine the sulfide sulfur content of the samples (AS 4969.7, 2008 method). The Scr test provides a more accurate representation of the MPA, as acid generation primarily forms from the reactive sulfide measured by this method.

Based on the results of the ABA screening and whole rock multi-element tests, samples were selected for more comprehensive static testing. The selection of these samples considered material type, location and lithology type. The selected samples were specifically tested for:

- Total Organic Carbon, Total Inorganic Carbon and Total Carbon [LECO method];
- Single addition Net Acid Generation (NAG) tests (Miller, 1998);
- Acid Buffering Characterisation Curve (ABCC) [Miller and Jeffery, 1995] (to be reported as an addendum);
- X-Ray Diffraction (XRD) (semi-quantitative); and,

- DI Water Leach (2:1 solid: liquid; 12 hr tumble) with subsequent analysis off:
    - pH and EC (2:1 leach, probes and meter);
    - Acidity and alkalinity (automatic titrator measured as $CaCO_3$);
    - Dissolved major anions (Cl, SO4) [ICP-AES];
    - Nitrogen suite (Total Nitrogen + NO_2 + NO_3 + NH_3);
    - Dissolved major cations (Ca, Mg, Na and K) [ICP-AES]; and,
    - Dissolved metals/metalloids (Ag, Al, As, B, Ba, Be, Bi, Cd, Ce, Co, Cr, Cs, Cu, Fe, Ga, Hf, Hg, La, Li, Mn, Mo, Nb, Ni, Pb, Rb, Re, Sb, Se, Si, Sn, Sr, Ta, Th, Tl, Ti, U, V, W, Y, Zn, Zr) [ICP-AES and FIMS].

A series of physical tests were selected to assess the potential for deep bedrock material to be used for rehabilitation purposes. A sub-set of 'as received' samples were sent to TriLab Laboratories Brisbane and the following tests undertaken:

- Emmerson Aggregate tests ()
- Particle size distribution (coarse fraction)
- Point load tests
- Bulk density (of a composite sample).

3 Results

Results are discussed according to key stratigraphical and lithological domains encountered within the GBO.

Summary results tables for the geochemical test programs are provided in **Attachment B** and consist of:

- **Table B1:** Acid Base Account (ABA) Test Results
- **Table B3:** Geochemical Abundance Index (GAI)

The raw ALS test results for the static geochemical test program are provided in **Attachment C**.

3.1 Acid Base Account Results

An explanation of the terminology used in this section, including a description of the ABA test methodology, is provided in **Attachment A**. Complete ABA results for the 287 samples are in **Attachment B** and the associated laboratory certificated are provided in **Attachment C.** The key ABA data trends are summarised in the following sections.

3.1.1 Paste pH

The paste pH values range from pH 4.1 (slightly acidic) to 10.6 (basic/ alkaline) (**Figure 3-1**; **Figure 3-2)** with a mean of 8.6. The majority of samples have a neutral to basic paste pH. The BIF and Saprolite (ferruginous) samples can be separated into two distinct groups: The alkaline paste pH values are associated with either Aegirine rich BIF or BIF sampled below the pre-mining water table, and those collected from the shallower (oxidised) BIF. This is also evident for the Saprolite (ferruginous) samples.

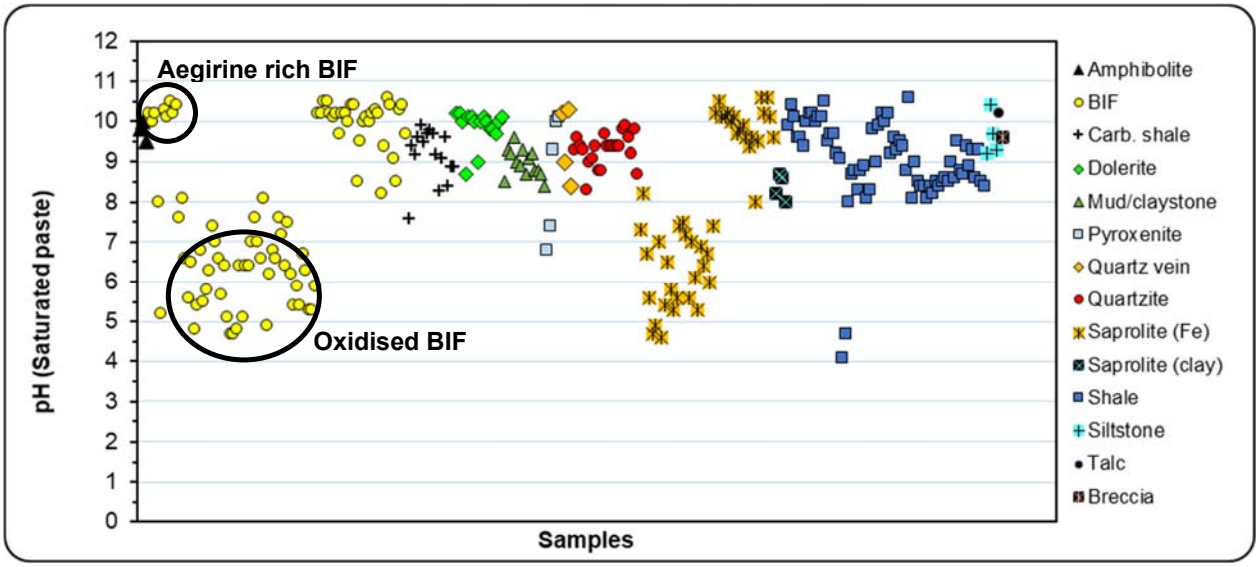

Figure 3-1: Saturated paste pH for Karara waste rock according to lithology type.

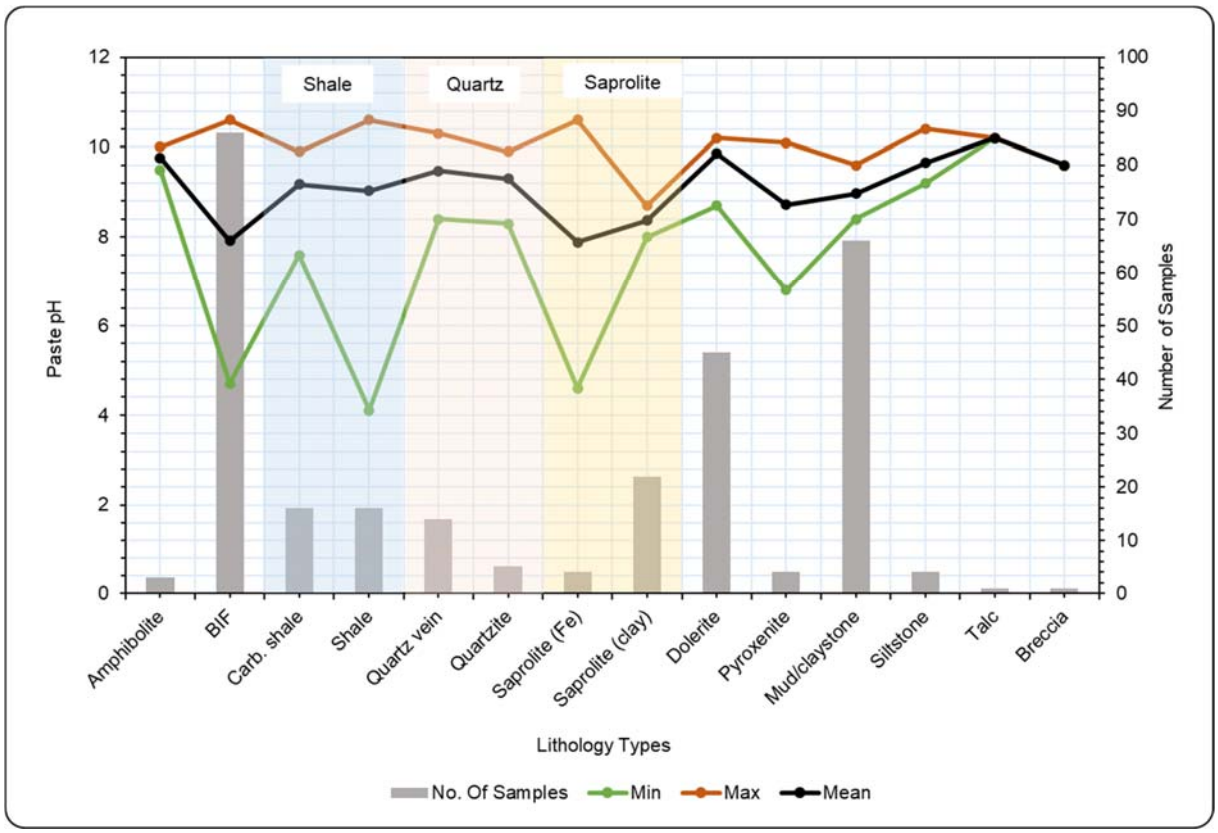

Figure 3-2 Statistics of saturated paste pH for Karara waste rock according to lithology type.

3.1.2 Paste EC

The paste EC of the 287 samples ranges from 148 to 15,550 µS/cm (**Figure 3-3**), with a mean value of 1,034 µS/cm. The paste EC values are generally higher in the shallower oxidised samples (e.g. Saprolite and oxidised BIF).

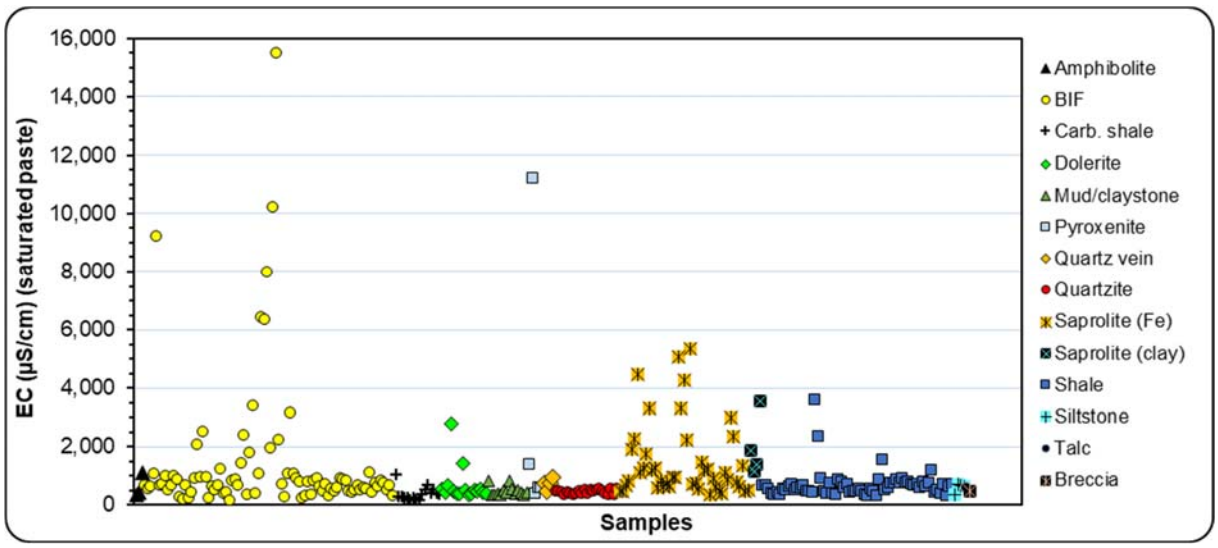

Figure 3-3: Saturated paste EC for Karara waste rock according to lithology type.

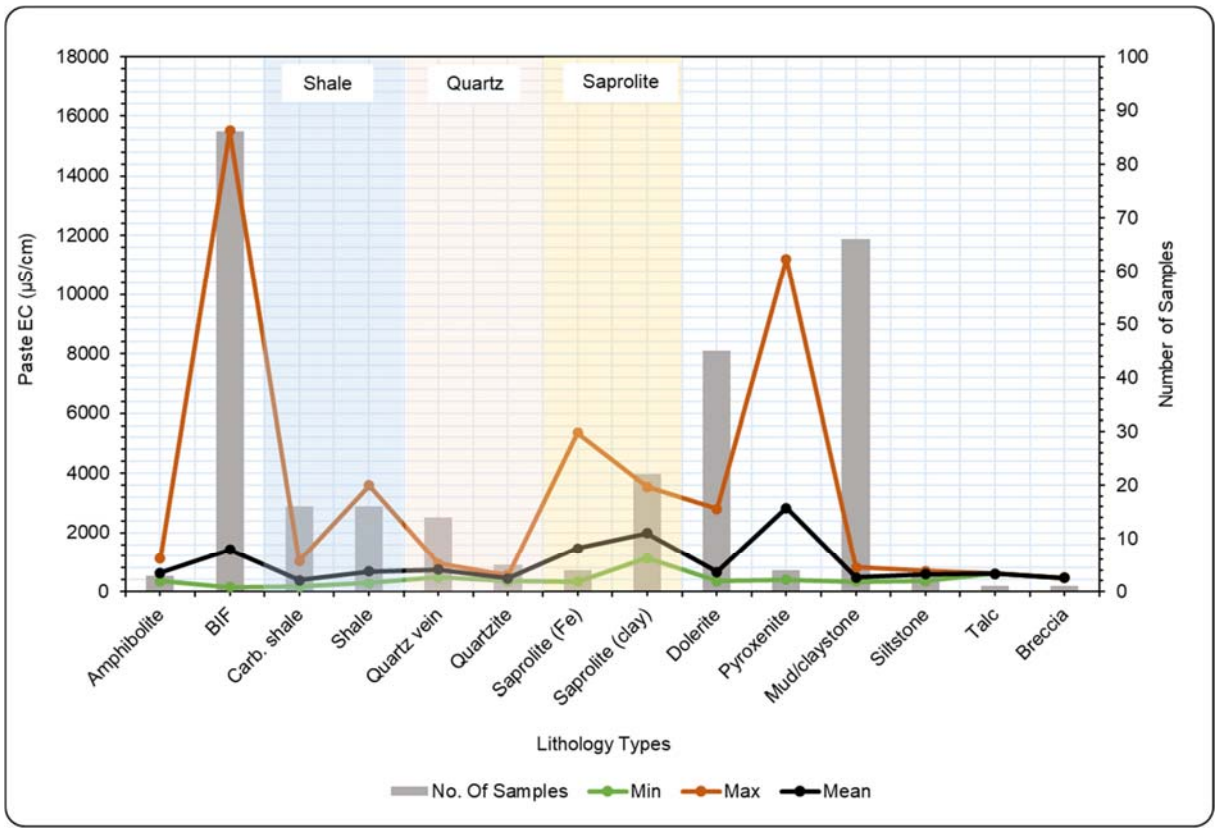

Figure 3-4: Statistics of saturated paste EC for Karara waste rock according to lithology type.

3.1.3 Total sulfur and sulfide sulfur

Sulfide-bearing minerals are the primary source of acidity. The TS content of the KML samples range from <0.01 %S (below instrumental detection limits (IDL) to 25.5 %S (**Figure 3-5**), with mean values of 1.49 %S. The total sulfur measured in 89 samples is less than or equal to the median crustal abundance (0.1 %S) of sulfur (Bowen, 1979; INAP, 2009). Materials with a TS content less than or equal to 0.1 %S are essentially barren of sulfur and have negligible capacity to generate additional acidity[2].

Approximately 52% of total samples have a TS > 0.25% (i.e. the site cut-off for PAF or NAF material). The highest TS concentrations are associated with BIF, Shale, Carbonaceous Shale, Quartz veins, Saprolite (clay) and Mudstone/ Claystone (metapelite) (**Figure 3-6**).

The CRS method measures the sulfide sulfur content or un-oxidised portion of sulfur (e.g. pyrite and marcasite). CRS was measured on select samples with a TS > 0.1% (**Figure 3-7**). The results indicate a close positive linear relationship between TS and sulfide sulfur (**Figure 3-7**) and indicated ~85% of the TS measured in the samples was present as sulfide sulfur.

[2] The average crustal abundance of sulfur is approximately 0.1 % (INAP, 2009).

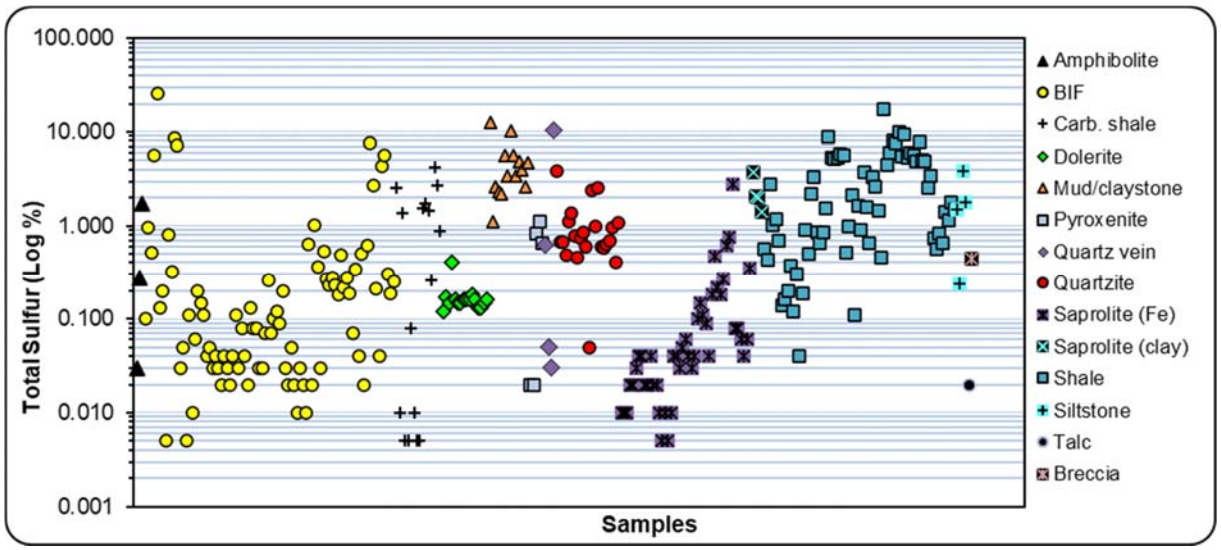

Figure 3-5: Total sulfur for Karara waste rock according to lithology type.

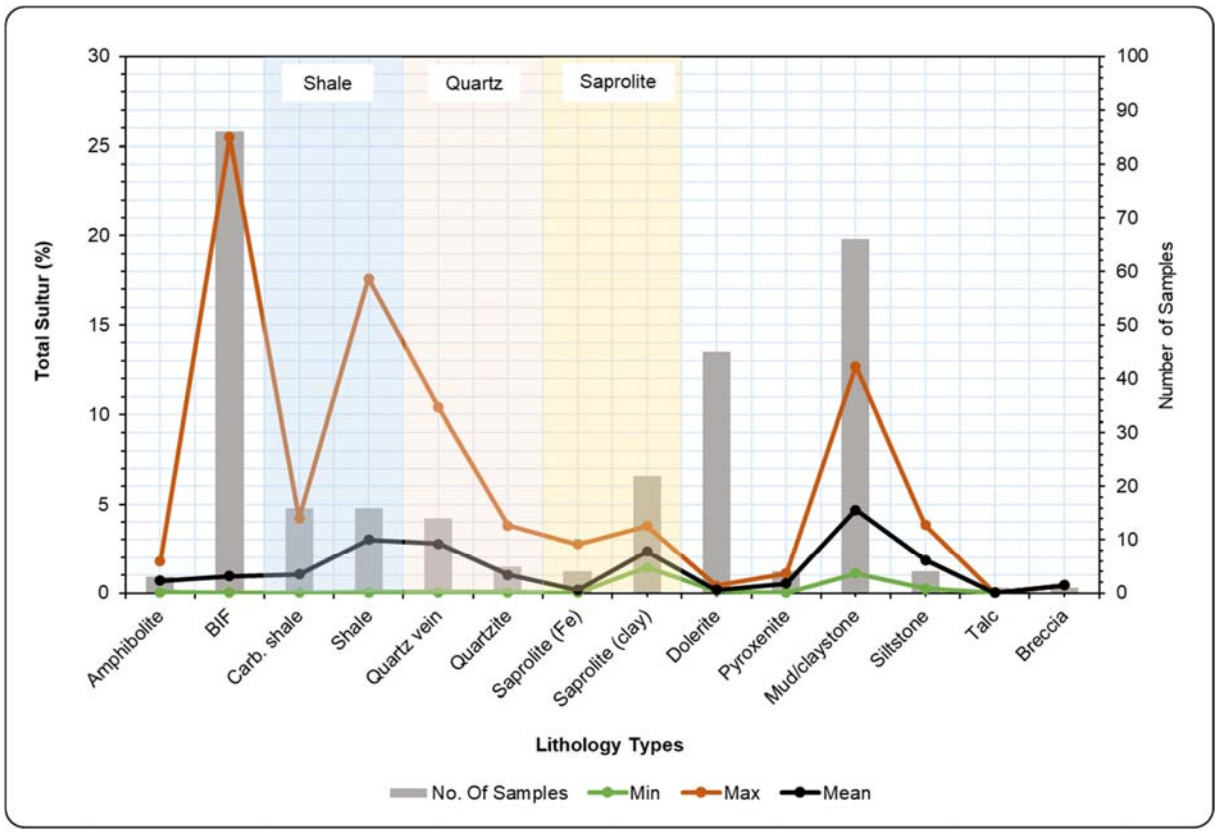

Figure 3-6: Statistics of total sulfur for Karara waste rock according to lithology type.

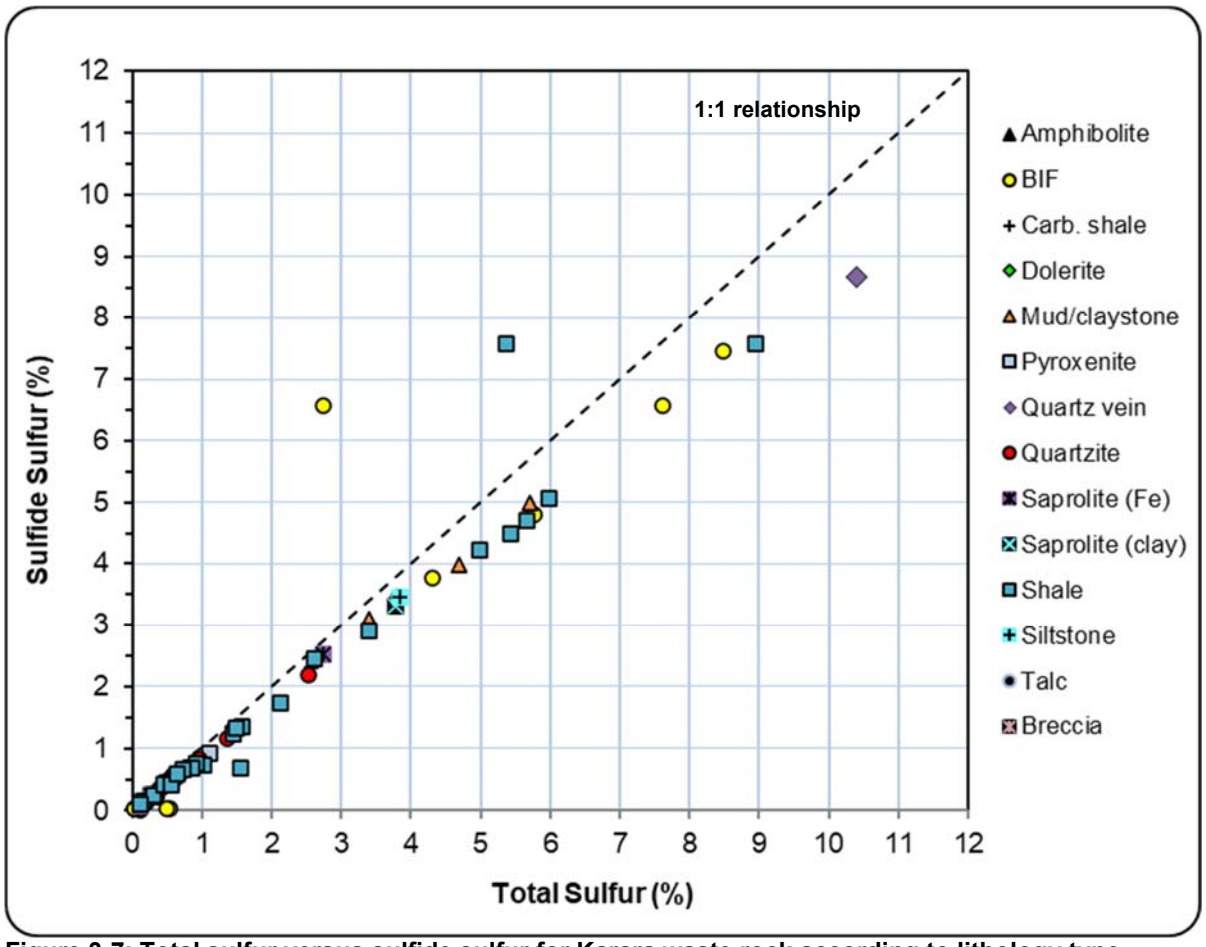

Figure 3-7: Total sulfur versus sulfide sulfur for Karara waste rock according to lithology type

3.1.4 Maximum Potential Acidity

The MPA is inferred using TS (i.e. TS x 30.625) and assumes that all TS is present as pyrite and will completely oxidise to produce actual acidity. CRS was used to infer MPA for those samples where CRS was measured. The MPA ranges from negligible to 780.9 kg H_2SO_4/t with a median and mean value of 8.6 and 45.5 kg H_2SO_4/t, respectively.

3.1.5 Acid Neutralisation Capacity (ANC)

The ANC results for each lithological unit is summarised in **Table 3-1**. The ANC values for the 287 samples ranges from <0.25 to 97.8 kg H_2SO_4/t and has a mean value of 19.55 kg H_2SO_4/t. The samples with the greatest median ANC are associated with Siltstone, Saprolite (clay) and Dolerite, while the lowest median ANC values are associated with Pyroxenite, Saprolite (ferruginous) and Amphibolite samples.

Table 3-1 Summary statistics of measured ANC according to lithology

Lithology	Min	Max	Mean	Median	Count
BIF	0.25	92.4	19.44	12.8	86
Saprolite (Fe)	3.8	62.6	18.51	9.5	4
Saprolite (clay)	19.3	36.4	26.63	25.4	22
Pyroxenite	2.9	28.8	14.24	7.4	4
Siltstone	14	65.8	45.80	51.7	4
Shale	0.25	97.8	20.19	14.95	16
Quartzite	8	35.1	14.58	14.25	5
Breccia	35.1	35.1	35.10	35.1	1
Mud/claystone	14	29.7	19.02	18.25	66
Quartz vein	15.6	63.4	38.65	37.8	14
Dolerite	9.3	27.2	20.65	20.05	45
Amphibolite	10.6	32.2	17.90	10.9	3
Carb. shale	9.1	22.5	13.64	12.85	16
Talc	36.2	36.2	36.20	36.2	1

3.1.6 Carbon Speciation

Carbon speciation testing was undertaken on 86 waste rock samples to determine the proportion of total carbon (TC), total organic carbon (TOC) and total inorganic carbon (TIC) (by calculation). Inorganic carbon is typically associated with carbonate minerals which may provide ANC (e.g. calcite and dolomite), whereas organic carbon has no ability to neutralise any acidity that may be formed.

Total carbon ranged between <0.001% to 3.46% with a mean of 0.65%. The TIC and TOC of the samples was highly variable within most lithology types. The only exceptions were Dolomite which was only composed of TIC (carbonates), while Carbonaceous Shale, Pyroxenite and Quartzite were only composed of TOC.

3.1.7 Net Acid Production Potential (NAPP)

The NAPP is the balance between the capacity of a sample to generate acidity (MPA) minus its capacity to neutralise acidity (ANC). The calculated NAPP values for all the waste rock samples range from -86.9 to +780.7 kg H_2SO_4/t and are provided in **Figure 3-8** according to lithology type. A summary of the number of samples with a positive NAPP according to lithology type are shown in **Table 3-2.** Positive NAPP values (NAPP > +10 kg H_2SO_4/t) are generally associated largely with Shale, Saprolite (clay) and Mudstone/ Claystone.

Table 3-2 Number of samples for positive NAPP values (>0 kg H_2SO_4/t) across lithology types

Lithology	Number of samples	Number of samples: NAPP > 0 kg H_2SO_4/t	Number of samples (%): NAPP > 10 kg H_2SO_4/t
BIF	86	15	8 (9.3%)
Saprolite (Fe)	45	1	1 (2.2%)
Saprolite (clay)	4	4	4 (100%)
Pyroxenite	5	2	1 (20%)
Siltstone	4	2	2 (50%)
Shale	66	50	46 (70%)
Quartzite	22	17	9 (41%)
Breccia	1	0	0 (0%)
Mud/claystone	14	14	13 (93%)
Quartz vein	4	1	1 (25%)
Dolerite	16	0	0 (0%)
Amphibolite	3	1	1 (33%)
Carb. shale	16	8	7 (44%)
Talc	1	0	0 (0%)

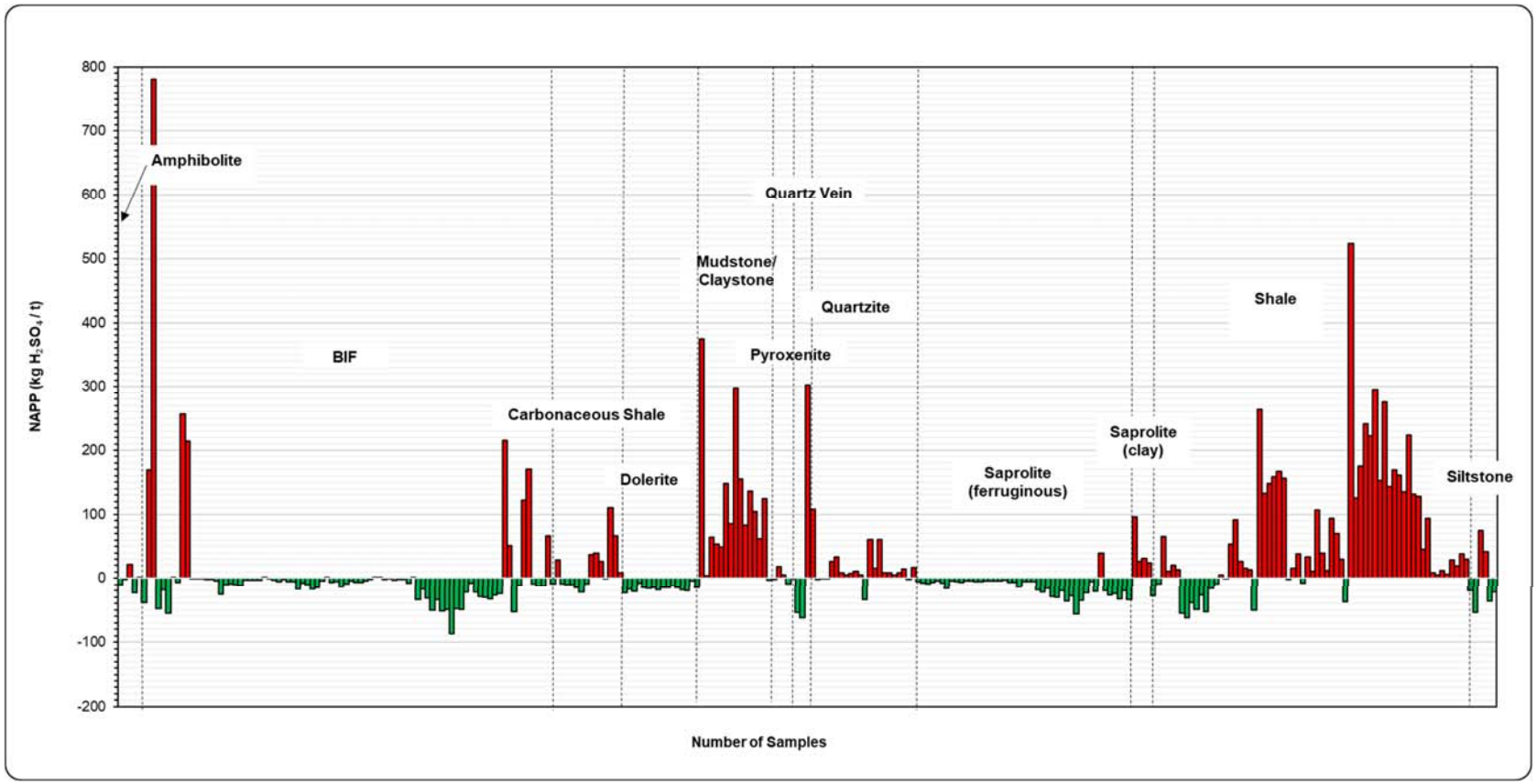

Figure 3-8: NAPP for Karara waste rock according to lithology.

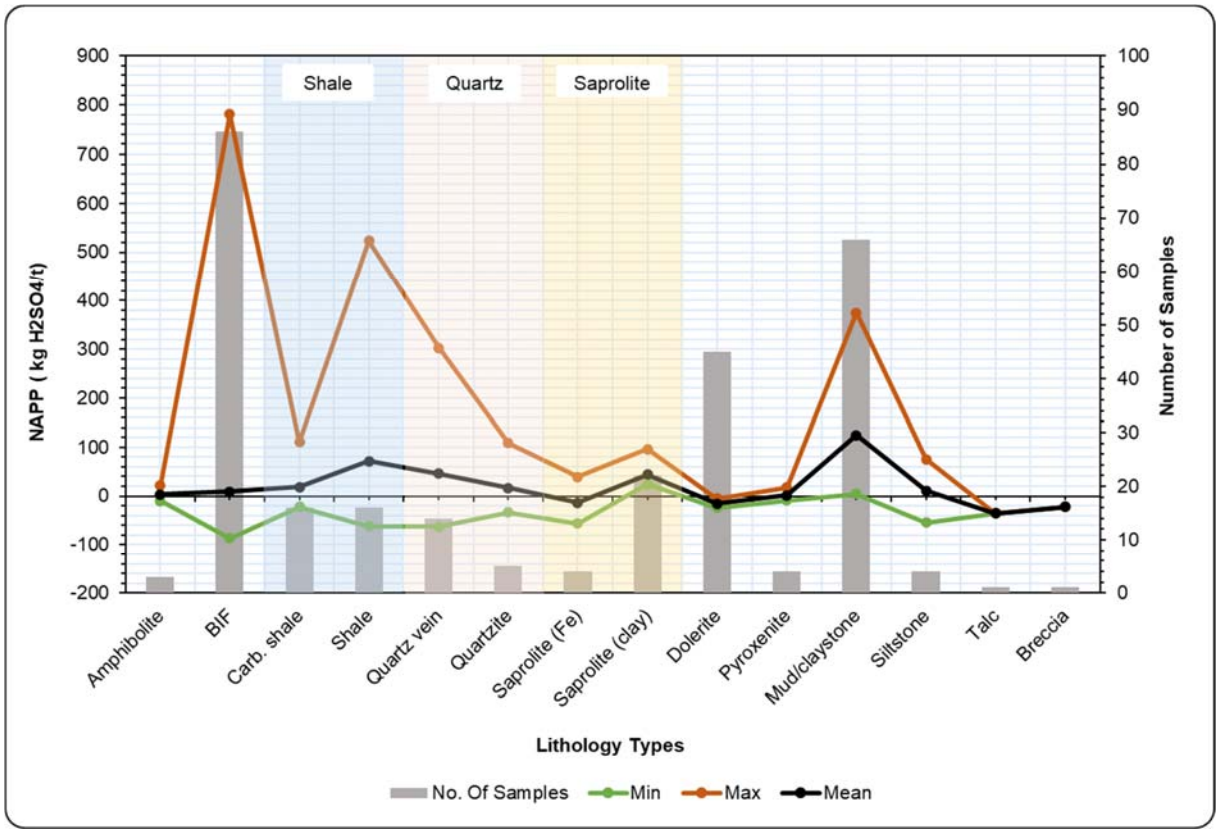

Figure 3-9: Statistics of NAPP (kg H_2SO_4/ t) for Karara waste rock according to lithology type.

3.1.8 Net Potential Ratio (NPR)

The ANC:MPA ratio, referred to as the Net Potential Ratio (NPR), of the waste rock samples ranges from <0.01 to 360.5, with a median and mean value of 2.1 and 7.5, respectively. **Figure 3-10** shows a plot of ANC versus MPA for the 287 waste rock samples. ANC:MPA ratio lines have been plotted on the graph to illustrate the factor of safety associated with the samples. Generally, those samples with an NPR of greater than 2 or sulfur content < 0.1% are considered to represent material with a low to negligible risk of generating additional acidity and generally have a high factor of safety in terms of potential for AMD (COA, 2016; INAP, 2009). There are 171 waste rock samples tested that fall outside the negligible to low-risk domains in the figure and therefore the majority of samples tested have a low factor of safety and high risk of acid generation.

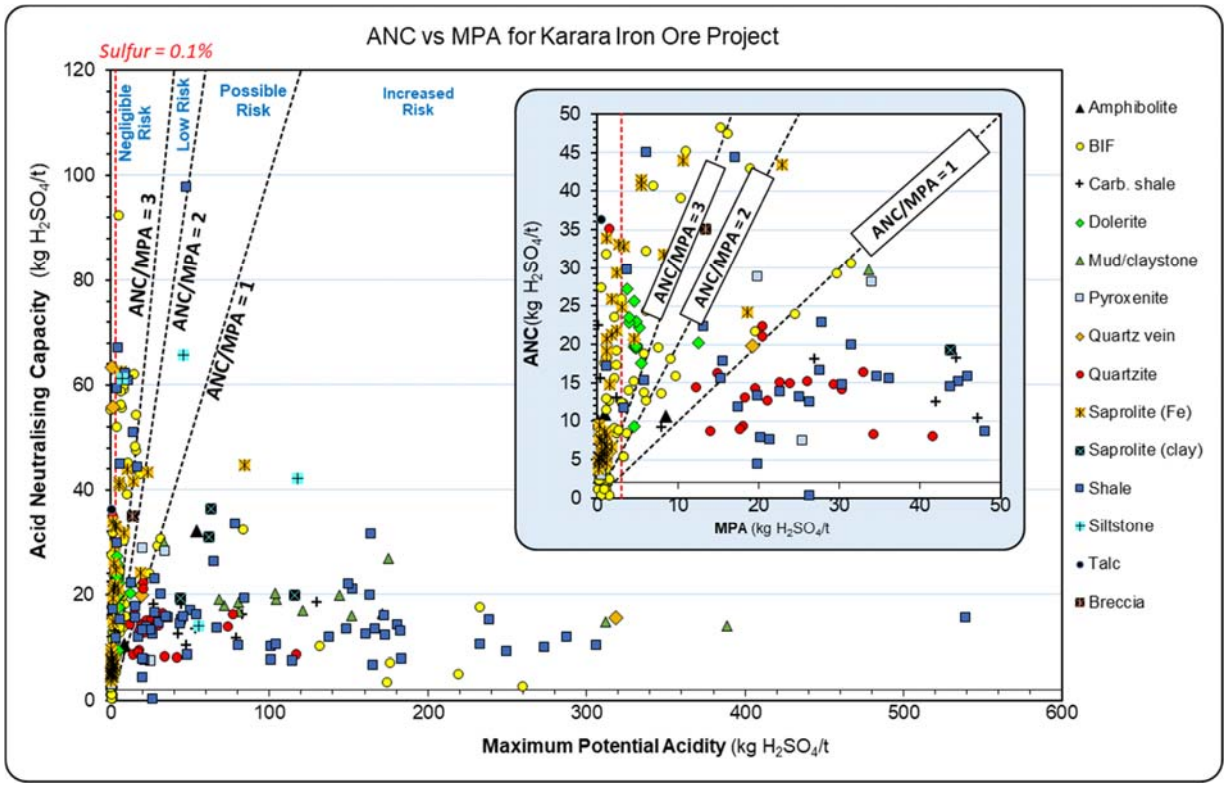

Figure 3-10: ANC versus MPA for Karara waste rock according to lithology.

3.1.9 Net Acid Generation (NAG)

An explanation of the terminology used in this section, including a description of the NAG test methodology, is provided at **Attachment A**. Of the 48 samples tested, 29 samples registered a NAG pH < 4.5; these were in the BIF (n=6), Carbonaceous Shale (n=1), Mudstone/ Claystone. Quartzite, Saprolite (clay), Siltstone and Shale.

The samples were also classified according to the AMIRA (2002) classification system (NAG pH versus NAPP) and are displayed in **Figure 3-11**. The classification indicates the waste rock samples tested from KML typically fall within the 'potentially-acid forming' quadrant (25 samples), with 18 samples falling within the 'non-acid forming' quadrant and 4 samples being classified as 'uncertain' though largely falling on the border of 'potentially-acid forming' and 'uncertain' quadrants. The PAF samples are associated largely with Shale and BIF, Quartzite and Mudstone/ Claystone. The 'uncertain' sample with a positive NAPP and neutral NAG pH is from BIF (1 samples) and probably results due to the presence of sulfate in the samples and thus an overestimation of MPA. The uncertain samples with a negative NAPP and acidic NAG pH are associated with Quartzite (2 samples) and Shale (1 sample) and could result due to (amongst other reasons) an overestimation of readily available ANC.

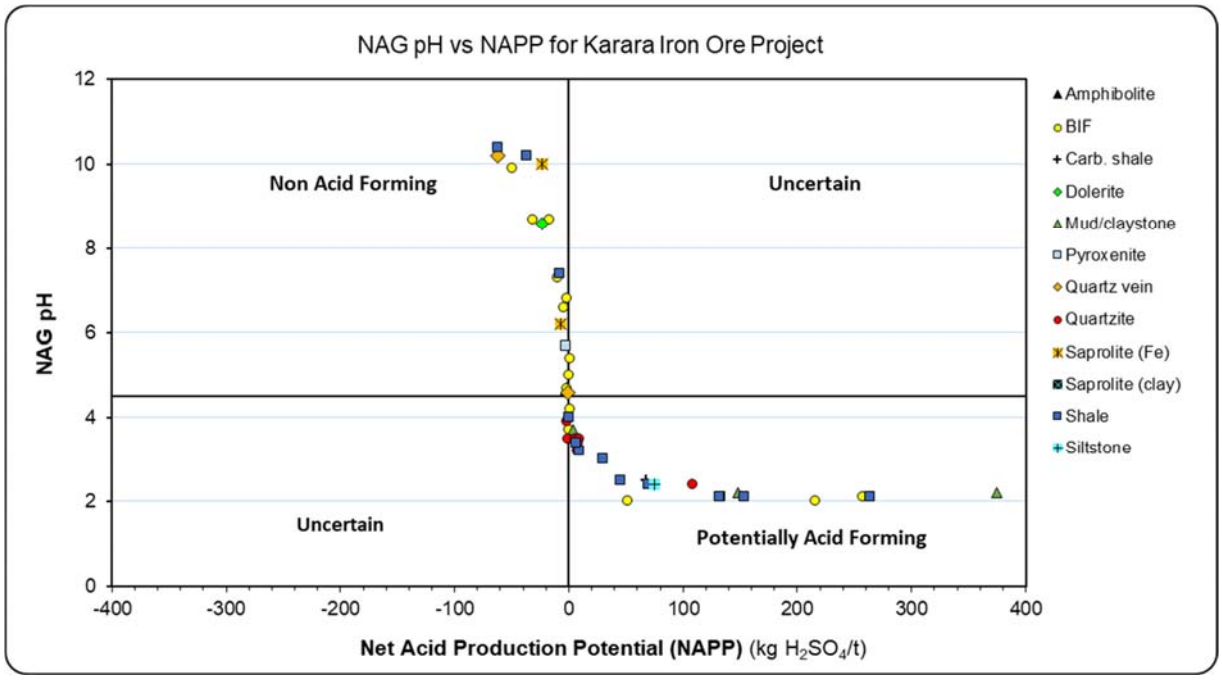

Figure 3-11: NAGpH versus NAPP for Karara waste rock according to lithology type.

3.2 Whole Rock Multi-Element Concentration in Solids

RGS was provided with 287 multi-element testing results associated with the samples provided by KML. There are no specific guidelines and/or regulatory criteria in WA specifically related to total metal(loid) concentrations in waste rock. Therefore, RGS has used the geochemical abundance index (GAI) as a guide to determine potential metal(loid) enrichments.

3.2.1 Geochemical Abundance Index

Total metal/metalloid concentrations in waste rock materials can be compared to median crustal abundance for unmineralised soils (Bowen, 1979, INAP, 2009). The extent of enrichment is reported as the Geochemical Abundance Index (GAI), which relates the actual concentration in a sample with the median (or average) crustal abundance on a $\log_{10}$ scale. GAI is expressed in integer increments from 0 to 6, where a GAI value of 0 indicates that the element is present at a concentration less than, or similar to, the median crustal abundance; and a GAI value of 6 indicates approximately a 100-fold enrichment above median crustal abundance (**Table 3-3**). As a general rule, a GAI of 3 or greater signifies enrichment that may warrant further examination.

Metals/metalloids identified as enriched may not necessarily be a concern for revegetation, drainage water quality or public health, but their significance should still be evaluated. The GAI only provides an indication of metals/metalloids that may be enriched relative to the global average crustal abundance[1], some points to consider:

- The median crustal abundance varies between different literature sources (at times order of magnitude), therefore affecting the calculated GAI values.
- If a sample is shown to be enriched relative to the average crustal abundance, there is no direct correlation that the sample will also leach metals/metalloids at elevated concentrations. The mobility of

[1] Average crustal abundance values were sourced from the "GARD Guide", Chapter 5 (INAP, 2009) and where values were not available, they were taken from Bowen (1978).

metals/metalloids is dependent on mineralogy, adsorption/desorption and the chemical environment in which it occurs (e.g. pH and redox).

- Although there are a number of metals/metalloids elevated relative to the median crustal abundance, the nature of an ore deposit means the background levels are always expected to be elevated. For instance, Tellurium is found to be naturally occurring at higher GAI factors from volcaniclastic sandstone in the Pilbara Region

Similarly, because metals/metalloids is not enriched does not mean it will never be a concern, because under some conditions (e.g. low pH) the solubility of common environmentally important elements such as Al, Cu, Cd, Fe and Zn increases significantly.

The GAI of the 287 rock samples is presented in **Table B2 (Attachment B)** and summarised in **Table 3-4** showing the total number samples with GAI above 3 by lithology type. The results indicate some samples were enriched in sulfur (114 samples; typically associate with shales), iron (61 samples; typically associated with BIF ore), magnesium (11 samples), lead (1 sample) and zinc (9 samples).

The potential solubility of these and other metals/metalloids is investigated further through the use of static leach tests (**Section 3.3**).

Table 3-3 Geochemical Abundance Index (GAI) values and enrichment factors

GAI	Enrichment factor	GAI	Enrichment factor
0	Less than 3-fold enrichment	4	24 – 48 fold enrichment
1	3 – 6 fold enrichment	5	48 – 96 fold enrichment
2	6 – 12 fold enrichment	6	Greater than 96 fold enrichment
3	12 – 24 fold enrichment		

Table 3-4 GAI Values above Enrichment Factor of 3 by lithology

Elements by Lithology (GAI > 3)	Major Elements											Minor Elements			
	Sulfur	Aluminium	Calcium	Iron	Potassium	Magnesium	Manganese	Phosphorus	Silicon	Titanium	Sodium	Copper	Lead	Vanadium	Zinc
BIF	14	0	0	42	0	3	0	0	0	0	0	0	1	0	1
Saprolite (Fe)	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0
Saprolite (clay)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Pyroxenite	3	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Siltstone	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shale	54	0	0	0	0	2	0	0	0	0	0	0	0	0	2
Quartzite	18	0	0	0	0	1	0	0	0	0	0	0	0	0	3
Breccia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mud/claystone	14	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Quartz vein	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Dolerite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibolite	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Carb. shale	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Talc	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Total Samples with GAI > 3	114	0	0	61	0	11	0	0	0	0	0	0	1	0	9

3.3 Water Quality of Leachates

There are no specific regulatory criteria for metal/metalloid concentrations in leachate from waste materials on mine sites in Western Australia. As such, RGS has compared the multi-element results in water extracts from 20 samples with Australian guidelines for livestock drinking water (ANZECC & ARMCANZ, 2000). These guidelines are provided for context only and are not intended to be interpreted as "maximum permissible levels" for site water storage or discharge, or to indicate probable water quality likely to occur at a site.

It should be recognised that direct comparison of geochemical data with guideline values can be misleading. For the purpose of this study, guideline values are only provided for broad context and should not be interpreted as arbitrary 'maximum' values or 'trigger' values. Using sample pulps (ground to passing 75 µm) provides a very high surface area to solution ratio, which encourages mineral reaction and dissolution of the solid phase. As such, the results of screening tests on water extract solutions are assumed to represent an assumed 'worst case' scenario for initial surface runoff and seepage from spoil materials.

The results from multi-element testing of water extracts (1:3 sample:water) from 20 waste rock samples are presented in **Table 3-5.**

The total alkalinity in the water extracts ranges from <1 to 70 mg $CaCO_3$/L) and has a mean value of 33 mg $CaCO_3$/L. The majority of the alkalinity is in the form of either bicarbonate (HCO_3) or carbonate (CO_3^{2-}) alkalinity. Most water extracts have < 1 mg $CaCO_3$/L acidity, with all the water extracts having < 5 mg $CaCO_3$/L acidity.

The concentration of major ions in the water extracts is generally low compared with Australian guidelines for livestock drinking water (ANZECC & ARMCANZ, 2000), with the dominant major ions being chloride, sulfate, sodium, bicarbonate/ carbonate alkalinity, potassium, magnesium and calcium. The concentration of soluble sulfate in the water extracts ranges from 2 to 100 mg/L (mean 27 mg/L) with all samples below the ANZECC & ARMCANZ (2000) sulfate water quality guideline criterion of 1,000 mg/L for livestock drinking water.

The concentration of trace metal(loid)s tested in the water extracts is predominantly below the laboratory LoR. Most metal(loid) concentrations tested in the water extracts are well below the applied water quality guideline criteria. There were only three samples that showed leached arsenic concentrations above the applied livestock drinking water guidelines, including: Pyroxenite (2 samples) and a BIF (1 sample) waste rock.

Table 3-5 Water extract results for Karara waste rock samples

Chemical Parameters	Drill Hole ID →		MKD082	MKD082	MKD082	MKD084	MKD084	MKD107	MKD107	MKD107	MKD107	MKD177	rhab2020_020	rhab_2020_039	MKD082	MKD096	MKD107	MKD177	MKD023	MKD066	MKD087	MKD107
	RGS Sample Number →		RGS209	RGS211	RGS223	RGS227	RGS241	RGS250	RGS251	RGS254	RGS260	RGS274	RGS020	RGS039	RGS117	RGS130	RGS139	RGS141	RGS144	RGS148	RGS155	RGS169
	Lithology ID →		BIF	Shale	BIF	BIF	Shale	Pyroxenite	Pyroxenite	Quartzite	Shale	Quartz vein	BIF	BIF	Shale	Quartzite	Quartzite	Mud/claystone	BIF	Quartz vein	Siltstone	Dolerite
	Site Classification ID →		PAF	PAF	PAF	PAF	PAF	PAF	PAF	PAF	PAF	PAF	MGY	MGP	MGB	MGB	MGB	MGB	NAF	PAF	NAF	NAF
	Limit of Reporting	Livestock Drinking Water[1]																				
Hydroxide Alkalinity ($mgCaCO_3/L$)	1 mg/L	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity ($mgCaCO_3/L$)	1 mg/L	-	26	23	47	<1	<1	27	21	5	<1	<1	<1	<1	32	15	<1	<1	11	59	44	26
Bicarbonate Alkalinity ($mgCaCO_3/L$)	1 mg/L	-	6	13	8	34	35	5	5	10	7	7	3	<1	4	18	27	13	24	11	11	14
Total Alkalinity ($mgCaCO_3/L$)	1 mg/L	-	32	36	54	34	35	33	26	15	7	7	3	<1	35	33	27	13	36	70	56	41
Acidity ($mgCaCO_3/L$)	1 mg/L	-	<1	<1	<1	1	<1	<1	<1	<1	1	2	5	4	<1	<1	<1	1	<1	<1	<1	<1
Major Ions	All units mg/L																					
Calcium (Ca)	1	1000	<1	<1	<1	17	9	<1	<1	<1	<1	5	<1	14	4	<1	2	3	<1	<1	1	1
Magnesium (Mg)	1	-	<1	<1	<1	4	2	<1	<1	<1	<1	4	<1	17	1	<1	<1	1	<1	<1	<1	<1
Potassium (K)	1	-	6	5	16	8	8	21	9	6	7	5	40	157	2	10	6	5	8	10	2	14
Sodium (Na)	1	-	27	22	15	13	20	19	28	15	26	31	7	18	15	23	28	24	34	47	48	11
Chloride (Cl)	1	-	19	5	1	24	24	21	14	11	24	34	42	302	1	16	19	26	17	6	12	6
Sulfate (SO_4)	1	1000	16	3	2	65	39	21	22	13	38	83	27	100	3	16	7	43	15	13	10	4
Trace Metals/Metalloids	All units mg/L																					
Aluminium (Al)	0.01	5	3.62	3.3	1.89	0.43	0.81	0.31	0.14	3.59	0.88	0.09	<0.01	0.02	0.09	2.74	1.13	0.46	0.36	1.81	1.14	1.75
Ammonia	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	0.001	-	0.016	0.013	0.004	0.062	0.049	0.013	0.014	0.007	0.011	0.068	<0.001	<0.001	0.001	0.003	0.008	0.123	0.055	0.002	0.009	<0.001
Arsenic (As)	0.001	0.5	0.004	0.181	0.034	0.006	0.008	1.68	1.38	0.095	0.005	<0.001	<0.001	<0.001	0.094	0.462	0.051	0.011	6.99	0.11	0.09	0.006
Barium (Ba)	0.001	-	0.004	0.016	0.003	0.01	0.003	0.001	<0.001	0.005	0.005	0.009	0.032	0.086	0.016	0.007	0.011	0.005	0.004	0.005	0.006	0.006
Beryllium (Be)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (B)	0.05	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.36	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05
Cadmium (Cd)	0.0001	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Caesium (Cs)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium (Ce)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Cr)	0.001	1	0.002	0.005	<0.001	<0.001	<0.001	0.002	0.001	0.004	0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	0.002	<0.001	<0.001	<0.001
Cobalt (Co)	0.001	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (Cu)	0.001	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.004	0.005	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cyanide	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dysprosium (Dy)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium (Er)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Europium (Eu)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Gadolinium (Gd)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium (Ga)	0.001	-	0.003	0.004	0.004	0.001	0.002	0.001	<0.001	0.005	0.002	<0.001	<0.001	<0.001	<0.001	0.006	0.002	0.002	<0.001	0.004	0.003	0.003
Hafnium (Hf)	0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium (Ho)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hydrogen sulfide	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Indium (In)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (Fe)	0.05	-	0.76	0.98	0.4	<0.05	<0.05	0.07	0.07	0.84	0.44	<0.05	<0.05	0.16	<0.05	1.14	0.13	<0.05	0.07	0.2	0.09	0.27
Lanthanum (La)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.001	0.1	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium (Li)	0.001	-	0.002	0.014	0.018	0.006	0.004	<0.001	<0.001	0.001	<0.001	0.015	0.004	0.01	0.004	0.002	<0.001	0.008	<0.001	0.026	0.012	0.001
Lutetium (Lu)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum (Mo)	0.001	0.15	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.008	<0.001	<0.001
Neodymium (Nd)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni)	0.001	1	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.011	<0.001	0.002	<0.001	<0.001	0.003	<0.001	<0.001	<0.001
Nitrate	0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Rubidium (Rb)	0.001	-	0.006	0.006	0.005	0.011	0.016	0.006	0.006	0.009	0.011	0.031	0.011	0.035	0.022	0.011	0.008	0.016	0.014	0.007	0.007	0.012

Chemical Parameters		Drill Hole ID →	MKD082	MKD082	MKD082	MKD084	MKD084	MKD107	MKD107	MKD107	MKD107	MKD177	rhab2020_020	rhab_2020_039	MKD082	MKD096	MKD107	MKD177	MKD023	MKD066	MKD087	MKD107
		RGS Sample Number →	RGS209	RGS211	RGS223	RGS227	RGS241	RGS250	RGS251	RGS254	RGS260	RGS274	RGS020	RGS039	RGS117	RGS130	RGS139	RGS141	RGS144	RGS148	RGS155	RGS169
		Lithology ID →	BIF	Shale	BIF	BIF	Shale	Pyroxenite	Pyroxenite	Quartzite	Shale	Quartz vein	BIF	BIF	Shale	Quartzite	Quartzite	Mud/claystone	BIF	Quartz vein	Siltstone	Dolerite
		Site Classification ID →	PAF	PAF	PAF	PAF	PAF	PAF	PAF	PAF	PAF	PAF	MGY	MGP	MGB	MGB	MGB	MGB	NAF	PAF	NAF	NAF
	Limit of Reporting	Livestock Drinking Water[1]																				
Strontium (Sr)	0.001	-	<0.001	<0.001	<0.001	0.016	0.008	<0.001	<0.001	<0.001	<0.001	0.022	0.005	0.186	0.014	0.002	0.006	0.011	0.001	0.004	0.009	0.003
Tellurium (Te)	0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Terbium (Tb)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium (Tl)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium (Th)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium (Tm)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tin (Sn)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti)	0.01	-	0.01	0.04	0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Tributyltin	0.001	-	0.004	0.012	0.001	0.014	0.003	<0.001	<0.001	0.009	0.005	0.088	0.019	0.195	<0.001	0.006	<0.001	0.008	<0.001	0.001	<0.001	0.002
Uranium (U)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium (V)	0.01	-	0.01	0.02	0.01	<0.01	<0.01	0.02	0.02	0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.02	0.02	0.01	0.04
Ytterbium (Yb)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium (Y)	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc (Zn)	0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.026	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zirconium (Zr)	0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Notes:
< indicates concentration less than the detection limit. Shaded cells exceed applied guideline values.
1. ANZECC & ARMCANZ (2000). Recommended guideline limits for Livestock Drinking Water.
1 taken from the "Australian and New Zealand Guidelines for Fresh and Marine Water Quality", National Water Quality Management Strategy, 2000, compilation by ANZECC and ARMCANZ.

3.4 Physical Test Results

A series of physical tests were selected to assess the potential for deep bedrock material to be used for rehabilitation purposes. The sub-set of samples were all classified as NAF-B or NAF and had negligible to very low chance of saline and metalliferous drainage.

A total of 20 samples underwent Emerson aggregates test, with 10 samples further tested for particle size distribution (PSD) and point load tests. After the testing, the samples were composited to determine a bulk density value. The dry bulk density was measured to be 1.43 t/m^3 (uncompacted) or 1.61 t/m^3 (compacted).

A summary of the test results is provided in **Table 3-6** while PSD is provided in **Table 3-7** together with textural class. The Emerson aggregate tests showed that all samples were grey gravels with an Emerson Class 3.

The PSD for each of the samples were similar (**Figure 3-12**) and showed the samples were dominated by coarse to fine gravels with a small portion (~15%) of coarse and medium sands.

Point load testing is an index which measures the strength characteristics of intact rocks. The strength index (Is) is usually carried out on core samples of 50 mm diameter for which no correction is required (Is(50)). However, if the sample has different dimensions, it is termed an 'irregular lump' and must be corrected. The application of such a correction factor introduces possible inaccuracy (Broch and Franklin, 1972).

The point load strength results range from very high to extra high and are shown in **Figure 3-13**. The measurements infer that the waste rocks have point load strengths that are equivalent to (amongst others) quartz, dolomite and granite. Rocks with a high load strength may be resistant to weathering and suitable as rock armouring to reduce erosion on sloping surfaces.

Table 3-6: Physical test summary

RGS Sample ID	Sample ID	Lithology	Site Classification	Is (MPa)	Is(50) (MPa)	Load Direction		Description	Emerson Class Number
RGS146	G117134	Shale	NAF	12.05	8.07	Irregular	Lump	GRAVEL - grey	3
RGS144	G117590	BIF	NAF	12.51	7.98	Irregular	Lump	GRAVEL - grey	3
RGS145	G77183	BIF	NAF	6.78	4.52	Irregular	Lump	GRAVEL - grey	3
RGS152	G117348	Shale	PAF	9.21	5.45	Irregular	Lump	GRAVEL - grey	3
RGS149	G77789	Quartz vein	NAF					GRAVEL - grey	3
RGS160	G116493	Dolerite	NAF	17.3	11.4	Irregular	Lump	GRAVEL - grey	3
RGS152	G117348	Shale	PAF					GRAVEL - grey	3
RGS155	G116375	Siltstone	NAF	12.51	8.06	Irregular	Lump	GRAVEL - grey	3
RGS156	G116488	Dolerite	NAF	19.55	11.55	Irregular	Lump	GRAVEL - grey	3
RGS158	G116491	Dolerite	NAF					GRAVEL - grey	3
RGS159	G116492	Dolerite	NAF					GRAVEL - grey	3
RGS161	G116494	Dolerite	NAF					GRAVEL - grey	3
RGS163	G116496	Dolerite	NAF	30.72	18.79	Irregular	Lump	GRAVEL - grey	3
RGS168	G117859	Quartzite	NAF					GRAVEL - grey	3
RGS162	G116495	Dolerite	NAF	22.44	14.35	Irregular	Lump	GRAVEL - grey	3
RGS172	G117499	Dolerite	NAF					GRAVEL - grey	3
RGS175	G117503	Dolerite	NAF					GRAVEL - grey	3
RGS177	G140690	Carb. shale	NAF					GRAVEL - grey	3
RGS180	G140695	Carb. shale	NAF	18.24	11.87	Irregular	Lump	GRAVEL - grey	3
RGS182	G140699	Carb. shale	PAF					GRAVEL - grey	3

Table 3-7: Particle size distribution and textural class

RGS Sample ID			RGS146	RGS144	RGS145	RGS152	RGS160	RGS155	RGS156	RGS163	RGS162	RGS180
Sample ID			G117134	G117590	G77183	G117348	G116493	G116375	G116488	G116496	G116495	G140695
Lithology			Shale	BIF	BIF	Shale	Dolerite	Siltstone	Dolerite	Dolerite	Dolerite	Carb. shale
Particle Size Distribution	Soil Textural Class	Size (mm)	% Passing									
	Cobble	150										
	Coarse gravel	75										
		63										
		53										
		37.5	100	100								
		26.5	96	98	100	100	100	100	100	100	100	100
	Fine gravel	19	80	88	76	91	90	88	72	88	86	83
		13.2	44	41	34	50	40	41	29	46	37	34
		9.5	32	23	22	29	26	25	17	29	23	22
		6.7	24	14	13	19	17	17	11	20	15	17
	Coarse sand	4.75	18	10	9	14	12	12	7	15	10	12
	Medium sand	2.36	11	5	5	8	8	7	4	9	6	7
		1.18	7	3	3	4	5	4	2	5	4	4
		0.6	4	2	2	3	3	2	1	3	3	2
	Fine sand	0.43	3	2	1	2	2	2	1	3	2	2
		0.3	3	2	1	2	2	2	1	2	2	2
		0.15	2	1	1	1	1	1	1	1	1	1
	Coarse silt	0.08	2	1	1	1	1	1	0	1	1	1

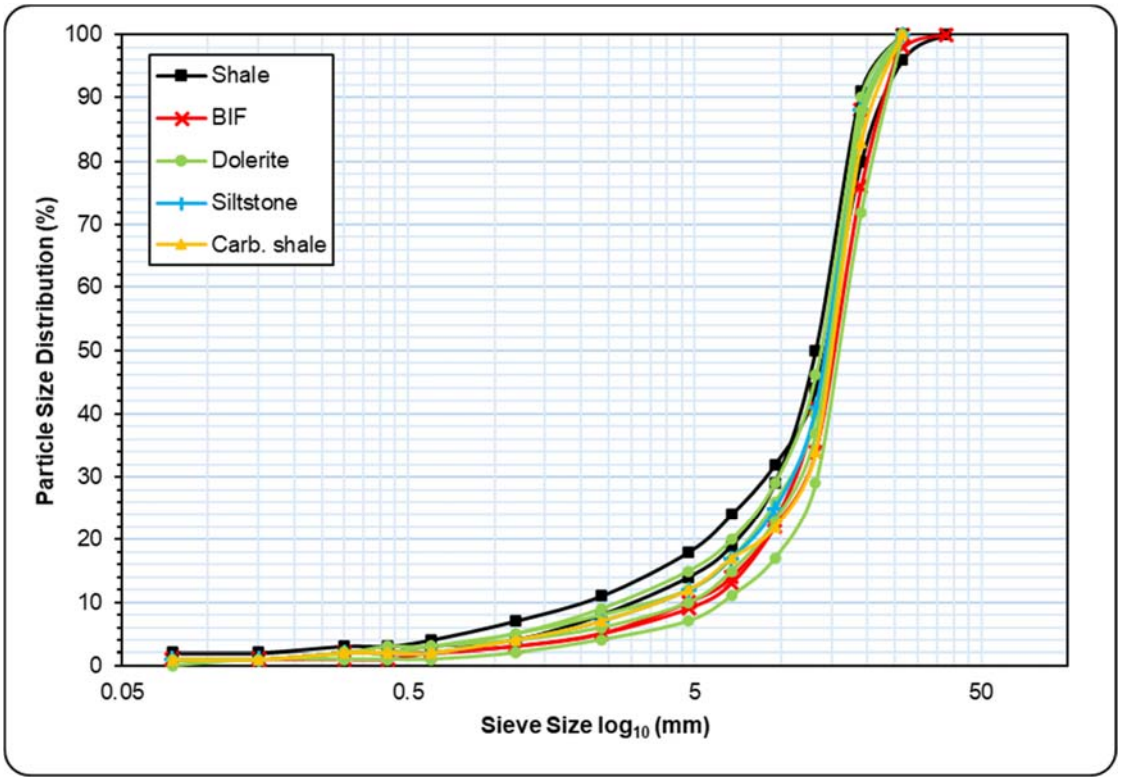

Figure 3-12: Particle size distribution for select Karara waste rock samples according to lithology.

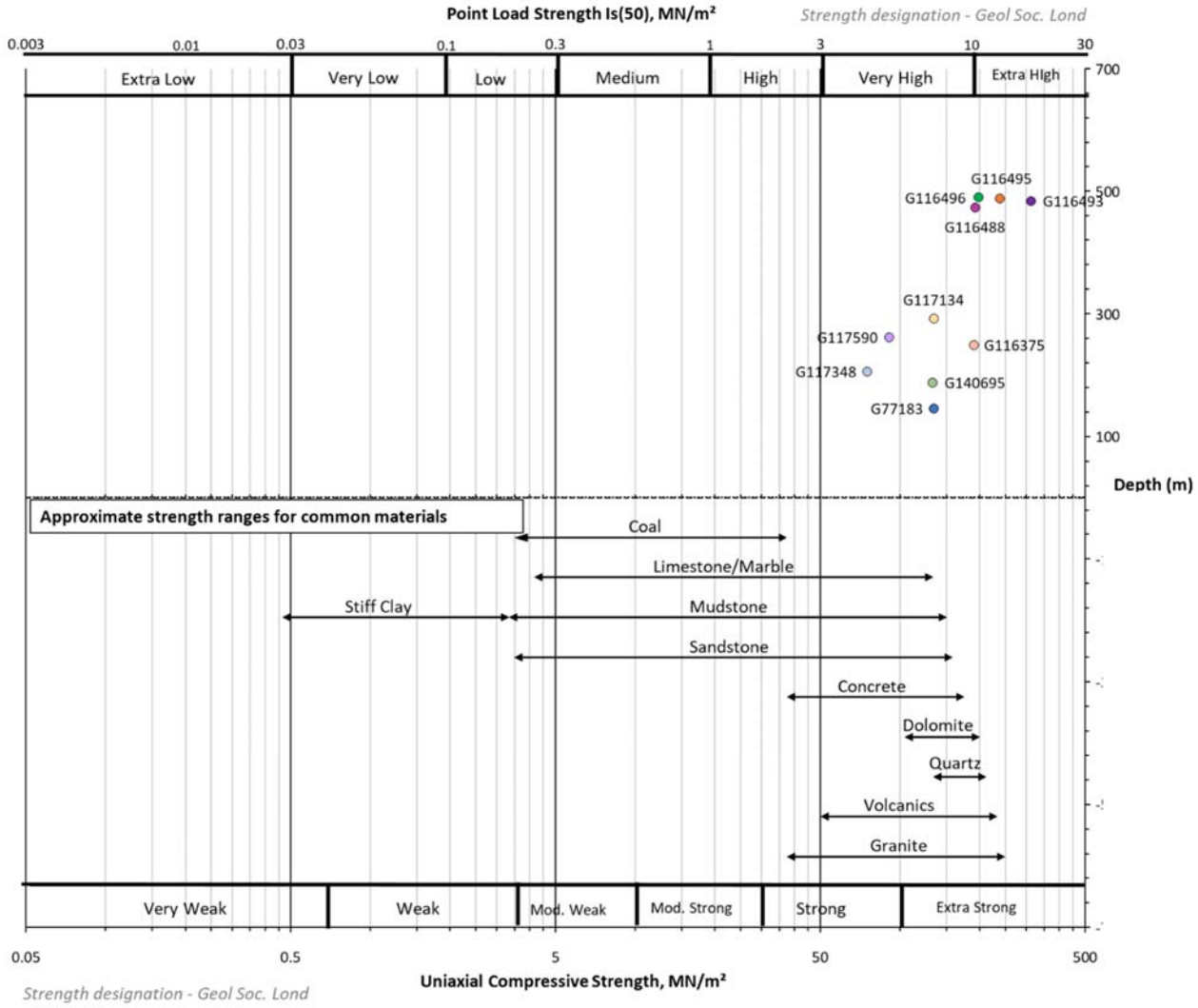

Figure 3-13: Point load test results for select Karara waste rock samples.

4 Geochemical Classification

4.1 Classification of acidic drainage

The Acid Base Account test data presented in **Table B1** (**Attachment B**) and discussed in **Section 3** have been used to classify the acid forming nature of the 287 waste rock samples. The classification criteria generally reflect Australian (COA, 2016) and international (INAP, 2009) guideline criteria for classification of mine waste materials.

The data in **Table 4-1** provide the criteria used by RGS to classify the acidic drainage potential of the samples into five waste classes, and the number of samples in each class according to lithology and site classification are provided in **Table 4-2** and

Table 4-3, respectively. The results verify that 32 % of the 287 samples are NAF-Barren (NAF-B), 22% samples are classified as NAF, 7% samples are classified as Uncertain, 5% samples are classified as PAF-low capacity (PAF-LC) and 31% sample are classified as Acid Forming (AF) (these are predominantly associated with Mudstone/ Claystone, Carbonaceous Shale, Shale, BIF (Aegirine rich), Quartzite and Saprolite (clay)).

It is noted that the NAPP classification using TS unequivocally overestimates MPA, because in 41 of the 86 samples the sulfide content is < 15% of the TS content.

Table 4-1: Acidic drainage classification criteria for Karara waste rock samples

Codes	Classification	Total Sulfur (%)	NAPP (kg H_2SO_4/t)	NPR
NAF (B)	Non-Acid Forming (Barren)	≤ 0.1	-	-
NAF	Non-Acid Forming	> 0.1	≤ -5	≥ 2
Uncertain	Uncertain	> 0.1	> -5 to ≤ +5	< 2
PAF (LC)	Potentially Acid Forming - Low Capacity	> 0.1	> 5 to ≤ 10	< 2
AF	Acid Forming	> 0.1	> 10	< 2

Notes:

1. If total sulfur is less than or equal to 0.1%, the NAPP and ANC:MPA ratio are not required for material classification as the sample is essentially barren of oxidisable sulfur.
2. A sample classified as NAF can be further described as 'barren' if the total sulfur and/or sulfide sulfur content is less than or equal to 0.1 %S, as the sample essentially has negligible acid generating capacity.
3. Samples that fall outside the stated NAF/PAF classification categories based on the criteria provided are be classified as Uncertain.

Table 4-2: Acidic drainage classification criteria for waste rock materials according to lithology

Lithology	NAF-B	NAF	Uncertain	PAF-LC	AF
BIF	44	26	7	0	9
Saprolite (Fe)	34	10			1
Saprolite (clay)	0	0	0	0	4
Pyroxenite	2	1	0	1	1
Siltstone	0	1	0	1	2
Shale	3	9	3	3	48
Quartzite	0	2	4	7	9
Breccia	0	1	0	0	0
Mud/claystone	0	0	1	0	13
Quartz vein	0	0	2	1	1
Dolerite	8	6	2	0	0
Amphibolite	0	2	0	1	0
Carb. shale	3	6	1	1	5
Talc	1	0	0	0	0
Total	**95**	**64**	**20**	**15**	**93**

Table 4-3: Acidic drainage classification criteria for waste rock materials according to site classification

Site Class	NAF-B	NAF	Uncertain	PAF-LC	AF
MGP	32	8	1		2
MGO	4	0	0	0	0
MGG	1	1	1	0	0
MGY	30	6	2	0	3
MGB	6	22	5	3	12
PAF_{waste}	11	7	8	9	76
NAF_{waste}	11	21	2	1	2
Total	**95**	**65**	**19**	**13**	**95**

4.2 Classification of metal leaching (ML) potential

The water-soluble leach test data from select samples verify that the potential for substantial adverse effects from metal(loid)s is low. The only exception is for arsenic associated with Pyroxenite and BIF. The vast majority of elements are likely to be non-mobile (insoluble) and adsorbed/ structurally incorporated in iron (oxy)hydroxides which are present in the waste rock.

These results should be further investigated using kinetic leach testing (refer to **Section 5**).

4.3 Saline drainage

A saline drainage hazard ranking was also applied to the waste rock samples which includes TS and saturated paste EC (**Table 4-4**). The number of samples in each class according to lithology and site classification are provided in **Table 4-5** and **Table 4-6**, respectively

The samples with a high risk of saline drainage are typically directly associated with AF or PAF-LC samples due to the high TS content. There were few samples that were classified as NAF-Barren or NAF that also have a high to moderate risk of saline drainage. In these few cases, they were mainly associated with BIF and Saprolite (ferruginous) samples

Table 4-4: Saline drainage classification criteria for Karara waste rock samples

Classification	TS (%)	$EC_{1:2}$ (uS/cm)
Negligible		< 500
Very Low		500 - 2,000
Low	< 1	2,000 - 4,000
Moderate	> 1 to < 2	4,000 - 10,000
High	> 2	10,000

Table 4-5: Saline drainage classification criteria for waste rock materials according to lithology

Lithology	Negligible	Very Low	Low	Moderate	High
BIF	24	41	6	5	10
Saprolite (Fe)	7	28	5	4	1
Saprolite (clay)	0	0	0	1	3
Pyroxenite	1	2	0	1	1
Siltstone	0	1	0	2	1
Shale	7	17	2	10	30

Quartzite	12	4	0	3	3
Breccia	1	0	0	0	0
Mud/claystone	0	0	0	1	13
Quartz vein	0	3	0	0	1
Dolerite	10	6	0	0	0
Amphibolite	0	0	1	1	1
Carb. shale	10	1	0	3	2
Talc	0	1	0	0	0
Total	**72**	**104**	**14**	**31**	**66**

Table 4-6: Saline drainage classification criteria for waste rock materials according to site class

Site Class	Negligible	Very Low	Low	Moderate	High
MGP	11	21	7	0	4
MGO	3	1	0	2	
MGG	0	1	0	0	0
MGY	5	25	4	5	2
MGB	17	19	0	6	6
PAFwaste	16	23	2	17	53
NAFwaste	20	14	1	1	1
Total	**72**	**104**	**14**	**31**	**66**

5 Conclusions

RGS completed a geochemical and physical characterisation program of 287 representative waste rock samples from the Karara pit. The results are summarised below.

- The TS content of the waste rock samples range from <0.01 %S to 25.5 %S, with mean values of 1.49 %S. Of the 297 samples 89 (31%) have low total sulfur concentrations that are comparable to the average crustal abundance for sulfur of 0.1 % (INAP, 2009). Materials with a sulfur content less than or equal to 0.1 %S are essentially barren of sulfur and have negligible capacity to generate acidity.
- Approximately 52% of total samples have a TS > 0.25% (i.e. the site cut-off for PAF or NAF material). With the highest TS concentrations are associated with BIF, Shale, Carbonaceous Shale, Quartz veins, Saprolite (clay) and Mudstone/ Claystone (metapelite).
- Sulfur speciation tests indicate a close positive linear relationship between TS and sulfide sulfur and indicated ~85% of the TS measured in the samples was present as sulfide sulfur.
- The ANC values for the samples ranges from <0.25 to 97.8 kg H_2SO_4/t and has a mean value of 19.55 kg H_2SO_4/t. The samples with the greatest median ANC are associated with Siltstone, Saprolite (clay) and Dolerite. This is consistent with the carbon speciation tests which indicated the samples were composed almost entirely of inorganic (carbonate) carbon. The lowest median ANC values are associated with Pyroxenite, Saprolite (ferruginous) and Amphibolite samples.
- Classification of the samples according to the AMIRA (2002) (NAG pH versus NAPP) and are displayed indicates the waste rock samples typically fall within the 'PAF' quadrant (25 samples), with 18 samples falling within the 'NAF' quadrant and 4 samples being classified as 'uncertain' though largely falling on the border of 'PAF' and 'uncertain' quadrants. The PAF samples are associated largely with Shale and BIF, Quartzite and Mudstone/ Claystone.
- The TS, NAPP and NPR were used to classify the acidic drainage potential of the samples into five waste classes. The classification indicates that 32 % of the 287 samples are NAF-Barren, 22% samples are classified as NAF, 7% samples are classified as Uncertain, 5% samples are classified as PAF-LC and 31% sample are classified as Acid Forming (AF).
- The PAF-LC and AF samples are generally associated with Mudstone/ Claystone, Carbonaceous Shale, Shale, BIF (Aegirine rich), Quartzite and Saprolite (clay)) lithologies (**Table 5-1**). The NAF-B and NAF samples are generally associated with BIF, Saprolite (ferruginous) and Dolerite lithologies (**Table 5-1**).
- The TS and $EC_{1:2}$ was used as a saline drainage hazard ranking. The samples with a high risk of saline drainage are typically directly associated with AF or PAF-LC samples due to the high TS content (**Table 5-1**). There were few samples that were classified as NAF-Barren or NAF that also have a high to moderate risk of saline drainage. In these few cases, they were mainly associated with BIF and Saprolite (ferruginous) samples
- Total metal(loid) concentrations in the samples were compared to median crustal abundance for unmineralised soils and the extent of enrichment reported as the GAI. The GAI indicate some samples were enriched in sulfur (114 samples; typically associate with shales), iron (61 samples; typically associated with BIF ore), magnesium (11 samples), lead (1 sample) and zinc (9 samples).
- The multi-element leach testing of water extracts (1:3 sample:water) showed leached metal(loid)s were typically below instrumental detection limits, with only a few samples that showed elevated leached metal(loid) concentrations for arsenic (two Pyroxenite and a BIF sample). The vast majority of elements are likely to be non-mobile (insoluble) and adsorbed/ structurally incorporated in iron (oxy)hydroxides which are present in the waste rock. The select results verify that the potential for substantial adverse effects from metal(loid)s (i.e. metalliferous drainage) is low.
- The physical analysis of select NAF bedrock samples verifies they are all hard / very hard with an Emerson Class of 3. These rock samples verify that the associated units they were sourced from have the potential to be mined and utilised for construction and rehabilitation. Specific applications for rock with these characteristics may include lining drains, armouring angle of repose slopes or using this rock as a mulch in final slopes with soil cover systems.

Table 5-1: Karara acid and saline waste rock classification.

Acid drainage class	NAF (B)					NAF				Uncertain				PAF (LC)			PAF				
Saline drainage class	Negligible	Very Low	Low	Moderate	High	Negligible	Very Low	Low	Moderate	Negligible	Very Low	Moderate	High	Negligible	Very Low	Moderate	Negligible	Very Low	Low	Moderate	High
BIF	15	22	4	2	1	8	15	2	1	1	4	1	1			1				1	8
Saprolite (Fe)	3	22	5	4		4	6														1
Saprolite (clay)																				1	3
Pyroxenite		1			1		1									1	1				
Siltstone									1						1					1	1
Shale		3				2	7			1	2			1	2		2	4	2	10	29
Quartzite							2			4				6	1		2	1		3	3
Breccia						1															
Mud/claystone												1								13	
Quartz vein							2				1										1
Dolerite	8					6				2											
Amphibolite								1												1	1
Carb. shale						3	6			1					1					3	2
Talc		1																			
Total	26	49	9	6	2	24	39	3	2	9	7	2	1	7	5	2	5	5	2	33	49

Note: Colour bars represent relative proportion of samples within a waste class.

5.1 Recommendations

5.1.1 Laboratory Kinetic Testing Program

Kinetic tests are strongly recommended to supplement static testing already undertaken for the project. The kinetic tests are required to quantify estimates of lag times to the onset of acidic conditions (when this occurs), primary sulfide oxidation rates, primary neutralisation potential dissolution rates, changes in leachate chemistry and changes in long-term loading rates (i.e., kg of contaminant per tonne of material per unit time).

Common laboratory scale kinetic geochemical test work include the following:

- Free draining kinetic leach column (KLC) test work (simulating reactions in the unsaturated zone of a waste rock dump).
- Saturated kinetic leach column (KLC) test work (simulating the reactions occurring when waste rock is inundated by rebounding groundwater).
- Humidity cell (HC) test work.
- Oxygen consumption rate method (OCR).

Kinetic geochemical test work involves measurement of key parameters as a function of time to measure or infer sulfide oxidation rate. In addition, kinetic test work allow assessment of metal and metalloids release rates and provide insight into long-term water quality.

KLC tests and humidity cells infer sulfide oxidation rates based on the rate of sulfate release over time in the leachate from the sample, while oxygen consumption methods measure sulfide oxidation rates directly by monitoring trends in oxygen concentration over time. Water quality is inferred from leachate collected from the samples following irrigation / flushing over a period of time.

A short summary of laboratory based kinetic method is presented below.

Free draining KLC testwork

KLC is commonly used to assess sulfide oxidation rates and help assist with prediction of long-term water quality. The method described below is consistent with AMIRA (2002) guidelines. Leach columns are loaded with samples and subjected to cycles of wetting and drying to promote sulfide oxidation and flushing of oxidation and neutralisation products. Leachate collected from the columns is filtered and analysed for parameters of interest. The test period depends of the time required for concentrations of key parameters to stabilise, usually taking between 6-24 months.

Samples are usually crushed prior to the testwork to 4 mm grain size and 2-4 kg of material is loaded into the columns. Heat lamps are generally operated on a cyclic basis, 8-10 h per day 5 days a week, to maintain a temperature of approximately 30-35^{o}C at the surface of the sample. Deionised water is used to irrigate and flush the materials on a weekly basis, with sample collection for water quality testing usually occurring every 4th week. Leachate chemistry and volumes are used to quantify sulfate release rate and indirectly sulfide oxidation rates. Similarly, metals and metalloids concentrations overtime are used to estimate metal loadings. Estimates of sulfide oxidation rates are based on the assumption that all sulfate generated by the oxidation of sulfate minerals is released into the leachate (no sinks) and that all sulfate is associated with sulfide oxidation (i.e. not released from sulfate phases).

RGS prefer to use an improved KLC method which incorporates ~20 kg of materials, reduces scale-up/ particle size effects and allows in situ monitoring of redox, temperature, etc (**Figure 5-1**).

Figure 5-1: Example of large kinetic leach column (KLC) tests operated as 'free-leach' and saturated.

Humidity cell testwork

AMIRA (2002) and the ASTM D5744-07e1 are the most common protocols for conducting HC testwork. The AMIRA method, which is specifically designed for waste rock, requires the testwork to be conducted at constant temperature (25°C) and humidity (65% relative humidity) in order to optimise sulfide oxidation process. The test period depends on the time required for concentrations of key parameters to stabilise, usually taking between 6-24 months.

Tests are conducted on 1 kg of material, air-dried on materials with 1.7mm grain size. Samples are flooded weekly with deionised water, with leachate not allowed to drain for at least one hour. After this time, the columns are free drained and sample collected for water quality testwork. The ASTM method is consistent with the AMIRA method, but in addition it requires periodic drying cycles.

Similarly to the KCL method, leachate chemistry and volumes are used to quantify sulfate release rate and indirectly sulfide oxidation rates. Estimates of sulfide oxidation rates are based on the assumption that all sulfate generated by the oxidation of sulfate minerals is released into the leachate (no sinks) and that all sulfate is associated with sulfide oxidation (i.e. not released from sulfate phases). Metals and metalloids concentrations overtime are used to estimate metal loadings.

Oxygen consumption (OC) testwork

Oxygen consumption methods involve the direct measurement of the rate of oxygen consumption, which in the case of sulphidic material is controlled by the rate of pyrite oxidation. Therefore, measurement of oxygen consumption can be used to obtain a direct measure of sulfide oxidation rates. At this stage, there is not a standard protocol for testing of sulfide oxidation rates using oxygen consumption with various methods developed in recent years by the Australian Nuclear Science and Technology Organisation (ANSTO), CSIRO, and several universities in North America.

In general, the sample is loaded in an airtight, rigid cell where oxygen consumption is measured using an electrochemical sensor in a constant temperature room. Carbon dioxide generated as a result of bacterial oxidation of organic carbon or from neutralisation reactions involving carbonate materials is measured using a carbon dioxide absorbent located inside the sample chamber. The mass change in absorbent is then used to assess the extent of neutralisation reactions. Furthermore, sulfide oxidation rates can be measured as a function of moisture, where moisture is a controlled variable.

The key differences between OC and KCL / HC is that OC testwork typically requires 2-8 weeks for assessment of sulfide oxidation and neutralisation rates, and determination of sulfide oxidation rates is not influenced by sulfate precipitation or dissolution reactions.

Although, this method can provide some indications on short-term water quality, it cannot be used to assess neutral mine drainage potentials in non-sulfide bearing materials.

5.1.1.1 *Proposed laboratory kinetic testing program for Karara*

Based on the specific knowledge gaps identified for the project and the strength and weaknesses associated with each of the kinetic methods described above, RGS recommends a two-phase kinetic laboratory geochemical testing program, as summarised below.

Phase 1: Oxygen consumption methods

RGS recommends that sulfide oxidation rate, carbonate dissolution rates and pollution generation rates be assessed using the oxygen consumption method. Information from this testwork will allow rapid identification of key lithological units at high risk for AMD (inclusive of saline and metalliferous drainage).

In addition, results from this phase can be used as guide to select future samples for further testwork (i.e. KCL). This technique can provide fast determination of kinetic properties of the sample and will guide selection of future samples for further testing.

Phase 2: KLC Tests

RGS recommends KLC tests (RGS method) to assess long-term water quality, provide additional details on sulfide oxidation rates and pollution generation rate, and allow assessment of metal loadings from both sulfidic and non-sulfide bearing materials.

5.1.2 Review waste rock classification criteria

RGS recommend using the existing historical geochemical data together with the outcomes of this assessment to refine the current waste rock classification criteria so that a refined AMD block model can be developed to include geochemical environmental layers to highlight zones within the pit characterised by elevated metal(loid) concentrations, zones that have potential for saline drainage generation and PAF/NAF characteristics of the material. The waste block model can be used to assist with management of waste material as well as pit rock (**Section 5.1.3**).

5.1.3 Waste Rock and Rehabilitation Material Block Model

KML has a block model incorporating >20,000 assay samples (inclusive of total sulfur, MgO and CaO). This provides the foundations for developing a waste rock and rehabilitation material block model to allow segregation of different waste units according to a range of geochemical and physical properties (e.g. PAF, NAF, metalliferous/saline NAF, acid consuming, etc.). Waste rock and rehabilitation material block models are

essential to allow proper management and handling of waste and beneficial materials, and assist with closure options for the pit voids (as pit walls may be exposed to atmospheric oxidation for a period of time and contribute to final pit void water quality). The effectiveness of a waste rock and rehabilitation material block model is determined by many factors; however, the key considerations are the classicisation criteria and sampling density (i.e. extrapolation between sampling points).

After the waste rock block classification criteria is updated and the waste model is developed (**Section 5.1.2**), RGS recommend incorporation classification criteria to differentiate waste materials that can be used for rehabilitation and closure objectives (**Section 5.1.3.1**). These criteria would focus on topsoil and NAF material associated with the regolith.

Once the waste rock and rehabilitation material classification criteria is refined and built into the waste rock and rehabilitation material block model, routine chemical and physical parameters should be analysed for all drilling and test pitting programs within the proposed pit extent so that the waste rock and rehabilitation material block model can be routinely updated.

5.1.3.1 *Identification (and quantification) of site rehabilitation materials*

KML has a geological model of the deposit and reliable quantification of the resource and reserves. There is limited quantification of the mine waste outside of the orebody which will include deleterious mine waste requiring active management (i.e. PAF, saline NAF, metalliferous NAF) and beneficial mine waste that could be used for rehabilitation. Without reliable quantification of the material balance that is potentially available for rehabilitation work it is probable that the ability to develop robust, reliable and cost effective mine waste management strategies for the WRD and TSF will decrease, and potential for environmental harm will increase.

RGS recommend the following work program to reduce operational costs associated with rehandling mine waste, development of borrow areas, and rehabilitation of the WRD and (potentially) open pit. A progressive well thought out rehabilitation material sampling and analytical program (RMSaP) could lead to a substantial reduction in Financial Assurance (FA) and potential environmental harm.

- Review the geology model with KML geologists to understand the level of detail the geologists have of the mine materials outside the orebody.
- Develop and implement a targeted test pit and shallow diamond core drilling program to identify potential borrow materials for rehabilitation work; this could utilise existing core stored in the core farm. Aged core will provide valuable information of how the materials weather over time.
- Conduct geochemical and physical analyses of test pit and drill core samples to identify the most to least beneficial materials for rehabilitation work.
- Update the geological model with data from the test pit and drilling program, including producing a rehabilitation material balance that would determine the potential soil / rock cover configurations that would be possible given the overall volumes of each material type what will be available over the Life-of-Mine (LoM) .
- Develop a LoM rehabilitation material schedule (using software such as Deswik.LHS) to plan for the immediate use, or temporary stockpiling of material to reduce rehandling to the maximum extent possible.
- Utilise the schedule to quantify the cost of WRD rehabilitation.
- Utilise the information from the RMSaP to develop field scale soil cover test piles or similar.
- Apply the information from the RMSaP and field soil cover test pads to full scale progressive rehabilitation.

5.1.3.2 *Physical Tests*

As mentioned above, physical characterisation of waste rock materials should be considered for future assessments (e.g. identification of site rehabilitation materials). The physical properties are required to understand the waste rock (and thus WRD) hydrology; this could include developing a model used to determine water balance of the WRD (infiltration, evaporation, seepage, etc.) and oxygen diffusion into the dump or through a potential cover system/ cap. While this is not strictly relevant to this project, the physical characteristics of the waste rock will be required.

The key physical properties would need to include (amongst other things):

- Bulk density and porosity (to be done on in-situ “core” samples retrieved from test pits)

- Particle size distribution (PSD) (< 2.36 mm)
- Particle size distribution (PSD) on coarse fragments (>2.36 mm)
- Aggregate stability (Emerson Aggregate Test)
- Water repellence
- Soil water characteristic curves (SWCC).
- Falling head or constant head permeability analysis

The physical analyses outlined in

5.1.4 Groundwater and Surface Water Monitoring

Monitoring of seepage volumes and water quality is required during operations and post closure. Seepage water quality monitoring would provide information on the quality of drainage coming from different portions of the waste facilities. Seepage water quality monitoring provides the first indication of drainage chemistry from the WRD.

Water quality monitoring both upstream and downstream of the waste facilities is required to determine how runoff and seepage from the waste facilities is influencing the downstream water quality.

Monitoring bores should be located at the lowest point of the original ground surface, and along the original drainage lines to allow detection of seepage and groundwater infiltration from the waste facilities. Consideration of potential higher permeability zones as identified with surface and airborne geophysics will be included to place these in the optimal positions for early detection and possible seepage interception.

Seepage monitoring should occur in the collection ponds/bunds and drains at the toe of the WRD.

The irregular sequence of expected flows (rainfall events) means that timing of seepage sampling events is important to obtain an accurate indication of water quality impacts. Quarterly monitoring of the seepage would provide a long-term record to understand the changes occurring in the waste facilities, but this must be supplemented by seepage monitoring after high rainfall events and at the end of the ‘wet season’ but also at the beginning of the wet season to quantify potential flush loads from the WRD. Full analyses would be required at selected times (at least at the quarterly sampling) but as a minimum pH, electrical conductivity and redox potential should be measured.

6 References

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ATTACHMENT A

Geochemical Assessment of Mine Materials

7 Attachment A

GEOCHEMICAL ASSESSMENT OF MINE MATERIALS

ACID GENERATION AND PREDICTION

Acid generation is caused by the exposure of sulfide minerals, most commonly pyrite (FeS_2), to atmospheric oxygen and water. Sulfur assay results are used to calculate the maximum acid that could be generated by the sample by either directly determining the pyritic S content or assuming that all sulfur not present as sulfate occurs as pyrite. Pyrite reacts under oxidising conditions to generate acid according to the following overall reaction:

$$FeS_2 + 15/4\ O_2 + 7/2\ H_2O \rightarrow Fe(OH)_3 + 2\ H_2SO_4$$

According to this reaction, the maximum potential acidity (MPA) of a sample containing 1 %S as pyrite would be 30.6 kg H_2SO_4/t. The chemical components of the acid generation process consist of the above sulfide oxidation reaction and acid neutralization, which is mainly provided by inherent carbonates and to a lesser extent silicate materials. The amount and rate of acid generation is determined by the interaction and overall balance of the acid generation and neutralisation components.

Determination of pH and Electrical Conductivity

pH and Electrical Conductivity (EC) measured on saturated paste. This gives an indication of the inherent acidity and salinity of the mine material when initially exposed in an emplacement area.

Total Sulfur Content and Maximum Potential Acidity (MPA)

Total sulfur content is determined by the LECO high temperature combustion method. The total sulfur content is then used to calculate the MPA, which is based on the assumption that the entire sulfur content is present as reactive pyrite. Direct determination of the pyritic sulfur content can provide a more accurate estimate of the MPA.

Acid Neutralising Capacity (ANC)

By addition of acid to a known weight of sample, then titration with NaOH to determine the amount of residual acid. The ANC measures the capacity of a sample to react with and neutralise acid. The ANC can be further evaluated by slow acid titration to a set end-point in the Acid Buffering Characteristic Curve (ABCC) test through calculation of the amount of acid consumed and evaluation of the resultant titration curve.

Acid Buffering Characteristic Curve (ABCC)

The ABCC (AMIRA, 2002) provides an evaluation of the available ANC in a sample by slow acid titration to a set endpoint, evaluation of the resultant titration curve, and calculation of the amount of acid consumed. Essentially the ABCC results provide an indication of the proportion of the measured ANC that is likely to be readily available to buffer any acid generated through sulfide oxidation.

Net Acid Producing Potential (NAPP)

The net acid producing potential (NAPP) is used as an indicator of materials that may be of concern with respect to acid generation. The NAPP calculation represents the balance between the maximum potential acidity (MPA) of a sample, which is derived from the total or sulfide sulfur content, and the acid neutralising capacity (ANC) of the material, which is determined experimentally. By convention, the NAPP result is expressed in units of kg H_2SO_4/t sample. If the capacity of the solids to neutralise acid (ANC) exceeds their capacity to generate acid (MPA), then the NAPP of the material is negative. Conversely, if the MPA exceeds the ANC, the NAPP of the material is positive.

Total Organic Carbon/Total Inorganic Carbon/Total Carbon

Total Organic Carbon (TOC), Total Inorganic Carbon (TIC) and Total Carbon (TC) are determined by LECO high temperature combustion method. TOC represents all carbon covalently bonded in organic molecules

whereas TIC represents carbonate (CO_3^{2-}), bicarbonate (HCO_3^-) and dissolved carbon dioxide (CO_2) present in sample, with TC representing total carbon in both TOC and TIC forms present in samples.

Net Acid Generation (NAG)

The net acid generation (NAG) test involves the addition of hydrogen peroxide to a sample of mine rock or process residue to oxidise reactive sulfide, then measurement of pH and titration of any net acidity produced by the acid generation and neutralisation reactions occurring in the sample. A significant NAG result (*i.e.* final $NAG_{pH} < 4.5$) indicates that the sample is potentially acid forming (PAF) and the test provides a direct measure of the net amount of acid remaining in the sample after all acid generating and acid neutralising reactions have taken place. A $NAG_{pH} > 4.5$ indicates that the sample is non-acid forming (NAF). The NAG test provides a direct assessment of the potential for a material to produce acid after a period of exposure and weathering and can be used to refine the results of the theoretical NAPP predictions, if required. The NAG test can sometimes be used as a stand-alone test at some hard rock mines, but is recommended that this only be considered after site specific calibration work is carried out. The standard NAG test is generally unsuitable for coal mine waste samples and can produce a false positive result.

ASSESSMENT OF ELEMENT ENRICHMENT AND SOLUBILITY

In mineralised areas it is common to find a suite of enriched elements that have resulted from natural geological processes. Multi-element scans are carried out to identify any elements that are present in a material (or readily leachable from a material) at concentrations that may be of environmental concern with respect to surface water quality, revegetation and public health. The samples are generally analysed for the following elements:

Major elements	Al, Ca, Fe, K, Mg, Na, Ti and S.
Minor elements	Ag, As, B, Ba, Be, Bi, Cd, Ce, Cl, Co, Cr, Cs, Cu, F, Ga, Ge, Hf, Hg, In, La, Li, Mn, Mo, N, Nb, Nd, Ni, P, Pb, Rb, Re, Sb, Sc, Se, Si, Sn, Sr, Ta, Te, Th, Tl, U, V, W, Y, Zn, Zr

The concentration of these elements in samples can be directly compared with relevant state or national environmental and health-based concentration guideline criteria to determine the level of significance. Water extracts are used to determine the immediate element solubilities under the existing sample pH conditions of the sample. The following tests are normally carried out:

Multi-Element Composition of Solids

Multi-element composition of solid samples determined using a combination of ICP-mass spectroscopy (ICP-MS), ICP-optical emission spectroscopy (OES), and atomic absorption spectrometry (AAS).

Multi-Element Composition of Water Extracts (1:3 w/v leach, 12 h tumble)

Multi-element composition of water extracts from solid samples determined using a combination of ICP-mass spectroscopy (ICP-MS), ICP-optical emission spectroscopy (OES), and atomic absorption spectrometry (AAS).

Under some conditions (*eg*. low pH) the solubility and mobility of common environmentally important elements can increase significantly. If element mobility under initial pH conditions is deemed likely and/or subsequent low pH conditions may occur, kinetic leach column test work may be completed on representative samples.

(Semi) - Quantitative X-Ray Diffraction (QXRD)

X-ray diffraction (XRD) patterns were obtained from the samples with a Panalytical Aeris Powder Diffractometer, and linear Pixcel detector. Operating conditions were 40kV/8mA, Fe Kß filter, step scan 0.01/29 secs˚2Θ at, 1/2˚ divergence and a 1.0˚ ant-scatter slit. Scan range was 5° to 80° 2Θ. Phases were identified by computer search/match of the ICDD PDF4 2020 Minerals Database. Quantitative results determined with full pattern Rietveld refinement software.

ATTACHMENT B

Static Test Results

8 Attachment B

8.1 Static Test Results

8.1.1 Attachment B1: Acid Base Account (ABA) Test Results for Karara

8.1.2 Attachment B2: Geochemical Abundance Index (GAI) Results for Karara Selected Waste Rock Samples

8.1.3 Attachment B3: Multi-Element Test Results for Water Extracts from Karara Waste Rock

Table B1: Acid Base Account (ABA) Test Results for Karara Iron Ore Project

RGS Sample No.	Sample ID	Drill Hole ID	Lithology	Site Classification	Sample Depth		pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5)	NAG Capacity (pH 7)	Total Organic Carbon (TOC)	Total Carbon (TC)	Total inorganic Carbon (TIC)	Sample Classification[3]	Saline drainge hazard ranking
					From	To		(µS/cm)	(%)	(%)	kg H_2SO_4/t					kg H_2SO_4/t							
Low Grade Ore (MGB), Magnetite (Mag) 25% - 30%																						
RGS096	G94863	MKD017	BIF	MGB	138	140	10.2	362	0.02		0.6	8.3	-7.7	13.6							Non-Acid Forming (Barren)	Negligble
RGS099	G77072	MKD037	BIF	MGB	182	184	10.5	837	1.03	0.90	27.7	30.6	-2.9	1.0	4.2	0.4	7.7	<0.02	<0.02	<0.02	Uncertain	Moderate
RGS100	G77104	MKD037	BIF	MGB	246	248	10.5	892	0.36		11.0	45.1	-34.1	4.1				<0.02	0.26	0.26	Non-Acid Forming	Very Low
RGS101	G77178	MKD044	BIF	MGB	136	138	10.2	642	0.03	0.03	0.9	17.6	-16.7	19.2	8.7	<0.1	<0.1	0.19	0.2	<0.02	Non-Acid Forming (Barren)	Very Low
RGS102	G77178	MKD044	BIF	MGB	136	138	10.1	469	0.53	0.03	0.9	47.4	-46.5	2.9	8.7	<0.1	<0.1	0.19	0.2	<0.02	Non-Acid Forming (Barren)	Negligble
RGS103	G77180	MKD044	BIF	MGB	140	142	10.2	696	0.27		8.3	59.1	-50.8	7.1							Non-Acid Forming	Very Low
RGS104	G77180	MKD044	BIF	MGB	140	142	9.7	306	0.23		7.0	40.6	-33.6	5.8							Non-Acid Forming	Negligble
RGS105	G77193	MKD044	BIF	MGB	166	168	10.2	542	0.28		8.6	59.9	-51.3	7.0							Non-Acid Forming	Very Low
RGS106	G77193	MKD044	BIF	MGB	166	168	10.2	475	0.23		7.0	55.7	-48.7	7.9							Non-Acid Forming	Negligble
RGS108	G117135	MKD065	BIF	MGB	294	296	10.2	653	0.1		3.1	25.9	-22.8	8.5				<0.02	0.06	0.06	Non-Acid Forming (Barren)	Very Low
RGS110	G116334	MKD066	BIF	MGB	518	520	10.3	514	0.3		9.2	18.1	-8.9	2.0							Non-Acid Forming	Very Low
RGS111	G116335	MKD066	BIF	MGB	520	522	10.4	653	0.19		5.8	18.8	-13.0	3.2							Non-Acid Forming	Very Low
RGS118	G77946	MKD082	BIF	MGB	232	234	10	566	0.97	0.86	26.3	29.2	-2.9	1.0	3.7	2.1	6.9	<0.02	0.11	0.11	Uncertain	Very Low
RGS119	G77963	MKD082	BIF	MGB	266	268	10.2	631	0.52		15.9	54.3	-38.4	3.4							Non-Acid Forming	Very Low
RGS120	G77983	MKD082	BIF	MGB	306	308	8	1080	5.76	4.79	146.7	7	139.7	0.0				0.9	0.98	0.08	Potentially Acid Forming	High
RGS121	G77985	MKD082	BIF	MGB	310	312	5.2	9230	25.5		780.9	<0.5	780.7	0.0							Potentially Acid Forming	High
RGS122	G77991	MKD082	BIF	MGB	322	324	10	580	0.18		5.5	92.4	-86.9	16.8							Non-Acid Forming	Very Low
RGS123	G94029	MKD082	BIF	MGB	398	400	10.3	678	0.13		4.0	52	-48.0	13.1				0.1	0.39	0.29	Non-Acid Forming	Very Low
RGS128	G116376	MKD087	BIF	MGB	262	264	10.4	921	0.48		14.7	62.1	-47.4	4.2							Non-Acid Forming	Very Low
RGS129	G116377	MKD087	BIF	MGB	264	266	10.4	866	0.22	0.19	5.9	56.1	-50.2	8.3	9.9	<0.1	<0.1	<0.02	0.14	0.14	Non-Acid Forming	Very Low
RGS132	G117540	MKD107	BIF	MGB	478	480	9.7	311	0.25	0.21	6.5	19.6	-13.1	2.6							Non-Acid Forming	Negligble
RGS124	G94032	MKD082	Breccia	MGB	404	406	9.6	466	0.44		13.5	35.1	-21.6	2.6							Non-Acid Forming	Negligble
RGS141	G140267	MKD177	Mud/claystone	MGB	370	372	8.5	818	12.7	11.20	343.0	14	329.0	0.0	2.2	109	147	1.12	1.13	<0.02	Potentially Acid Forming	High
RGS094	KM101636	MKD015	Pyroxenite	MGB	194	196	6.8	1370	0.02		0.6	3.9	-3.3	6.4							Non-Acid Forming (Barren)	Very Low
RGS095	KM101637	MKD015	Pyroxenite	MGB	196	198	7.4	11200	0.02		0.6	2.9	-2.3	4.7	5.7	<0.1	1.3				Non-Acid Forming (Barren)	High
RGS133	G117562	MKD107	Pyroxenite	MGB	522	524	9.3	404	0.83	0.68	20.9	7.4	13.5	0.3				0.24	0.24	<0.02	Potentially Acid Forming	Negligble
RGS116	G77930	MKD082	Quartzite	MGB	200	202	9.3	464	3.82	3.45	105.7	8.6	97.1	0.1	2.4	63.3	77.7	0.44	0.44	<0.02	Potentially Acid Forming	High
RGS130	G117866	MKD096	Quartzite	MGB	126	128	9.6	483	0.67		20.5	22.3	-1.8	1.1							Uncertain	Negligble
RGS131	G117867	MKD096	Quartzite	MGB	128	130	9.4	421	0.67	0.57	17.3	21	-3.7	1.0	3.5	4.3	10.3	0.09	0.1	<0.02	Uncertain	Negligble
RGS134	G117565	MKD107	Quartzite	MGB	528	530	9.3	354	0.49		15.0	16.2	-1.2	1.1				0.56	0.56	<0.02	Uncertain	Negligble
RGS135	G117566	MKD107	Quartzite	MGB	530	532	8.3	419	1.12		34.3	8.2	26.1	0.2							Potentially Acid Forming	Moderate
RGS136	G117570	MKD107	Quartzite	MGB	538	540	9	408	1.36	1.15	35.2	8	27.2	0.2				0.45	0.45	<0.02	Potentially Acid Forming	Moderate
RGS137	G117573	MKD107	Quartzite	MGB	544	546	9.1	352	0.78		23.9	14.9	9.0	0.6							Potentially Acid Forming - Low Capacity	Negligble
RGS138	G117576	MKD107	Quartzite	MGB	550	552	9.4	375	0.46	0.40	12.2	8.6	3.6	0.6							Potentially Acid Forming - Low Capacity	Negligble
RGS139	G117586	MKD107	Quartzite	MGB	570	572	8.8	460	0.74	0.64	19.6	15	4.6	0.7	3.2	6.7	12.5	0.59	0.6	<0.02	Potentially Acid Forming - Low Capacity	Negligble
RGS140	G117587	MKD107	Quartzite	MGB	572	573	8.8	399	0.85	0.70	21.6	15.2	6.4	0.6							Potentially Acid Forming	Negligble
RGS097	KA101968	MKD020	Saprolite (Fe)	MGB	26	28	9.6	491	0.35		10.7	43.9	-33.2	4.1							Non-Acid Forming	Negligble
RGS107	G117133	MKD065	Shale	MGB	290	292	9.9	678	0.56	0.47	14.4	44.4	-30.0	2.6				0.09	0.22	0.13	Non-Acid Forming	Very Low
RGS109	G116331	MKD066	Shale	MGB	512	514	10.4	670	0.43		13.2	22.3	-9.1	1.7							Non-Acid Forming	Very Low
RGS112	G77911	MKD082	Shale	MGB	162	164	10.1	550	2.76		84.5	19.2	65.3	0.2							Potentially Acid Forming	High
RGS113	G77912	MKD082	Shale	MGB	164	166	9.6	380	1.03	0.74	22.7	20	2.7	0.6				0.16	0.16	<0.02	Potentially Acid Forming	Moderate
RGS114	G77917	MKD082	Shale	MGB	174	176	9.6	365	1.18		36.1	15.6	20.5	0.4							Potentially Acid Forming	Moderate
RGS115	G77922	MKD082	Shale	MGB	184	186	9.4	416	0.7		21.4	7.6	13.8	0.4							Potentially Acid Forming	Negligble
RGS117	G77937	MKD082	Shale	MGB	214	216	10	349	0.14		4.3	59.3	-55.0	13.8							Non-Acid Forming	Negligble
RGS125	G117346	MKD084	Shale	MGB	202	204	10.2	563	0.16	0.15	4.6	67.1	-62.5	13.7	10.4	<0.1	<0.1	0.12	0.56	0.44	Non-Acid Forming	Very Low
RGS126	G117360	MKD084	Shale	MGB	230	232	10.2	522	0.2		6.1	45	-38.9	7.3							Non-Acid Forming	Very Low
RGS127	G117375	MKD084	Shale	MGB	260	262	10	622	0.37		11.3	60.9	-49.6	5.4							Non-Acid Forming	Very Low
RGS098	G77473	MKD027	Siltstone	MGB	251	252	9.2	350	1.5		45.9	65.8	-19.9	1.4							Non-Acid Forming	Moderate
High Grade Ore (MGG), Mag > 30%, S > 0.16% and Al_2O_3 < 1.1%																						
RGS003	KM101578	rhab2020_003	BIF	MGG	4	5	6.5	674	<0.01		0.2	1.1	-0.9	7.2							Non-Acid Forming (Barren)	Very Low
High Grade Ore (MGO), Mag > 30%, 0.05% < S < 0.16% and Al_2O_3 < 1.1%																						
RGS004	KM101579	rhab2020_004	BIF	MGO	3	4	4.8	239	0.11	0.01	0.3	5.3	-5.0	1.6				0.29	0.45	0.16	Uncertain	Negligble
RGS005	KM101580	rhab2020_005	BIF	MGO	3	4	5.4	420	0.01		0.3	2.1	-1.8	6.9							Non-Acid Forming (Barren)	Negligble
RGS029	KM101604	rhab_2020_029	BIF	MGO	45	46	6.2	6440	0.03		0.9	0.6	0.3	0.7							Non-Acid Forming (Barren)	Moderate
RGS031	KM101606	rhab_2020_031	BIF	MGO	50	51	6.6	7990	0.26		8.0	13.6	-5.6	1.7							Non-Acid Forming	Moderate
RGS046	KM101621	rhab_2020_046	Saprolite (Fe)	MGO	3	4	8.2	453	0.01		0.3	7.7	-7.4	25.1							Non-Acid Forming (Barren)	Negligble
RGS047	KM101622	rhab_2020_047	Saprolite (Fe)	MGO	2	3	6.7	669	0.01		0.3	9.5	-9.2	31.0							Non-Acid Forming (Barren)	Very Low

Table B1: Acid Base Account (ABA) Test Results for Karara Iron Ore Project

RGS Sample No.	Sample ID	Drill Hole ID	Lithology	Site Classification	Sample Depth		pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5)	NAG Capacity (pH 7)	Total Organic Carbon (TOC)	Total Carbon (TC)	Total inorganic Carbon (TIC)	Sample Classification[3]	Saline drainge hazard ranking
					From	To		(µS/cm)	(%)	(%)	kg H_2SO_4/t					kg H_2SO_4/t							
High Grade Ore (MGP), Mag > 30%, S < 0.05% and Al_2O_3 < 1.1%																						
RGS001	KM101576	rhab2020_001	BIF	MGP	12	13	6.6	249	0.03		0.9	1.6	-0.7	1.7							Non-Acid Forming (Barren)	Negligble
RGS006	KM101581	rhab2020_006	BIF	MGP	15	16	6.8	917	0.06		1.8	6.1	-4.3	3.3							Non-Acid Forming (Barren)	Very Low
RGS007	KM101582	rhab2020_007	BIF	MGP	29	30	5.5	2070	0.2		6.1	32.1	-26.0	5.2							Non-Acid Forming	Low
RGS008	KM101583	rhab2020_008	BIF	MGP	34	35	5.8	933	0.15		4.6	15.2	-10.6	3.3							Non-Acid Forming	Very Low
RGS009	KM101584	rhab2020_009	BIF	MGP	38	39	6.3	2490	0.11	0.07	2.1	12.2	-10.1	3.6				0.02	0.11	0.09	Non-Acid Forming	Low
RGS010	KM101585	rhab2020_010	BIF	MGP	38	39	7.4	963	0.04		1.2	11.4	-10.2	9.3							Non-Acid Forming (Barren)	Very Low
RGS011	KM101586	rhab2020_011	BIF	MGP	31	32	7	240	0.05		1.5	12.6	-11.1	8.2							Non-Acid Forming (Barren)	Negligble
RGS012	KM101587	rhab2020_012	BIF	MGP	32	33	6.6	620	0.03		0.9	4.3	-3.4	4.7							Non-Acid Forming (Barren)	Very Low
RGS013	KM101588	rhab2020_013	BIF	MGP	25	26	5.7	490	0.04		1.2	3.8	-2.6	3.1							Non-Acid Forming (Barren)	Negligble
RGS014	KM101589	rhab2020_014	BIF	MGP	18	19	6.4	654	0.03		0.9	4.1	-3.2	4.5							Non-Acid Forming (Barren)	Very Low
RGS015	KM101590	rhab2020_015	BIF	MGP	14	15	5.1	1210	0.02		0.6	3.4	-2.8	5.6							Non-Acid Forming (Barren)	Very Low
RGS016	KM101591	rhab2020_016	BIF	MGP	3	4	4.7	392	0.04		1.2	1.1	0.1	0.9							Non-Acid Forming (Barren)	Negligble
RGS017	KM101592	rhab2020_017	BIF	MGP	1	2	4.7	423	0.03		0.9	1.1	-0.2	1.2	5	<0.1	6				Non-Acid Forming (Barren)	Negligble
RGS018	KM101593	rhab2020_018	BIF	MGP	6	7	4.8	148	0.02		0.6	4.2	-3.6	6.9							Non-Acid Forming (Barren)	Negligble
RGS019	KM101594	rhab2020_019	BIF	MGP	15	16	6.4	837	0.04		1.2	6.9	-5.7	5.6				0.12	0.14	0.02	Non-Acid Forming (Barren)	Very Low
RGS021	KM101596	rhab2020_021	BIF	MGP	25	26	6.4	682	0.03		0.9	6.8	-5.9	7.4							Non-Acid Forming (Barren)	Very Low
RGS022	KM101597	rhab2020_022	BIF	MGP	29	30	6.4	1440	0.08		2.5	8.4	-6.0	3.4							Non-Acid Forming (Barren)	Very Low
RGS023	KM101598	rhab2020_023	BIF	MGP	37	38	7	2380	0.04		1.2	18.5	-17.3	15.1							Non-Acid Forming (Barren)	Low
RGS024	KM101599	rhab2020_024	BIF	MGP	35	36	7.6	364	0.02		0.6	7.9	-7.3	12.9							Non-Acid Forming (Barren)	Negligble
RGS025	KM101600	rhab2020_025	BIF	MGP	34	35	7	1770	0.13	0.09	2.8	14	-11.2	3.5	7.3	<0.1	<0.1	0.02	0.1	0.08	Non-Acid Forming	Very Low
RGS026	KM101601	rhab2020_026	BIF	MGP	26	27	6.6	3390	0.08		2.5	19.2	-16.8	7.8							Non-Acid Forming (Barren)	Low
RGS027	KM101602	rhab2020_027	BIF	MGP	10	11	8.1	384	0.08		2.5	17.3	-14.9	7.1							Non-Acid Forming (Barren)	Negligble
RGS028	KM101603	rhab_2020_028	BIF	MGP	49	50	4.9	1070	0.03		0.9	4.6	-3.7	5.0							Non-Acid Forming (Barren)	Very Low
RGS032	KM101607	rhab_2020_032	BIF	MGP	39	40	7.6	1950	0.07		2.1	15.6	-13.5	7.3							Non-Acid Forming (Barren)	Very Low
RGS033	KM101608	rhab_2020_033	BIF	MGP	44	45	7.2	10200	0.1		3.1	12.4	-9.3	4.0							Non-Acid Forming (Barren)	High
RGS034	KM101609	rhab_2020_034	BIF	MGP	43	44	6.4	15500	0.12	0.03	1.0	8.4	-7.4	2.3	6.6	<0.1	0.5	0.06	0.12	0.06	Uncertain	High
RGS035	KM101610	rhab_2020_035	BIF	MGP	29	30	7.5	2210	0.09		2.8	8.8	-6.0	3.2							Non-Acid Forming (Barren)	Low
RGS036	KM101611	rhab_2020_036	BIF	MGP	33	34	6.2	709	0.2	0.12	3.8	12.7	-8.9	2.1				0.03	0.03	<0.02	Non-Acid Forming	Very Low
RGS037	KM101612	rhab_2020_037	BIF	MGP	34	35	5.4	268	0.03		0.9	5	-4.1	5.4							Non-Acid Forming (Barren)	Negligble
RGS038	KM101613	rhab_2020_038	BIF	MGP	29	30	5.9	1070	0.02		0.6	2.3	-1.7	3.8							Non-Acid Forming (Barren)	Very Low
RGS039	KM101614	rhab_2020_039	BIF	MGP	26	27	5.4	3150	0.05		1.5	<0.5	1.3	0.2	5.4	<0.1	2				Non-Acid Forming (Barren)	Low
RGS040	KM101615	rhab_2020_040	BIF	MGP	20	21	6.7	1080	0.02		0.6	<0.5	0.4	0.4							Non-Acid Forming (Barren)	Very Low
RGS041	KM101616	rhab_2020_041	BIF	MGP	14	15	6.3	898	0.01		0.3	2.6	-2.3	8.5							Non-Acid Forming (Barren)	Very Low
RGS042	KM101617	rhab_2020_042	BIF	MGP	11	12	5.3	787	0.03		0.9	1.1	-0.2	1.2							Non-Acid Forming (Barren)	Very Low
RGS083	KA101973	MKD020	Saprolite (clay)	MGP	36	38	8.7	1130	2.07		63.4	36.4	27.0	0.6							Potentially Acid Forming	High
RGS084	KA101974	MKD020	Saprolite (clay)	MGP	38	40	8.6	1370	2.03		62.2	31	31.2	0.5							Potentially Acid Forming	High
RGS079	KA101969	MKD020	Saprolite (Fe)	MGP	28	30	9.9	456	0.18		5.5	40.8	-35.3	7.4							Non-Acid Forming	Negligble
RGS080	KA101970	MKD020	Saprolite (Fe)	MGP	30	32	9.6	389	0.27	0.24	7.4	31.7	-24.3	3.8	10	<0.1	<0.1	0.03	0.23	0.2	Non-Acid Forming	Negligble
RGS085	KA101975	MKD020	Saprolite (Fe)	MGP	40	42	9.6	854	0.75		23.0	43.4	-20.4	1.9							Non-Acid Forming	Very Low
RGS088	KA101978	MKD020	Saprolite (Fe)	MGP	46	48	9.5	2330	0.08		2.5	21.8	-19.4	8.9							Non-Acid Forming (Barren)	Low
RGS089	KA101979	MKD020	Saprolite (Fe)	MGP	48	50	10.6	777	0.08		2.5	29.3	-26.9	12.0							Non-Acid Forming (Barren)	Very Low
RGS090	KA101980	MKD020	Saprolite (Fe)	MGP	50	52	10.2	647	0.06		1.8	25.9	-24.1	14.1							Non-Acid Forming (Barren)	Very Low
RGS091	KA101981	MKD020	Saprolite (Fe)	MGP	52	54	10.6	1360	0.04		1.2	33.9	-32.7	27.7							Non-Acid Forming (Barren)	Very Low

Table B1: Acid Base Account (ABA) Test Results for Karara Iron Ore Project

RGS Sample No.	Sample ID	Drill Hole ID	Lithology	Site Classification	Sample Depth		pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC:MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5)	NAG Capacity (pH 7)	Total Organic Carbon (TOC)	Total Carbon (TC)	Total inorganic Carbon (TIC)	Sample Classification[3]	Saline drainge hazard ranking
					From	To		(µS/cm)	(%)	(%)	kg H_2SO_4/t					kg H_2SO_4/t							
High Grade Ore (MGY), Mag > 30%, S > 0.16% and Al_2O_3 > 1.1%																						
RGS002	KM101577	rhab2020_002	BIF	MGY	12	13	5.6	195	0.05		1.5	2.4	-0.9	1.6							Non-Acid Forming (Barren)	Negligble
RGS020	KM101595	rhab2020_020	BIF	MGY	21	22	5.1	852	0.11		3.4	5.4	-2.0	1.6	6.8	<0.1	0.6	0.05	0.05	<0.02	Uncertain	Very Low
RGS030	KM101605	rhab_2020_030	BIF	MGY	51	52	6.8	6340	0.07		2.1	9.1	-7.0	4.2							Non-Acid Forming (Barren)	Moderate
RGS043	KM101618	rhab_2020_043	BIF	MGY	14	15	5.3	241	0.02		0.6	3.1	-2.5	5.1							Non-Acid Forming (Barren)	Negligble
RGS044	KM101619	rhab_2020_044	BIF	MGY	19	20	5.9	318	0.01		0.3	2.3	-2.0	7.5							Non-Acid Forming (Barren)	Negligble
RGS093	G77518	MKD045	BIF	MGY	128	130	10.2	791	0.64	0.54	16.6	21.7	-5.1	1.1	4.7	<0.1	2.4	<0.02	0.04	0.04	Uncertain	Very Low
RGS082	KA101972	MKD020	Saprolite (clay)	MGY	34	36	8.2	1870	3.78	3.31	101.4	19.8	81.6	0.2	2.2	59.9	70.3	0.94	0.98	0.04	Potentially Acid Forming	High
RGS087	KA101977	MKD020	Saprolite (clay)	MGY	44	46	8	3550	1.43		43.8	19.3	24.5	0.4							Potentially Acid Forming	Moderate
RGS045	KM101620	rhab_2020_045	Saprolite (Fe)	MGY	4	5	7.3	486	0.01		0.3	5.2	-4.9	17.0							Non-Acid Forming (Barren)	Negligble
RGS048	KM101623	rhab_2020_048	Saprolite (Fe)	MGY	5	6	5.6	825	0.02		0.6	7.3	-6.7	11.9							Non-Acid Forming (Barren)	Very Low
RGS049	KM101624	rhab_2020_049	Saprolite (Fe)	MGY	4	5	4.7	1890	0.02		0.6	5.3	-4.7	8.7							Non-Acid Forming (Barren)	Very Low
RGS050	KM101625	rhab_2020_050	Saprolite (Fe)	MGY	6	7	4.9	2280	0.03		0.9	8.7	-7.8	9.5							Non-Acid Forming (Barren)	Low
RGS051	KM101626	rhab_2020_051	Saprolite (Fe)	MGY	12	13	7	4460	0.04		1.2	17.5	-16.3	14.3							Non-Acid Forming (Barren)	Moderate
RGS052	KM101627	rhab_2020_052	Saprolite (Fe)	MGY	10	11	4.6	1100	0.04		1.2	5.8	-4.6	4.7							Non-Acid Forming (Barren)	Very Low
RGS053	KM101628	rhab_2020_053	Saprolite (Fe)	MGY	12	13	5.4	1260	0.02		0.6	5.8	-5.2	9.5							Non-Acid Forming (Barren)	Very Low
RGS054	KM101629	rhab_2020_054	Saprolite (Fe)	MGY	15	16	6.5	1760	0.02		0.6	7.6	-7.0	12.4	6.2	<0.1	3.3	0.34	0.34	<0.02	Non-Acid Forming (Barren)	Very Low
RGS055	KM101630	rhab_2020_055	Saprolite (Fe)	MGY	16	17	5.8	3310	0.04		1.2	5.4	-4.2	4.4							Non-Acid Forming (Barren)	Low
RGS056	KM101631	rhab_2020_056	Saprolite (Fe)	MGY	11	12	5.3	1180	0.02		0.6	5.1	-4.5	8.3							Non-Acid Forming (Barren)	Very Low
RGS057	KM101632	rhab_2020_057	Saprolite (Fe)	MGY	7	8	5.6	1270	0.02		0.6	6.1	-5.5	10.0							Non-Acid Forming (Barren)	Very Low
RGS058	KM101633	rhab_2020_058	Saprolite (Fe)	MGY	17	18	7.4	572	0.01		0.3	5.4	-5.1	17.6							Non-Acid Forming (Barren)	Very Low
RGS059	KM101634	rhab_2020_059	Saprolite (Fe)	MGY	19	20	7.5	844	<0.01		0.2	4.7	-4.5	30.7							Non-Acid Forming (Barren)	Very Low
RGS060	KM101635	rhab_2020_060	Saprolite (Fe)	MGY	19	20	7.2	646	0.01		0.3	5.1	-4.8	16.7							Non-Acid Forming (Barren)	Very Low
RGS061	KM101638	rhab_2020_063	Saprolite (Fe)	MGY	0	1	5.6	746	<0.01		0.2	3.8	-3.6	24.8							Non-Acid Forming (Barren)	Very Low
RGS062	KM101639	rhab_2020_064	Saprolite (Fe)	MGY	0	1	7	646	0.01		0.3	4.6	-4.3	15.0							Non-Acid Forming (Barren)	Very Low
RGS063	KM101640	rhab_2020_065	Saprolite (Fe)	MGY	2	3	6.1	954	0.04		1.2	4.5	-3.3	3.7							Non-Acid Forming (Barren)	Very Low
RGS064	KM101641	rhab_2020_066	Saprolite (Fe)	MGY	3	4	5.3	967	0.04		1.2	8.1	-6.9	6.6							Non-Acid Forming (Barren)	Very Low
RGS065	KM101642	rhab_2020_067	Saprolite (Fe)	MGY	3	4	6.9	5080	0.03		0.9	7	-6.1	7.6							Non-Acid Forming (Barren)	Moderate
RGS066	KM101643	rhab_2020_068	Saprolite (Fe)	MGY	1	2	6.4	3300	0.05		1.5	14.8	-13.3	9.7							Non-Acid Forming (Barren)	Low
RGS068	KM101645	rhab_2020_070	Saprolite (Fe)	MGY	6	7	6	2240	0.04		1.2	6.7	-5.5	5.5							Non-Acid Forming (Barren)	Low
RGS069	KM101646	rhab_2020_071	Saprolite (Fe)	MGY	19	20	7.4	5360	0.03		0.9	6.4	-5.5	7.0							Non-Acid Forming (Barren)	Moderate
RGS070	KA101959	MKD020	Saprolite (Fe)	MGY	8	10	10.2	707	0.04		1.2	19.2	-18.0	15.7							Non-Acid Forming (Barren)	Very Low
RGS071	KA101960	MKD020	Saprolite (Fe)	MGY	10	12	10.5	759	0.1		3.1	24.8	-21.7	8.1							Non-Acid Forming (Barren)	Very Low
RGS072	KA101961	MKD020	Saprolite (Fe)	MGY	12	14	10.1	540	0.15		4.6	20.8	-16.2	4.5							Non-Acid Forming	Very Low
RGS073	KA101962	MKD020	Saprolite (Fe)	MGY	14	16	10.1	1470	0.11	0.09	2.8	32.8	-30.0	9.7				<0.02	0.09	0.09	Non-Acid Forming	Very Low
RGS074	KA101963	MKD020	Saprolite (Fe)	MGY	16	18	10.2	1180	0.09		2.8	33.1	-30.3	12.0							Non-Acid Forming (Barren)	Very Low
RGS075	KA101964	MKD020	Saprolite (Fe)	MGY	18	20	10	1240	0.04		1.2	20.8	-19.6	17.0							Non-Acid Forming (Barren)	Very Low
RGS076	KA101965	MKD020	Saprolite (Fe)	MGY	20	22	10.1	336	0.18		5.5	41.4	-35.9	7.5							Non-Acid Forming	Negligble
RGS077	KA101966	MKD020	Saprolite (Fe)	MGY	22	24	9.7	895	0.47		14.4	41.7	-27.3	2.9							Non-Acid Forming	Very Low
RGS078	KA101967	MKD020	Saprolite (Fe)	MGY	24	26	9.8	644	0.22		6.7	62.6	-55.9	9.3							Non-Acid Forming	Very Low
RGS081	KA101971	MKD020	Saprolite (Fe)	MGY	32	34	9.4	1090	0.61		18.7	24.2	-5.5	1.3							Non-Acid Forming	Very Low
RGS086	KA101976	MKD020	Saprolite (Fe)	MGY	42	44	8	3000	2.75	2.53	77.5	44.7	32.8	0.5				0.68	0.85	0.17	Potentially Acid Forming	High

Table B1: Acid Base Account (ABA) Test Results for Karara Iron Ore Project

RGS Sample No.	Sample ID	Drill Hole ID	Lithology	Site Classification	Sample Depth		pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5)	NAG Capacity (pH 7)	Total Organic Carbon (TOC)	Total Carbon (TC)	Total inorganic Carbon (TIC)	Sample Classification[3]	Saline drainge hazard ranking
					From	To		(µS/cm)	(%)	(%)	kg H_2SO_4/t					kg H_2SO_4/t							
Non-Acid Forming Waste (NAF), Mag < 25%, S < 0.25%																						
RGS165	G117842	MKD088	Amphibolite	NAF	344	346	9.8	354	0.03		0.9	10.9	-10.0	11.9							Non-Acid Forming (Barren)	Negligble
RGS166	G117843	MKD088	Amphibolite	NAF	346	348	10	416	0.28	0.25	7.6	10.6	-3.0	1.2	4.7	<0.1	2.5	<0.02	<0.02	<0.02	Uncertain	Negligble
RGS142	KA101958	MKD020	BIF	NAF	6	8	8.5	822	0.28		8.6	30.1	-21.5	3.5							Non-Acid Forming	Very Low
RGS144	G117590	MKD023	BIF	NAF	262	264	10	434	0.07		2.1	23.5	-21.4	11.0							Non-Acid Forming (Barren)	Negligble
RGS145	G77183	MKD044	BIF	NAF	146	148	10.1	497	0.34	0.24	7.3	39.1	-31.8	3.8				0.08	0.2	0.12	Non-Acid Forming	Negligble
RGS147	G117136	MKD065	BIF	NAF	296	298	10.1	699	0.2		6.1	24.3	-18.2	4.0							Non-Acid Forming	Very Low
RGS151	G116079	MKD074	BIF	NAF	204	206	10.5	1000	<0.01		0.2	55.2	-55.0	360.5							Non-Acid Forming (Barren)	Very Low
RGS176	G140689	MKD123	Carb. shale	NAF	176	178	7.6	1040	2.57	2.31	70.7	11.8	58.9	0.1	2.5	40	52.1	0.36	0.36	<0.02	Potentially Acid Forming	High
RGS177	G140690	MKD123	Carb. shale	NAF	178	180	9.4	280	0.01		0.3	9.1	-8.8	29.7							Non-Acid Forming (Barren)	Negligble
RGS178	G140693	MKD123	Carb. shale	NAF	184	186	9.2	283	1.37	1.17	35.8	12.6	23.2	0.3							Potentially Acid Forming	Moderate
RGS179	G140694	MKD123	Carb. shale	NAF	186	188	9.6	258	<0.01		0.2	9.2	-9.0	60.1							Non-Acid Forming (Barren)	Negligble
RGS180	G140695	MKD123	Carb. shale	NAF	188	190	9.9	249	<0.01		0.2	10.2	-10.0	66.6				0.28	0.28	<0.02	Non-Acid Forming (Barren)	Negligble
RGS181	G140698	MKD123	Carb. shale	NAF	194	196	9.5	168	0.08		2.5	13.1	-10.7	5.3							Non-Acid Forming (Barren)	Negligble
RGS156	G116488	MKD087	Dolerite	NAF	474	476	10.2	530	0.12	0.11	3.4	27.2	-23.8	7.4	8.6	<0.1	<0.1	<0.02	0.03	0.03	Non-Acid Forming	Very Low
RGS157	G116490	MKD087	Dolerite	NAF	478	480	10.2	430	0.17		5.2	22.2	-17.0	4.3							Non-Acid Forming	Negligble
RGS158	G116491	MKD087	Dolerite	NAF	480	482	10	669	0.15		4.6	25.7	-21.1	5.6							Non-Acid Forming	Very Low
RGS159	G116492	MKD087	Dolerite	NAF	482	484	8.7	2800	0.41		12.6	20.2	-7.6	1.6							Non-Acid Forming	Low
RGS160	G116493	MKD087	Dolerite	NAF	484	486	10.1	451	0.16		4.9	19.6	-14.7	4.0							Non-Acid Forming	Negligble
RGS161	G116494	MKD087	Dolerite	NAF	486	488	10.1	377	0.15		4.6	20.6	-16.0	4.5							Non-Acid Forming	Negligble
RGS162	G116495	MKD087	Dolerite	NAF	488	490	10	398	0.15		4.6	19.7	-15.1	4.3							Non-Acid Forming	Negligble
RGS163	G116496	MKD087	Dolerite	NAF	490	492	9	1420	0.16	0.13	4.0	23	-19.0	4.7				<0.02	<0.02	<0.02	Non-Acid Forming	Very Low
RGS164	G116496	MKD087	Dolerite	NAF	490	492	10	510	0.16	0.13	4.0	19.7	-15.7	4.0				<0.02	<0.02	<0.02	Non-Acid Forming	Very Low
RGS169	G117496	MKD107	Dolerite	NAF	390	392	10.1	348	0.16	0.13	4.1	19.6	-15.5	4.0				<0.02	<0.02	<0.02	Non-Acid Forming	Negligble
RGS170	G117497	MKD107	Dolerite	NAF	392	394	10	383	0.18		5.5	17.6	-12.1	3.2							Non-Acid Forming	Negligble
RGS171	G117498	MKD107	Dolerite	NAF	394	396	9.8	490	0.16		4.9	19.9	-15.0	4.1							Non-Acid Forming	Negligble
RGS172	G117499	MKD107	Dolerite	NAF	396	398	9.8	458	0.13		4.0	22.8	-18.8	5.7							Non-Acid Forming	Negligble
RGS173	G117501	MKD107	Dolerite	NAF	400	402	9.7	532	0.13		4.0	23.5	-19.5	5.9							Non-Acid Forming	Very Low
RGS174	G117502	MKD107	Dolerite	NAF	402	404	10	417	0.15	0.12	3.8	9.3	-5.5	2.0				<0.02	<0.02	<0.02	Uncertain	Negligble
RGS175	G117503	MKD107	Dolerite	NAF	404	406	10.1	386	0.16		4.9	19.8	-14.9	4.0							Non-Acid Forming	Negligble
RGS149	G77789	MKD073	Quartz vein	NAF	122	124	9	483	0.05		1.5	55.8	-54.3	36.4							Non-Acid Forming (Barren)	Negligble
RGS150	G116078	MKD074	Quartz vein	NAF	202	204	10.3	751	0.03		0.9	63.4	-62.5	69.0	10.2	<0.1	<0.1				Non-Acid Forming (Barren)	Very Low
RGS167	G117844	MKD088	Quartzite	NAF	348	350	9.7	508	0.6	0.52	16.0	13	3.0	0.7	3.5	5	10.5	0.12	0.12	<0.02	Potentially Acid Forming - Low Capacity	Very Low
RGS168	G117859	MKD096	Quartzite	NAF	112	114	9.4	380	0.05		1.5	35.1	-33.6	22.9							Non-Acid Forming (Barren)	Negligble
RGS146	G117134	MKD065	Shale	NAF	292	294	10.1	711	0.12		3.7	29.8	-26.1	8.1							Non-Acid Forming	Very Low
RGS153	G117364	MKD084	Shale	NAF	238	240	10.5	599	0.04		1.2	17.2	-16.0	14.0							Non-Acid Forming (Barren)	Very Low
RGS154	G118081	MKD086	Shale	NAF	291	292	9.5	596	0.19		5.8	15.3	-9.5	2.6							Non-Acid Forming	Very Low
RGS155	G116375	MKD087	Siltstone	NAF	249	250	10.4	697	0.24		7.4	61.2	-53.9	8.3							Non-Acid Forming	Very Low

Table B1: Acid Base Account (ABA) Test Results for Karara Iron Ore Project

RGS Sample No.	Sample ID	Drill Hole ID	Lithology	Site Classification	Sample Depth		pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC:MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5)	NAG Capacity (pH 7)	Total Organic Carbon (TOC)	Total Carbon (TC)	Total inorganic Carbon (TIC)	Sample Classification[3]	Saline drainge hazard ranking
					From	To		(µS/cm)	(%)	(%)	kg H_2SO_4/t					kg H_2SO_4/t							
Potentially Acid Forming Waste (PAF), Mag < 25%, S > 0.25%																						
RGS247	G117860	MKD096	Amphibolite	PAF	114	116	9.5	1110	1.76		53.9	32.2	21.7	0.6							Potentially Acid Forming	Moderate
RGS143	G117589	MKD023	BIF	PAF	260	262	9.5	454	0.19		5.8	13.7	-7.9	2.4							Non-Acid Forming	Negligible
RGS193	G77177	MKD044	BIF	PAF	134	136	10	660	0.04	0.03	0.9	31.8	-30.9	26.0				0.02	0.14	0.12	Non-Acid Forming (Barren)	Very Low
RGS194	G77177	MKD044	BIF	PAF	134	136	10.2	505	0.5	0.03	0.9	48.2	-47.3	3.1				0.02	0.14	0.12	Non-Acid Forming (Barren)	Very Low
RGS195	G77188	MKD044	BIF	PAF	136	138	10.3	576	0.02		0.6	27.4	-26.8	44.7							Non-Acid Forming (Barren)	Very Low
RGS196	G77188	MKD044	BIF	PAF	136	138	10.2	555	0.62		19.0	42.9	-23.9	2.3							Non-Acid Forming (Barren)	Very Low
RGS197	G77201	MKD044	BIF	PAF	134	136	8.2	1110	7.61	6.57	201.2	17.6	183.6	0.1	2	118	129	0.03	0.18	0.15	Potentially Acid Forming	High
RGS198	G77201	MKD044	BIF	PAF	134	136	9.4	439	2.74	6.57	201.2	32.3	168.9	0.4	2	118	129	0.03	0.18	0.15	Potentially Acid Forming	High
RGS209	G77908	MKD082	BIF	PAF	156	158	10.2	510	0.8	0.66	20.2	23.9	-3.7	1.0	3.5	3.3	7.8	0.54	0.54	<0.02	Uncertain	Very Low
RGS219	G77947	MKD082	BIF	PAF	234	236	10.4	662	0.32		9.8	15.8	-6.0	1.6							Non-Acid Forming	Very Low
RGS220	G77987	MKD082	BIF	PAF	314	316	7.6	1000	8.48	7.46	228.5	2.5	226.0	0.0	2.1	135	149	1.81	1.92	0.11	Potentially Acid Forming	High
RGS221	G77988	MKD082	BIF	PAF	314	316	8.1	876	7.16		219.3	5	214.3	0.0							Potentially Acid Forming	High
RGS222	G77990	MKD082	BIF	PAF	320	322	10.6	756	0.21	0.18	5.6	58.8	-53.2	9.1				0.16	0.54	0.38	Non-Acid Forming	Very Low
RGS223	G77998	MKD082	BIF	PAF	320	322	10.4	614	0.04		1.2	12.9	-11.7	10.5				0.4	0.43	0.03	Non-Acid Forming (Barren)	Very Low
RGS226	G117384	MKD084	BIF	PAF	278	280	9.1	837	4.31	3.76	115.2	10.2	105.0	0.1							Potentially Acid Forming	High
RGS227	G117385	MKD084	BIF	PAF	280	282	8.5	755	5.69		174.3	3.3	171.0	0.0							Potentially Acid Forming	High
RGS182	G140699	MKD123	Carb. shale	PAF	196	198	9.7	238	0.01		0.3	15.6	-15.3	50.9							Non-Acid Forming (Barren)	Negligible
RGS265	G140691	MKD123	Carb. shale	PAF	180	182	9.8	174	<0.01		0.2	22.5	-22.3	146.9							Non-Acid Forming (Barren)	Negligible
RGS266	G140692	MKD123	Carb. shale	PAF	182	184	9.7	163	<0.01		0.2	9.5	-9.3	62.0							Non-Acid Forming (Barren)	Negligible
RGS267	G140696	MKD123	Carb. shale	PAF	190	192	9.2	372	1.54	1.30	39.8	10.4	29.4	0.2				0.34	0.35	<0.02	Potentially Acid Forming	Moderate
RGS268	G140697	MKD123	Carb. shale	PAF	192	194	8.3	527	1.74		53.3	13.6	39.7	0.3							Potentially Acid Forming	Moderate
RGS269	G140700	MKD123	Carb. shale	PAF	198	200	9.1	677	1.45		44.4	18.3	26.1	0.4							Potentially Acid Forming	Moderate
RGS270	G140701	MKD123	Carb. shale	PAF	200	202	9.6	413	0.26	0.23	7.1	9.2	-2.1	1.2				0.14	0.14	<0.02	Uncertain	Negligible
RGS285	G140279	MKD177	Carb. shale	PAF	394	396	8.4	542	4.23		129.5	18.7	110.8	0.1							Potentially Acid Forming	High
RGS286	G140280	MKD177	Carb. shale	PAF	396	398	8.9	407	2.7		82.7	16.3	66.4	0.2							Potentially Acid Forming	High
RGS287	G140281	MKD177	Carb. shale	PAF	398	400	8.9	374	0.88	0.71	21.6	18.2	3.4	0.7				1.44	1.48	0.04	Potentially Acid Forming - Low Capacity	Very Low
RGS271	G140264	MKD177	Mud/claystone	PAF	364	366	9.3	354	1.1	0.91	28.0	29.7	-1.7	0.9	3.7	2.2	6.8	0.32	0.44	0.12	Uncertain	Moderate
RGS272	G140265	MKD177	Mud/claystone	PAF	366	368	9.2	341	2.64		80.9	16.8	64.1	0.2							Potentially Acid Forming	High
RGS273	G140266	MKD177	Mud/claystone	PAF	368	370	9.6	372	2.34		71.7	17.9	53.8	0.2							Potentially Acid Forming	High
RGS275	G140269	MKD177	Mud/claystone	PAF	374	376	9	351	2.23		68.3	19	49.3	0.3							Potentially Acid Forming	High
RGS276	G140270	MKD177	Mud/claystone	PAF	376	378	8.9	502	5.71	5.00	153.1	26.9	126.2	0.2	2.2	70.7	87.4	2.1	2.3	0.2	Potentially Acid Forming	High
RGS277	G140271	MKD177	Mud/claystone	PAF	378	380	9.3	414	3.4		104.1	19.1	85.0	0.2							Potentially Acid Forming	High
RGS278	G140272	MKD177	Mud/claystone	PAF	380	382	8.7	824	10.2		312.4	14.8	297.6	0.0							Potentially Acid Forming	High
RGS279	G140273	MKD177	Mud/claystone	PAF	382	384	9.1	562	5.6		171.5	16.3	155.2	0.1							Potentially Acid Forming	High
RGS280	G140274	MKD177	Mud/claystone	PAF	384	386	9.2	398	3.39	3.10	94.9	20.3	74.6	0.2				2.54	2.55	<0.02	Potentially Acid Forming	High
RGS281	G140275	MKD177	Mud/claystone	PAF	386	388	8.8	501	4.97		152.2	16	136.2	0.1							Potentially Acid Forming	High
RGS282	G140276	MKD177	Mud/claystone	PAF	388	390	8.8	415	3.96		121.3	17	104.3	0.1							Potentially Acid Forming	High
RGS283	G140277	MKD177	Mud/claystone	PAF	390	392	8.7	337	2.62		80.2	18.6	61.6	0.2							Potentially Acid Forming	High
RGS284	G140278	MKD177	Mud/claystone	PAF	392	394	8.4	426	4.7	3.99	122.2	19.9	102.3	0.1							Potentially Acid Forming	High
RGS250	G117556	MKD107	Pyroxenite	PAF	510	512	10	599	1.11	0.93	28.5	28.2	0.3	0.8				0.03	0.03	<0.02	Potentially Acid Forming - Low Capacity	Moderate
RGS251	G117558	MKD107	Pyroxenite	PAF	514	516	10.1	580	0.65		19.9	28.8	-8.9	1.4							Non-Acid Forming	Very Low
RGS148	G116332	MKD066	Quartz vein	PAF	514	516	10.2	755	0.63	0.54	16.5	19.8	-3.3	1.0	4.6	<0.1	4.6	<0.02	0.02	0.02	Uncertain	Very Low
RGS274	G140268	MKD177	Quartz vein	PAF	372	374	8.4	947	10.4	8.67	265.5	15.6	249.9	0.0							Potentially Acid Forming	High
RGS184	G77464	MKD015	Quartzite	PAF	268	270	9.4	528	2.42		74.1	13.9	60.2	0.2							Potentially Acid Forming	High
RGS186	G77468	MKD015	Quartzite	PAF	276	278	9.4	481	0.99		30.3	14.1	16.2	0.5							Potentially Acid Forming	Negligible
RGS187	G77469	MKD015	Quartzite	PAF	278	280	9.4	521	2.52	2.18	66.8	16.2	50.6	0.2				0.53	0.53	<0.02	Potentially Acid Forming	High
RGS249	G117868	MKD096	Quartzite	PAF	130	132	9.4	554	0.59	0.48	14.6	9.3	5.3	0.5							Potentially Acid Forming - Low Capacity	Very Low
RGS252	G117563	MKD107	Quartzite	PAF	524	526	9.8	488	0.58	0.57	17.4	8.9	8.5	0.5	3.5	3.2	9.5	0.77	0.77	<0.02	Potentially Acid Forming - Low Capacity	Negligible
RGS253	G117567	MKD107	Quartzite	PAF	532	534	9.9	374	0.64		19.6	14.2	5.4	0.7							Potentially Acid Forming - Low Capacity	Negligible
RGS254	G117568	MKD107	Quartzite	PAF	534	536	9.6	363	0.69	0.60	18.4	12.6	5.8	0.6	3.4	5.4	12	0.74	0.74	<0.02	Potentially Acid Forming - Low Capacity	Negligible
RGS255	G117569	MKD107	Quartzite	PAF	536	538	9.2	530	0.96	0.82	25.0	14.8	10.2	0.5							Potentially Acid Forming	Very Low
RGS256	G117571	MKD107	Quartzite	PAF	540	542	9.8	365	0.4	0.35	10.7	14.3	-3.6	1.2	3.9	1.7	6.3	0.54	0.54	<0.02	Uncertain	Negligible
RGS264	G117585	MKD107	Quartzite	PAF	568	570	8.7	539	1.08		33.1	16.4	16.7	0.5							Potentially Acid Forming	Moderate
RGS152	G117348	MKD084	Shale	PAF	206	208	10.1	521	0.3	0.26	7.8	62.2	-54.4	6.8				0.41	0.87	0.46	Non-Acid Forming	Very Low
RGS183	G77459	MKD015	Shale	PAF	258	260	9.7	665	0.91	0.76	23.3	22.9	0.4	0.8				0.19	0.2	<0.02	Uncertain	Very Low
RGS185	G77465	MKD015	Shale	PAF	270	272	9.7	457	0.5	0.44	13.6	15.6	-2.0	1.0	4	1	5.8	0.39	0.39	<0.02	Uncertain	Negligible
RGS188	G77470	MKD015	Shale	PAF	280	282	9.2	474	2.18		66.8	13.7	53.1	0.2							Potentially Acid Forming	High

Table B1: Acid Base Account (ABA) Test Results for Karara Iron Ore Project

RGS Sample No.	Sample ID	Drill Hole ID	Lithology	Site Classification	Sample Depth		pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC:MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5)	NAG Capacity (pH 7)	Total Organic Carbon (TOC)	Total Carbon (TC)	Total inorganic Carbon (TIC)	Sample Classification[3]	Saline drainge hazard ranking
					From	To		(µS/cm)	(%)	(%)	kg H_2SO_4/t					kg H_2SO_4/t							
Potentially Acid Forming Waste (PAF), Mag < 25%, S > 0.25%																						
RGS189	G77471	MKD015	Shale	PAF	282	284	9.1	420	3.31		101.4	10.1	91.3	0.1							Potentially Acid Forming	High
RGS190	K102028	MKD021	Shale	PAF	80	82	4.1	3600	0.86		26.3	<0.5	26.1	0.0							Potentially Acid Forming	Low
RGS191	K102029	MKD021	Shale	PAF	82	84	4.7	2360	0.65		19.9	4.4	15.5	0.2							Potentially Acid Forming	Low
RGS199	G77202	MKD044	Shale	PAF	184	186	8	903	0.86	0.68	20.7	12.5	8.2	0.5				2.21	2.35	0.14	Potentially Acid Forming	Very Low
RGS200	G77202	MKD044	Shale	PAF	184	186	8.7	484	1.56	0.68	20.7	97.8	-77.1	2.0				2.21	2.35	0.14	Potentially Acid Forming	Moderate
RGS201	G77203	MKD044	Shale	PAF	186	188	8.8	400	8.94	7.59	232.4	10	222.4	0.0	2.1	122	144	1.82	1.94	0.12	Potentially Acid Forming	High
RGS202	G77203	MKD044	Shale	PAF	186	188	8.3	729	5.37	7.59	232.4	31.5	200.9	0.2	2.1	122	144	1.82	1.94	0.12	Potentially Acid Forming	High
RGS203	G77204	MKD044	Shale	PAF	188	190	8.8	402	5.25		160.8	12.5	148.3	0.1							Potentially Acid Forming	High
RGS204	G77204	MKD044	Shale	PAF	188	190	8.9	343	5.4		165.4	6.6	158.8	0.0							Potentially Acid Forming	High
RGS205	G77205	MKD044	Shale	PAF	190	192	8.1	877	5.91		181.0	14.3	166.7	0.1							Potentially Acid Forming	High
RGS206	G77205	MKD044	Shale	PAF	190	192	8.3	804	5.64		172.7	16	156.7	0.1							Potentially Acid Forming	High
RGS207	G77673	MKD077	Shale	PAF	280	282	9.8	604	0.51	0.43	13.0	17.8	-4.8	1.1				<0.02	0.03	0.03	Uncertain	Very Low
RGS208	G77674	MKD077	Shale	PAF	282	284	9	711	0.99		30.3	14.7	15.6	0.5							Potentially Acid Forming	Very Low
RGS210	G77910	MKD082	Shale	PAF	160	162	9.9	413	2.12	1.74	53.3	26.2	27.1	0.4							Potentially Acid Forming	High
RGS211	G77918	MKD082	Shale	PAF	176	178	10.2	484	0.11	0.11	3.3	11.7	-8.4	3.5	7.4	<0.1	<0.1	0.22	0.22	<0.02	Non-Acid Forming	Negligble
RGS212	G77919	MKD082	Shale	PAF	178	180	10	465	1.65		50.5	17	33.5	0.3							Potentially Acid Forming	Moderate
RGS213	G77921	MKD082	Shale	PAF	182	184	10.2	551	0.9		27.6	16.6	11.0	0.6							Potentially Acid Forming	Very Low
RGS214	G77926	MKD082	Shale	PAF	192	194	9.2	482	3.74		114.5	7.5	107.0	0.1							Potentially Acid Forming	High
RGS215	G77927	MKD082	Shale	PAF	194	196	9.6	331	1.57	1.35	41.3	8.7	32.6	0.2				2.48	2.54	0.06	Potentially Acid Forming	Moderate
RGS216	G77928	MKD082	Shale	PAF	196	198	9.3	295	0.66		20.2	7.9	12.3	0.4							Potentially Acid Forming	Negligble
RGS217	G77929	MKD082	Shale	PAF	198	200	9.5	546	3.31		101.4	7.7	93.7	0.1							Potentially Acid Forming	High
RGS218	G77939	MKD082	Shale	PAF	218	220	9.4	488	2.62	2.46	75.3	10.4	64.9	0.1	2.4	46.3	57.1	0.03	0.07	0.04	Potentially Acid Forming	High
RGS224	G117332	MKD084	Shale	PAF	176	177	8.8	295	1.46	1.23	37.7	15.2	22.5	0.3				0.02	0.19	0.17	Potentially Acid Forming	Moderate
RGS225	G117349	MKD084	Shale	PAF	176	177	10.6	852	0.46	0.41	12.6	50.9	-38.3	3.6	10.2	<0.1	<0.1	0.28	0.66	0.38	Non-Acid Forming	Very Low
RGS228	G117386	MKD084	Shale	PAF	282	284	8.1	1550	17.6		539.0	15.6	523.4	0.0							Potentially Acid Forming	High
RGS229	G117387	MKD084	Shale	PAF	284	286	9	490	4.5		137.8	12	125.8	0.1							Potentially Acid Forming	High
RGS230	G117388	MKD084	Shale	PAF	286	288	8.5	599	5.98	5.06	155.0	7.9	147.1	0.0				3.42	3.46	0.04	Potentially Acid Forming	High
RGS231	G117389	MKD084	Shale	PAF	288	290	8.4	760	8.16		249.9	9.1	240.8	0.0							Potentially Acid Forming	High
RGS232	G117391	MKD084	Shale	PAF	292	294	8.4	756	7.61		233.1	10.6	222.5	0.0							Potentially Acid Forming	High
RGS233	G117392	MKD084	Shale	PAF	294	296	8.1	885	10		306.3	10.4	295.9	0.0							Potentially Acid Forming	High
RGS234	G117393	MKD084	Shale	PAF	296	298	8.4	762	5.44	4.49	137.5	13.4	124.1	0.1	2.1	88.8	102	2.2	2.32	0.12	Potentially Acid Forming	High
RGS235	G117394	MKD084	Shale	PAF	298	300	8.2	899	9.4		287.9	11.9	276.0	0.0							Potentially Acid Forming	High
RGS236	G117395	MKD084	Shale	PAF	300	302	8.5	765	5.33		163.2	19.9	143.3	0.1							Potentially Acid Forming	High
RGS237	G117396	MKD084	Shale	PAF	302	304	8.4	774	5.96		182.5	13.1	169.4	0.1				2.3	2.41	0.11	Potentially Acid Forming	High
RGS238	G117397	MKD084	Shale	PAF	304	306	8.5	702	5.66	4.71	144.2	12.3	131.9	0.1				2.86	2.9	0.04	Potentially Acid Forming	High
RGS239	G117399	MKD084	Shale	PAF	308	310	8.6	673	4.85		148.5	13.4	135.1	0.1							Potentially Acid Forming	High
RGS240	G117400	MKD084	Shale	PAF	310	312	8.5	722	7.79		238.6	15.2	223.4	0.1							Potentially Acid Forming	High
RGS241	G117401	MKD084	Shale	PAF	312	314	9	577	4.98	4.23	129.5	21.1	108.4	0.1	2.1	72.9	88.1	2.7	2.74	0.04	Potentially Acid Forming	High
RGS242	G117402	MKD084	Shale	PAF	314	316	8.6	786	4.9		150.1	22.1	128.0	0.1							Potentially Acid Forming	High
RGS243	G117403	MKD084	Shale	PAF	316	318	9.5	622	2.56		78.4	33.4	45.0	0.4	2.5	36.1	47.2	0.25	0.33	0.08	Potentially Acid Forming	High
RGS244	G118082	MKD086	Shale	PAF	292	294	8.8	732	3.4	2.91	89.1	10.5	78.6	0.1							Potentially Acid Forming	High
RGS245	G117841	MKD088	Shale	PAF	342	344	8.7	1170	0.74	0.65	19.8	13.8	6.0	0.6	3.2	7.1	14.5	0.08	0.08	<0.02	Potentially Acid Forming - Low Capacity	Very Low
RGS257	G117577	MKD107	Shale	PAF	552	554	9.4	416	0.57	0.41	12.6	11.9	0.7	0.7				0.44	0.47	0.03	Potentially Acid Forming - Low Capacity	Negligble
RGS258	G117578	MKD107	Shale	PAF	554	556	8.9	521	0.82		25.1	13.2	11.9	0.5							Potentially Acid Forming	Very Low
RGS259	G117579	MKD107	Shale	PAF	556	558	9.3	396	0.65	0.59	18.0	13.3	4.7	0.7	3.4	4.5	10.3	0.77	0.77	<0.02	Potentially Acid Forming - Low Capacity	Negligble
RGS260	G117580	MKD107	Shale	PAF	558	560	8.6	689	1.43		43.8	14.5	29.3	0.3							Potentially Acid Forming	Moderate
RGS261	G117582	MKD107	Shale	PAF	562	564	9.3	317	1.13		34.6	15.8	18.8	0.5							Potentially Acid Forming	Moderate
RGS262	G117583	MKD107	Shale	PAF	564	566	8.5	635	1.77		54.2	16.1	38.1	0.3							Potentially Acid Forming	Moderate
RGS263	G117584	MKD107	Shale	PAF	566	568	8.4	705	1.5	1.32	40.4	15.8	24.6	0.3	3	11.2	24.7	1.03	1.04	<0.02	Potentially Acid Forming	Moderate
RGS192	G77635	MKD041	Siltstone	PAF	310	312	9.7	650	3.84	3.47	106.3	42.2	64.1	0.4	2.4	53.5	66.5	0.18	0.33	0.15	Potentially Acid Forming	High
RGS246	G117845	MKD088	Siltstone	PAF	350	350	9.3	635	1.81		55.4	14	41.4	0.3							Potentially Acid Forming	Moderate
RGS248	G117862	MKD096	Talc	PAF	118	120	10.2	602	0.02		0.6	36.2	-35.6	59.1							Non-Acid Forming (Barren)	Very Low
RGS067	KM101644	rhab_2020_069	Saprolite (Fe)	#N/A	5	6	6.7	4270	0.06		1.8	6.7	-4.9	3.6							Non-Acid Forming (Barren)	Moderate
RGS092	KA101983	MKD020	Saprolite (Fe)	#N/A			10.1	477	0.06		1.8	21.3	-19.5	11.6							Non-Acid Forming (Barren)	Negligble

Codes	Classification	Total Sulfur (%)	NAPP (kg H_2SO_4/t)	ANC:MPA Ratio
NAF (B)	Non-Acid Forming (Barren)	≤ 0.1	-	-
NAF	Non-Acid Forming	> 0.1	≤ -5	≥ 2
Uncertain	Uncertain	> 0.1	> -5 to ≤ +5	< 2
PAF (LC)	Potentially Acid Forming - Low Capacity	> 0.1	> 5 to ≤ 10	< 2
PAF	Potentially Acid Forming	> 0.1	> 10	< 2

1. Current pH, EC, Alkalinity and Acidity provided for saturated paste (1:2 soil water)
2. Scr = Chromium Reducible Sulfur; MPA = Maximum Potential Acidity; ANC = Acid Neutralising Capacity; and NAPP = Net Acid Producing Potential.
3. Sample classification criteria detail provided in report text.

* Where total sulfur or ANC results are less than the laboratory LoR a value of half of the LoR is used in analysis

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF
	RGS Sample Number →		1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Pit→		KM101576	KM101577	KM101578	KM101579	KM101580	KM101581	KM101582	KM101583	KM101584	KM101585	KM101586	KM101587	KM101588	KM101589
	Units	**Average Crustal Abundance[1]**	rhab2020_001	rhab2020_002	rhab2020_003	rhab2020_004	rhab2020_005	rhab2020_006	rhab2020_007	rhab2020_008	rhab2020_009	rhab2020_010	rhab2020_011	rhab2020_012	rhab2020_013	rhab2020_014
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Potassium (K)	%	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium (Mg)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF
	RGS Sample Number →		15	16	17	18	19	20	21	22	23	24	25	26	27	28
	Pit→		KM101590	KM101591	KM101592	KM101593	KM101594	KM101595	KM101596	KM101597	KM101598	KM101599	KM101600	KM101601	KM101602	KM101603
	Units	**Average Crustal Abundance[1]**	rhab2020_015	rhab2020_016	rhab2020_017	rhab2020_018	rhab2020_019	rhab2020_020	rhab2020_021	rhab2020_022	rhab2020_023	rhab2020_024	rhab2020_025	rhab2020_026	rhab2020_027	rhab_2020_028
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Potassium (K)	%	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium (Mg)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2 Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF
	RGS Sample Number →		29	30	31	32	33	34	35	36	37	38	39	40	41	42
	Pit→		KM101604	KM101605	KM101606	KM101607	KM101608	KM101609	KM101610	KM101611	KM101612	KM101613	KM101614	KM101615	KM101616	KM101617
	Units	**Average Crustal Abundance[1]**	rhab_2020_029	rhab_2020_030	rhab_2020_031	rhab_2020_032	rhab_2020_033	rhab_2020_034	rhab_2020_035	rhab_2020_036	rhab_2020_037	rhab_2020_038	rhab_2020_039	rhab_2020_040	rhab_2020_041	rhab_2020_042
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	3	2	3	3	3	3	3	3	3	3	3	3	3	3
Potassium (K)	%	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium (Mg)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	1	1	1	1	0	1	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		BIF	BIF	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)
	RGS Sample Number →		43	44	45	46	47	48	49	50	51	52	53	54	55	56
	Pit→		KM101618	KM101619	KM101620	KM101621	KM101622	KM101623	KM101624	KM101625	KM101626	KM101627	KM101628	KM101629	KM101630	KM101631
	Units	Average Crustal Abundance[1]	rhab_2020_043	rhab_2020_044	rhab_2020_045	rhab_2020_046	rhab_2020_047	rhab_2020_048	rhab_2020_049	rhab_2020_050	rhab_2020_051	rhab_2020_052	rhab_2020_053	rhab_2020_054	rhab_2020_055	rhab_2020_056
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	2	0	1	0	0	1	1	1	1	2	2	1	2	1
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	2	3	2	3	3	2	2	2	3	2	2	2	2	2
Potassium (K)	%	1.4	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Magnesium (Mg)	%	0.5	1	0	1	0	0	0	1	1	1	1	1	1	1	1
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)
	RGS Sample Number →		57	58	59	60	61	62	63	64	65	66	67	68	69	70
	Pit→		KM101632	KM101633	KM101634	KM101635	KM101638	KM101639	KM101640	KM101641	KM101642	KM101643	KM101644	KM101645	KM101646	KA101959
	Units	**Average Crustal Abundance[1]**	rhab_2020_057	rhab_2020_058	rhab_2020_059	rhab_2020_060	rhab_2020_063	rhab_2020_064	rhab_2020_065	rhab_2020_066	rhab_2020_067	rhab_2020_068	rhab_2020_069	rhab_2020_070	rhab_2020_071	MKD020
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	1	2	1	1	2	2	1	1	2	1	0	1	2	0
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	2	2	2	2	2	3	2	2	2	2	0	2	2	2
Potassium (K)	%	1.4	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Magnesium (Mg)	%	0.5	1	1	1	0	1	0	1	1	1	1	0	1	1	0
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (clay)	Saprolite (clay)	Saprolite (clay)
	RGS Sample Number →		71	72	73	74	75	76	77	78	79	80	81	82	83	84
	Pit→		KA101960	KA101961	KA101962	KA101963	KA101964	KA101965	KA101966	KA101967	KA101969	KA101970	KA101971	KA101972	KA101973	KA101974
	Units	Average Crustal Abundance[1]	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	3	2	2	3	3	3	3	2	3	3	3	2	3	3
Potassium (K)	%	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium (Mg)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Saprolite (Fe)	Saprolite (Fe)	Saprolite (clay)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	Saprolite (Fe)	BIF	Pyroxenite	Pyroxenite	BIF	Saprolite (Fe)	Siltstone
	RGS Sample Number →		85	86	87	88	89	90	91	92	93	94	95	96	97	98
	Pit→		KA101975	KA101976	KA101977	KA101978	KA101979	KA101980	KA101981	KA101983	G77518	KM101636	KM101637	G94863	KA101968	G77473
	Units	Average Crustal Abundance[1]	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD020	MKD045	MKD015	MKD015	MKD017	MKD020	MKD027
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	0	0	0	0	0	0	0	0	0	2	1	0	0	4
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	3	2	2	3	3	3	3	0	2	2	2	2	2	2
Potassium (K)	%	1.4	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Magnesium (Mg)	%	0.5	0	0	0	0	0	0	0	0	1	1	1	1	0	2
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		BIF	BIF	BIF	BIF	BIF	BIF	BIF	BIF	Shale	BIF	Shale	BIF	BIF	Shale
	RGS Sample Number →		99	100	101	102	103	104	105	106	107	108	109	110	111	112
	Pit→		G77072	G77104	G77178	G77178	G77180	G77180	G77193	G77193	G117133	G117135	G116331	G116334	G116335	G77911
	Units	**Average Crustal Abundance[1]**	MKD037	MKD037	MKD044	MKD044	MKD044	MKD044	MKD044	MKD044	MKD065	MKD065	MKD066	MKD066	MKD066	MKD082
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	3	3	1	1	2	2	2	2	2	2	2	2	1	2
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Potassium (K)	%	1.4	2	2	1	1	0	0	1	1	1	1	1	1	1	1
Magnesium (Mg)	%	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Shale	Shale	Shale	Quartzite	Shale	BIF	BIF	BIF	BIF	BIF	BIF	Breccia	Shale	Shale
	RGS Sample Number →		113	114	115	116	117	118	119	120	121	122	123	124	125	126
	Pit→		G77912	G77917	G77922	G77930	G77937	G77946	G77963	G77983	G77985	G77991	G94029	G94032	G117346	G117360
	Units	**Average Crustal Abundance[1]**	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD084	MKD084
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	4	4	4	5	5	3	1	7	7	2	3	2	1	1
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Potassium (K)	%	1.4	1	0	0	0	0	1	1	0	0	1	1	0	1	1
Magnesium (Mg)	%	0.5	2	1	1	2	3	1	1	1	1	1	1	1	1	1
Manganese (Mn)	%	0.1	0	0	0	1	1	0	0	0	1	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Shale	BIF	BIF	Quartzite	Quartzite	BIF	Pyroxenite	Quartzite	Quartzite	Quartzite	Quartzite	Quartzite	Quartzite	Quartzite
	RGS Sample Number →		127	128	129	130	131	132	133	134	135	136	137	138	139	140
	Pit→		G117375	G116376	G116377	G117866	G117867	G117540	G117562	G117565	G117566	G117570	G117573	G117576	G117586	G117587
	Units	**Average Crustal Abundance[1]**	MKD084	MKD087	MKD087	MKD096	MKD096	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	2	2	1	3	3	1	3	3	3	3	3	3	3	3
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Potassium (K)	%	1.4	0	2	1	0	0	0	0	0	0	0	0	0	0	0
Magnesium (Mg)	%	0.5	1	1	1	2	2	0	2	2	2	2	1	2	2	2
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	1	1	1	1	1	1	1	2
Lead (Pb)	ppm	35	0	0	0	1	1	1	1	1	0	1	0	1	2	2
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	1	1	1	1	0	1	3	3

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Mud/claystone	BIF	BIF	BIF	BIF	Shale	BIF	Quartz vein	Quartz vein	Quartz vein	BIF	Shale	Shale	Shale
	RGS Sample Number →		141	142	143	144	145	146	147	148	149	150	151	152	153	154
	Pit→		G140267	KA101958	G117589	G117590	G77183	G117134	G117136	G116332	G77789	G116078	G116079	G117348	G117364	G118081
	Units	**Average Crustal Abundance[1]**	MKD177	MKD020	MKD023	MKD023	MKD044	MKD065	MKD065	MKD066	MKD073	MKD074	MKD074	MKD084	MKD084	MKD086
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	6	0	1	0	1	0	0	1	0	0	0	1	1	0
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	1	1	0	0	0	0	0	1	0	0	0	0
Iron (Fe)	%	4	2	0	2	1	2	1	1	1	0	1	1	2	1	1
Potassium (K)	%	1.4	1	0	0	0	1	2	1	2	0	1	1	1	2	1
Magnesium (Mg)	%	0.5	1	0	2	3	1	1	1	1	0	4	3	1	1	1
Manganese (Mn)	%	0.1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	2	0	0	1	0	0	0	0	0	1	0	0	1	0
Lead (Pb)	ppm	35	1	0	2	3	0	0	0	0	0	0	0	0	0	1
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	4	0	0	2	0	0	0	0	0	0	0	0	0	1

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Siltstone	Dolerite	Dolerite	Dolerite	Dolerite	Dolerite	Dolerite	Dolerite	Dolerite	Dolerite	Amphibolite	Amphibolite	Quartzite	Quartzite
	RGS Sample Number →		155	156	157	158	159	160	161	162	163	164	165	166	167	168
	Pit→		G116375	G116488	G116490	G116491	G116492	G116493	G116494	G116495	G116496	G116496	G117842	G117843	G117844	G117859
	Units	**Average Crustal Abundance[1]**	MKD087	MKD087	MKD087	MKD087	MKD087	MKD087	MKD087	MKD087	MKD087	MKD087	MKD088	MKD088	MKD088	MKD096
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	1	0	1	0	1	0	0	0	1	1	0	0	1	0
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	1	1	1	1	1	1	1	1	1	0	0	0	2
Iron (Fe)	%	4	1	1	1	1	1	1	1	1	1	1	0	0	1	1
Potassium (K)	%	1.4	2	1	0	1	1	0	0	0	0	0	1	0	1	0
Magnesium (Mg)	%	0.5	1	2	2	2	2	2	2	2	2	2	1	0	1	3
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	1	1	1	1	1	1	1	1	1	0	1	0	1
Minor Elements																
Copper (Cu)	ppm	30	0	1	2	1	1	1	2	2	1	1	0	0	0	0
Lead (Pb)	ppm	35	1	0	1	1	0	0	1	1	0	0	1	0	0	2
Vanadium (V)	ppm	90	0	1	1	2	1	1	1	1	1	1	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Dolerite	Dolerite	Dolerite	Dolerite	Dolerite	Dolerite	Dolerite	Carb. shale	Carb. shale	Carb. shale	Carb. shale	Carb. shale	Carb. shale	Carb. shale
	RGS Sample Number →		169	170	171	172	173	174	175	176	177	178	179	180	181	182
	Pit→		G117496	G117497	G117498	G117499	G117501	G117502	G117503	G140689	G140690	G140693	G140694	G140695	G140698	G140699
	Units	**Average Crustal Abundance[1]**	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD123	MKD123	MKD123	MKD123	MKD123	MKD123	MKD123
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	0	1	1	0	1	1	0	1	0	0	0	0	0	1
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	2	2	1	1	1	2	2	0	0	0	0	0	0	0
Iron (Fe)	%	4	1	1	1	1	1	1	1	0	0	0	0	0	0	1
Potassium (K)	%	1.4	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Magnesium (Mg)	%	0.5	2	2	2	2	2	2	2	1	1	1	1	1	1	1
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	1	1	1	1	1	1	1	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	2	1	1	1	1	2	2	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	1	1	1	1	1	1	1	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Shale	Quartzite	Shale	Quartzite	Quartzite	Shale	Shale	Shale	Shale	Siltstone	BIF	BIF	BIF	BIF
	RGS Sample Number →		183	184	185	186	187	188	189	190	191	192	193	194	195	196
	Pit→		G77459	G77464	G77465	G77468	G77469	G77470	G77471	K102028	K102029	G77635	G77177	G77177	G77188	G77188
	Units	**Average Crustal Abundance[1]**	MKD015	MKD015	MKD015	MKD015	MKD015	MKD015	MKD015	MKD021	MKD021	MKD041	MKD044	MKD044	MKD044	MKD044
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	3	5	3	3	4	5	5	3	4	5	2	2	2	2
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	1	1	1	1	1	0	0	1	1	1	2	2	1	1
Potassium (K)	%	1.4	1	0	1	0	0	0	1	0	0	1	1	1	2	2
Magnesium (Mg)	%	0.5	2	1	1	2	2	2	2	1	2	1	1	1	1	1
Manganese (Mn)	%	0.1	0	1	1	1	1	1	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		BIF	BIF	Shale	Shale	Shale	Shale	Shale	Shale	Shale	Shale	Shale	Shale	BIF	Shale
	RGS Sample Number →		197	198	199	200	201	202	203	204	205	206	207	208	209	210
	Pit→		G77201	G77201	G77202	G77202	G77203	G77203	G77204	G77204	G77205	G77205	G77673	G77674	G77908	G77910
	Units	Average Crustal Abundance[1]	MKD044	MKD044	MKD044	MKD044	MKD044	MKD044	MKD044	MKD044	MKD044	MKD044	MKD077	MKD077	MKD082	MKD082
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	6	6	5	5	6	6	6	6	6	6	3	4	3	4
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Iron (Fe)	%	4	2	2	1	1	1	1	1	1	1	1	1	1	1	1
Potassium (K)	%	1.4	0	0	1	1	1	1	1	1	0	0	2	1	1	0
Magnesium (Mg)	%	0.5	2	2	2	2	2	2	2	2	2	2	1	1	3	3
Manganese (Mn)	%	0.1	1	1	1	1	1	1	0	0	1	1	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Shale	Shale	Shale	Shale	Shale	Shale	Shale	Shale	BIF	BIF	BIF	BIF	BIF	Shale
	RGS Sample Number →		211	212	213	214	215	216	217	218	219	220	221	222	223	224
	Pit→		G77918	G77919	G77921	G77926	G77927	G77928	G77929	G77939	G77947	G77987	G77988	G77990	G77998	G117332
	Units	**Average Crustal Abundance[1]**	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD082	MKD084
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	3	4	3	5	3	5	5	4	2	6	6	2	3	6
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	1	1	1	1	0	1	2	2	2	1	1	2	2	1
Potassium (K)	%	1.4	1	1	1	1	1	1	0	0	1	1	0	1	1	0
Magnesium (Mg)	%	0.5	2	2	2	2	2	2	1	2	1	2	2	1	1	1
Manganese (Mn)	%	0.1	0	0	0	0	0	0	1	0	0	1	1	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Lead (Pb)	ppm	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Shale	BIF	BIF	Shale	Shale	Shale	Shale	Shale	Shale	Shale	Shale	Shale	Shale	Shale
	RGS Sample Number →		225	226	227	228	229	230	231	232	233	234	235	236	237	238
	Pit→		G117349	G117384	G117385	G117386	G117387	G117388	G117389	G117391	G117392	G117393	G117394	G117395	G117396	G117397
	Units	**Average Crustal Abundance[1]**	MKD084	MKD084	MKD084	MKD084	MKD084	MKD084	MKD084	MKD084	MKD084	MKD084	MKD084	MKD084	MKD084	MKD084
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	2	5	6	6	6	6	6	6	6	6	6	6	6	6
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Potassium (K)	%	1.4	1	0	0	0	1	1	1	0	0	0	0	0	0	0
Magnesium (Mg)	%	0.5	1	1	1	1	1	2	1	1	1	1	1	1	1	1
Manganese (Mn)	%	0.1	0	1	0	1	1	1	0	0	1	1	1	1	1	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	0	1	1	2	2	1	2	2	1	1	1	1	1	1
Lead (Pb)	ppm	35	1	1	1	2	1	1	0	0	0	0	0	1	1	1
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	0	2	3	0	1	2	2	2	2	1	2	0	1	1

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

			Lithology →	Shale	Shale	Shale	Shale	Shale	Shale	Shale	Siltstone	Amphibolite	Talc	Quartzite	Pyroxenite	Pyroxenite	Quartzite
			RGS Sample Number →	239	240	241	242	243	244	245	246	247	248	249	250	251	252
			Pit→	G117399	G117400	G117401	G117402	G117403	G118082	G117841	G117845	G117860	G117862	G117868	G117556	G117558	G117563
	Units	Average Crustal Abundance[1]		MKD084	MKD084	MKD084	MKD084	MKD084	MKD086	MKD088	MKD088	MKD096	MKD096	MKD096	MKD107	MKD107	MKD107
Major Elements				Geochemical Abundance Index													
Sulfur (S)	%	0.07		5	6	6	6	5	3	2	2	3	2	2	3	4	3
Aluminium (Al)	%	7.1		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5		0	0	0	0	0	0	0	0	1	0	0	1	1	0
Iron (Fe)	%	4		1	1	1	1	1	1	1	1	1	1	1	1	1	2
Potassium (K)	%	1.4		0	0	1	0	0	1	2	1	0	0	1	0	0	0
Magnesium (Mg)	%	0.5		1	1	1	2	2	1	1	1	3	3	2	4	3	2
Manganese (Mn)	%	0.1		1	1	1	1	1	0	0	0	0	0	0	0	0	0
Phosphorus (P)	%	0.08		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																	
Copper (Cu)	ppm	30		1	1	1	1	1	1	1	0	1	0	0	1	1	1
Lead (Pb)	ppm	35		0	0	1	1	1	1	1	0	1	0	0	1	1	1
Vanadium (V)	ppm	90		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90		0	1	3	1	2	0	0	0	0	0	1	0	0	1

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Quartzite	Quartzite	Quartzite	Quartzite	Shale	Shale	Shale	Shale	Shale	Shale	Shale	Quartzite	Carb. shale	Carb. shale
	RGS Sample Number →		253	254	255	256	257	258	259	260	261	262	263	264	265	266
	Pit→		G117567	G117568	G117569	G117571	G117577	G117578	G117579	G117580	G117582	G117583	G117584	G117585	G140691	G140692
	Units	**Average Crustal Abundance[1]**	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD107	MKD123	MKD123
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	3	3	3	2	3	3	3	3	3	3	3	3	3	3
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	1	1	1	2	1	1	0	1	1	1	1	2	1	1
Potassium (K)	%	1.4	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Magnesium (Mg)	%	0.5	2	2	2	1	1	1	1	2	2	2	2	2	1	1
Manganese (Mn)	%	0.1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	1	2	2	0	1	1	1	2	1	2	2	2	1	1
Lead (Pb)	ppm	35	2	2	1	1	1	1	1	1	0	1	1	1	0	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	90	2	3	1	1	1	1	2	3	2	2	2	2	0	0

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Carb. shale	Carb. shale	Carb. shale	Carb. shale	Mud/claystone	Mud/claystone	Mud/claystone	Quartz vein	Mud/claystone	Mud/claystone	Mud/claystone	Mud/claystone	Mud/claystone	Mud/claystone
	RGS Sample Number →		267	268	269	270	271	272	273	274	275	276	277	278	279	280
	Pit→		G140696	G140697	G140700	G140701	G140264	G140265	G140266	G140268	G140269	G140270	G140271	G140272	G140273	G140274
	Units	Average Crustal Abundance[1]	MKD123	MKD123	MKD123	MKD123	MKD177	MKD177	MKD177	MKD177	MKD177	MKD177	MKD177	MKD177	MKD177	MKD177
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	3	2	3	2	3	4	5	6	5	6	5	6	5	5
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	%	4	1	1	1	1	1	0	0	1	0	1	1	1	1	1
Potassium (K)	%	1.4	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Magnesium (Mg)	%	0.5	1	1	1	1	2	2	1	1	2	2	2	2	1	1
Manganese (Mn)	%	0.1	0	0	0	0	1	0	0	0	0	0	1	1	1	1
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon (Si)	ppm	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titanium (Ti)	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	%	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minor Elements																
Copper (Cu)	ppm	30	1	1	1	0	0	1	1	2	1	2	1	2	2	1
Lead (Pb)	ppm	35	0	0	0	0	1	1	0	1	0	1	1	1	1	0
Vanadium (V)	ppm	90	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Zinc (Zn)	ppm	90	0	0	0	0	1	1	3	4	1	1	1	1	1	1

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

Table B2: Geochemical Abundance Index (GAI) Results for Selected Waste Rock Samples

	Lithology →		Mud/claystone	Mud/claystone	Mud/claystone	Mud/claystone	Carb. shale	Carb. shale	Carb. shale							
	RGS Sample Number →		281	282	283	284	285	286	287							
	Pit→		G140275	G140276	G140277	G140278	G140279	G140280	G140281							
	Units	**Average Crustal Abundance[1]**	MKD177	MKD177	MKD177	MKD177	MKD177	MKD177	MKD177							
Major Elements			Geochemical Abundance Index													
Sulfur (S)	%	0.07	5	5	5	5	5	4	3							
Aluminium (Al)	%	7.1	0	0	0	0	0	0	0							
Calcium (Ca)	%	1.5	0	0	0	0	0	0	0							
Iron (Fe)	%	4	1	1	1	1	1	1	1							
Potassium (K)	%	1.4	1	1	1	0	0	1	1							
Magnesium (Mg)	%	0.5	1	2	2	2	2	2	2							
Manganese (Mn)	%	0.1	1	0	0	0	0	1	1							
Phosphorus (P)	%	0.08	0	0	0	0	0	0	0							
Silicon (Si)	ppm	33	0	0	0	0	0	0	0							
Titanium (Ti)	%	-	0	0	0	0	0	0	0							
Sodium (Na)	%	0.5	0	0	0	0	0	0	0							
Minor Elements																
Copper (Cu)	ppm	30	2	1	1	2	2	1	1							
Lead (Pb)	ppm	35	0	0	0	0	1	1	0							
Vanadium (V)	ppm	90	0	0	0	0	0	1	1							
Zinc (Zn)	ppm	90	2	1	1	0	0	0	1							

Notes:

GAI's greater than or equal to 3 are highlighted.

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p60-61.

ATTACHMENT C

Laboratory Certificates

9 Attachment C

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2023048**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATT LANDERS	Contact	: Carsten Emrich
Address	: PO BOX 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2020009 - Karara	Date Samples Received	: 01-Sep-2020 13:30
Order number	: ----	Date Analysis Commenced	: 08-Sep-2020
C-O-C number	: ----	Issue Date	: 11-Sep-2020 15:15
Sampler	: ----		
Site	: ----		
Quote number	: BN/248/19 A		
No. of samples received	: 26		
No. of samples analysed	: 26		

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. 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
Santusha Pandra	Senior Chemist	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 Contact 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.

- EA031 (Saturated Paste pH): NATA accreditation does not cover the performance of this service.
- EA032 (Saturated Paste EC): NATA accreditation does not cover the performance of this service.
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	KA101965	KA101966	KA101967	KA101968	KA101969
			Client sampling date / time	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023048-001	EB2023048-002	EB2023048-003	EB2023048-004	EB2023048-005
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-35.9	-27.3	-55.9	-33.2	-35.3
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	41.4	41.7	62.6	43.9	40.8
ANC as CaCO3	----	0.1	% CaCO3	4.2	4.2	6.4	4.5	4.2
Fizz Rating	----	0	Fizz Unit	2	2	2	2	2
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	10.1	9.7	9.8	9.6	9.9
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	336	895	644	491	456
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.18	0.47	0.22	0.35	0.18

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	KA101970	KA101971	KA101972	KA101973	KA101974
			Client sampling date / time	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023048-006	EB2023048-007	EB2023048-008	EB2023048-009	EB2023048-010
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-23.4	-5.5	95.9	26.9	31.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	31.7	24.2	19.8	36.4	31.0
ANC as CaCO3	----	0.1	% CaCO3	3.2	2.5	2.0	3.7	3.2
Fizz Rating	----	0	Fizz Unit	2	1	1	2	2
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.6	9.4	8.2	8.7	8.6
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	389	1090	1870	1130	1370
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.27	0.61	3.78	2.07	2.03

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	KA101975	KA101976	KA101977	KA101978	KA101979
			Client sampling date / time	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023048-011	EB2023048-012	EB2023048-013	EB2023048-014	EB2023048-015
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-20.4	39.4	24.4	-19.4	-26.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	43.4	44.7	19.3	21.8	29.3
ANC as CaCO3	----	0.1	% CaCO3	4.4	4.6	2.0	2.2	3.0
Fizz Rating	----	0	Fizz Unit	2	2	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.6	8.0	8.0	9.5	10.6
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	854	3000	3550	2330	777
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.75	2.75	1.43	0.08	0.08

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	KA101980	KA101981	KA101983	KA101964	KA101959
			Client sampling date / time	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023048-016	EB2023048-017	EB2023048-019	EB2023048-020	EB2023048-021
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-24.1	-32.7	-19.5	-19.6	-18.0
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	25.9	33.9	21.3	20.8	19.2
ANC as CaCO3	----	0.1	% CaCO3	2.6	3.4	2.2	2.1	2.0
Fizz Rating	----	0	Fizz Unit	1	2	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	10.2	10.6	10.1	10.0	10.2
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	647	1360	477	1240	707
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.06	0.04	0.06	0.04	0.04

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	KA101958	KA101960	KA101961	KA101962	KA101963
			Client sampling date / time	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00	20-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023048-022	EB2023048-023	EB2023048-024	EB2023048-025	EB2023048-026
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-21.5	-21.7	-16.2	-29.4	-30.3
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	30.1	24.8	20.8	32.8	33.1
ANC as CaCO3	----	0.1	% CaCO3	3.1	2.5	2.1	3.3	3.4
Fizz Rating	----	0	Fizz Unit	2	1	1	2	2
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.5	10.5	10.1	10.1	10.2
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	822	759	540	1470	1180
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.28	0.10	0.15	0.11	0.09

Analytical Results

Sub-Matrix: **WATER** (Matrix: **SOIL**)				Client sample ID	**pH & EC of DI water**	**----**	**----**	**----**	**----**
				Client sampling date / time	01-Sep-2020 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB2023048-027**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**5.5**	**----**	**----**	**----**	**----**
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		<1	**----**	**----**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2023549**	Page	: 1 of 17
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATT LANDERS	Contact	: Carsten Emrich
Address	: PO BOX 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2020009 - Karara	Date Samples Received	: 07-Sep-2020 14:34
Order number	: ----	Date Analysis Commenced	: 08-Sep-2020
C-O-C number	: ----	Issue Date	: 28-Sep-2020 12:54
Sampler	: ----		
Site	: ----		
Quote number	: BN/248/19 A		
No. of samples received	: 71		
No. of samples analysed	: 71		

ilac-MRA NATA

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. 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
Kim McCabe	Senior Inorganic Chemist	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 Contact 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.

- EA031 (Saturated Paste pH): NATA accreditation does not cover the performance of this service.
- EA032 (Saturated Paste EC): NATA accreditation does not cover the performance of this service.
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101576	KM101577	KM101578	KM101579	KM101580
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-001	EB2023549-002	EB2023549-003	EB2023549-004	EB2023549-005
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-0.7	-0.9	-1.1	-1.9	-1.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	1.6	2.4	1.1	5.3	2.1
ANC as CaCO3	----	0.1	% CaCO3	0.2	0.2	0.1	0.5	0.2
Fizz Rating	----	0	Fizz Unit	0	0	0	1	0
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	6.6	5.6	6.5	4.8	5.4
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	249	195	674	239	420
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.03	0.05	<0.01	0.11	0.01

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101581	KM101582	KM101583	KM101584	KM101585
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-006	EB2023549-007	EB2023549-008	EB2023549-009	EB2023549-010
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-4.3	-26.0	-10.6	-8.8	-10.2
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	6.1	32.1	15.2	12.2	11.4
ANC as CaCO3	----	0.1	% CaCO3	0.6	3.3	1.6	1.2	1.2
Fizz Rating	----	0	Fizz Unit	0	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	6.8	5.5	5.8	6.3	7.4
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	917	2070	933	2490	963
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.06	0.20	0.15	0.11	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101586	KM101587	KM101588	KM101589	KM101590
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-011	EB2023549-012	EB2023549-013	EB2023549-014	EB2023549-015
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-11.1	-3.4	-2.6	-3.2	-2.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	12.6	4.3	3.8	4.1	3.4
ANC as CaCO3	----	0.1	% CaCO3	1.3	0.4	0.4	0.4	0.3
Fizz Rating	----	0	Fizz Unit	1	0	0	0	0
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	7.0	6.6	5.7	6.4	5.1
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	240	620	490	654	1210
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.05	0.03	0.04	0.03	0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101591	KM101592	KM101593	KM101594	KM101595
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-016	EB2023549-017	EB2023549-018	EB2023549-019	EB2023549-020
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	<0.5	-0.2	-3.6	-5.7	-2.0
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	1.1	1.1	4.2	6.9	5.4
ANC as CaCO3	----	0.1	% CaCO3	0.1	0.1	0.4	0.7	0.6
Fizz Rating	----	0	Fizz Unit	0	0	0	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	4.7	4.7	4.8	6.4	5.1
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	392	423	148	837	852
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.04	0.03	0.02	0.04	0.11

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	KM101596	KM101597	KM101598	KM101599	KM101600
				Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit		EB2023549-021	EB2023549-022	EB2023549-023	EB2023549-024	EB2023549-025
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		-5.9	-6.0	-17.3	-7.3	-10.0
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		6.8	8.4	18.5	7.9	14.0
ANC as CaCO3	----	0.1	% CaCO3		0.7	0.8	1.9	0.8	1.4
Fizz Rating	----	0	Fizz Unit		0	0	1	0	1
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		6.4	6.4	7.0	7.6	7.0
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		682	1440	2380	364	1770
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.03	0.08	0.04	0.02	0.13

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101601	KM101602	KM101603	KM101604	KM101605
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-026	EB2023549-027	EB2023549-028	EB2023549-029	EB2023549-030
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-16.8**	**-14.8**	**-3.7**	<0.5	**-7.0**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**19.2**	**17.3**	**4.6**	**0.6**	**9.1**
ANC as CaCO3	----	0.1	% CaCO3	**2.0**	**1.8**	**0.5**	<0.1	**0.9**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**0**	**0**	**1**
EA031: pH (saturated paste)								
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**6.6**	**8.1**	**4.9**	**6.2**	**6.8**
EA032: Electrical Conductivity (saturated paste)								
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**3390**	**384**	**1070**	**6440**	**6340**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.08**	**0.08**	**0.03**	**0.03**	**0.07**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101606	KM101607	KM101608	KM101609	KM101610
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-031	EB2023549-032	EB2023549-033	EB2023549-034	EB2023549-035
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-5.6	-13.4	-9.3	-4.7	-6.0
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	13.6	15.6	12.4	8.4	8.8
ANC as CaCO3	----	0.1	% CaCO3	1.4	1.6	1.3	0.9	0.9
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	6.6	7.6	7.2	6.4	7.5
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	7990	1950	10200	15500	2210
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.26	0.07	0.10	0.12	0.09

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101611	KM101612	KM101613	KM101614	KM101615
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-036	EB2023549-037	EB2023549-038	EB2023549-039	EB2023549-040
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-6.6**	**-4.1**	**-1.7**	**1.5**	**0.6**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**12.7**	**5.0**	**2.3**	<0.5	<0.5
ANC as CaCO3	----	0.1	% CaCO3	**1.3**	**0.5**	**0.2**	<0.1	<0.1
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**0**	**0**	**0**
EA031: pH (saturated paste)								
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**6.2**	**5.4**	**5.9**	**5.4**	**6.7**
EA032: Electrical Conductivity (saturated paste)								
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**709**	**268**	**1070**	**3150**	**1080**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.20**	**0.03**	**0.02**	**0.05**	**0.02**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101616	KM101617	KM101618	KM101619	KM101620
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-041	EB2023549-042	EB2023549-043	EB2023549-044	EB2023549-045
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-2.3	-0.2	-2.5	-2.0	-4.9
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	2.6	1.1	3.1	2.3	5.2
ANC as CaCO3	----	0.1	% CaCO3	0.3	0.1	0.3	0.2	0.5
Fizz Rating	----	0	Fizz Unit	0	0	0	0	0
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	6.3	5.3	5.3	5.9	7.3
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	898	787	241	318	486
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.01	0.03	0.02	0.01	0.01

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101621	KM101622	KM101623	KM101624	KM101625
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-046	EB2023549-047	EB2023549-048	EB2023549-049	EB2023549-050
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-7.4	-9.2	-6.7	-4.7	-7.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	7.7	9.5	7.3	5.3	8.7
ANC as CaCO3	----	0.1	% CaCO3	0.8	1.0	0.7	0.5	0.9
Fizz Rating	----	0	Fizz Unit	0	0	0	0	0
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.2	6.7	5.6	4.7	4.9
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	453	669	825	1890	2280
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.01	0.01	0.02	0.02	0.03

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101626	KM101627	KM101628	KM101629	KM101630
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-051	EB2023549-052	EB2023549-053	EB2023549-054	EB2023549-055
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-16.3	-4.6	-5.2	-7.0	-4.2
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	17.5	5.8	5.8	7.6	5.4
ANC as CaCO3	----	0.1	% CaCO3	1.8	0.6	0.6	0.8	0.6
Fizz Rating	----	0	Fizz Unit	1	0	0	0	0
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	7.0	4.6	5.4	6.5	5.8
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	4460	1100	1260	1760	3310
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.04	0.04	0.02	0.02	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101631	KM101632	KM101633	KM101634	KM101635
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-056	EB2023549-057	EB2023549-058	EB2023549-059	EB2023549-060
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-4.5	-5.5	-5.1	-4.7	-4.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	5.1	6.1	5.4	4.7	5.1
ANC as CaCO3	----	0.1	% CaCO3	0.5	0.6	0.6	0.5	0.5
Fizz Rating	----	0	Fizz Unit	0	0	0	0	0
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	5.3	5.6	7.4	7.5	7.2
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	1180	1270	572	844	646
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.02	0.01	<0.01	0.01

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101636	KM101637	KM101638	KM101639	KM101640
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-061	EB2023549-062	EB2023549-063	EB2023549-064	EB2023549-065
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-3.3	-2.3	-3.8	-4.3	-3.3
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	3.9	2.9	3.8	4.6	4.5
ANC as CaCO3	----	0.1	% CaCO3	0.4	0.3	0.4	0.5	0.5
Fizz Rating	----	0	Fizz Unit	0	0	0	0	0
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	6.8	7.4	5.6	7.0	6.1
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	1370	11200	746	646	954
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.02	<0.01	0.01	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	KM101641	KM101642	KM101643	KM101644	KM101645
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023549-066	EB2023549-067	EB2023549-068	EB2023549-069	EB2023549-070
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-6.9	-6.1	-13.3	-4.9	-5.5
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	8.1	7.0	14.8	6.7	6.7
ANC as CaCO3	----	0.1	% CaCO3	0.8	0.7	1.5	0.7	0.7
Fizz Rating	----	0	Fizz Unit	0	0	0	0	0
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	5.3	6.9	6.4	6.7	6.0
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	967	5080	3300	4270	2240
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.04	0.03	0.05	0.06	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	KM101646	----	----	----	----
				Client sampling date / time	07-Sep-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2023549-071	--------	--------	--------	--------	
				Result	----	----	----	----	
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-5.5**	----	----	----	----	
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**6.4**	----	----	----	----	
ANC as CaCO3	----	0.1	% CaCO3	**0.6**	----	----	----	----	
Fizz Rating	----	0	Fizz Unit	**0**	----	----	----	----	
EA031: pH (saturated paste)									
ø **pH (Saturated Paste)**	----	0.1	pH Unit	**7.4**	----	----	----	----	
EA032: Electrical Conductivity (saturated paste)									
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm	**5360**	----	----	----	----	
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%	**0.03**	----	----	----	----	

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2023627**	Page	: 1 of 22
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATT LANDERS	Contact	: Carsten Emrich
Address	: PO BOX 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2020009 - Karara	Date Samples Received	: 18-Aug-2020 13:45
Order number	: ----	Date Analysis Commenced	: 10-Sep-2020
C-O-C number	: ----	Issue Date	: 08-Oct-2020 16:13
Sampler	: ----		
Site	: ----		
Quote number	: BN/248/19 A		
No. of samples received	: 94		
No. of samples analysed	: 94		

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. 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 Inorganics, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, 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 Contact 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.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders EB2022390 and EB2023627 due to the size of the sample numbers. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- EA031 (Saturated Paste pH): NATA accreditation does not cover the performance of this service.
- EA032 (Saturated Paste EC): NATA accreditation does not cover the performance of this service.
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	pH and EC of DI Water	----	----	----	----
				Client sampling date / time	11-Aug-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB2023627-092	--------	--------	--------	--------
					Result	----	----	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**5.3**	----	----	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		<1	----	----	----	----

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117565	G117566	G117567	G117568	G117569
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-001	EB2023627-002	EB2023627-003	EB2023627-004	EB2023627-005
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-1.2	26.1	5.4	8.5	14.6
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	16.2	8.2	14.2	12.6	14.8
ANC as CaCO3	----	0.1	% CaCO3	1.6	0.8	1.4	1.3	1.5
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.3	8.3	9.9	9.6	9.2
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	354	419	374	363	530
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.49	1.12	0.64	0.69	0.96

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117570	G117571	G117573	G117576	G117577
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-006	EB2023627-007	EB2023627-008	EB2023627-009	EB2023627-010
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	33.6	-2.1	9.0	5.5	5.5
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	8.0	14.3	14.9	8.6	11.9
ANC as CaCO3	----	0.1	% CaCO3	0.8	1.4	1.5	0.9	1.2
Fizz Rating	----	0	Fizz Unit	0	1	1	0	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.0	9.8	9.1	9.4	9.4
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	408	365	352	375	416
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	1.36	0.40	0.78	0.46	0.57

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117578	G117579	G117580	G117582	G117583
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-011	EB2023627-012	EB2023627-013	EB2023627-014	EB2023627-015
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	11.9	6.6	29.2	18.8	38.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	13.2	13.3	14.5	15.8	16.1
ANC as CaCO3	----	0.1	% CaCO3	1.4	1.4	1.5	1.6	1.6
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.9	9.3	8.6	9.3	8.5
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	521	396	689	317	635
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.82	0.65	1.43	1.13	1.77

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117584	G117585	G117586	G117587	G77459
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-016	EB2023627-017	EB2023627-018	EB2023627-019	EB2023627-020
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	30.1	16.6	7.6	10.8	4.9
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	15.8	16.4	15.0	15.2	22.9
ANC as CaCO3	----	0.1	% CaCO3	1.6	1.7	1.5	1.6	2.3
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.4	8.7	8.8	8.8	9.7
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	705	539	460	399	665
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	1.50	1.08	0.74	0.85	0.91

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G77464	G77465	G77468	G77469	G77470
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-021	EB2023627-022	EB2023627-023	EB2023627-024	EB2023627-025
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	60.2	-0.3	16.2	60.9	53.0
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	13.9	15.6	14.1	16.2	13.7
ANC as CaCO3	----	0.1	% CaCO3	1.4	1.6	1.4	1.6	1.4
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.4	9.7	9.4	9.4	9.2
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	528	457	481	521	474
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	2.42	0.50	0.99	2.52	2.18

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G77471	G94863	G117589	G117590	G77473
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2023627-026	EB2023627-027	EB2023627-028	EB2023627-029	EB2023627-030
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		**91.2**	**-7.7**	**-7.9**	**-21.4**	**-19.9**
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		**10.1**	**8.3**	**13.7**	**23.5**	**65.8**
ANC as CaCO3	----	0.1	% CaCO3		**1.0**	**0.8**	**1.4**	**2.4**	**6.7**
Fizz Rating	----	0	Fizz Unit		**1**	**1**	**1**	**1**	**2**
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		**9.1**	**10.2**	**9.5**	**10.0**	**9.2**
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		**420**	**362**	**454**	**434**	**350**
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		**3.31**	**0.02**	**0.19**	**0.07**	**1.50**

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G77072	G77104	G77635	G77177	G77178
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2023627-031	EB2023627-032	EB2023627-033	EB2023627-034	EB2023627-035
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		**0.9**	**-34.1**	**75.3**	**-32.9**	**-31.2**
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		**30.6**	**45.1**	**42.2**	**48.2**	**47.4**
ANC as CaCO3	----	0.1	% CaCO3		**3.1**	**4.6**	**4.3**	**4.9**	**4.8**
Fizz Rating	----	0	Fizz Unit		**1**	**2**	**2**	**2**	**2**
EA031: pH (saturated paste)									
ø **pH (Saturated Paste)**	----	0.1	pH Unit		**10.5**	**10.5**	**9.7**	**10.2**	**10.1**
EA032: Electrical Conductivity (saturated paste)									
ø **Electrical Conductivity (Saturated Paste)**	----	1	µS/cm		**837**	**892**	**650**	**505**	**469**
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		**1.03**	**0.36**	**3.84**	**0.50**	**0.53**

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G77180	G77183	G77188	G77193	G77201
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2023627-036	EB2023627-037	EB2023627-038	EB2023627-039	EB2023627-040
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		**-33.6**	**-28.7**	**-23.9**	**-48.7**	**51.5**
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		**40.6**	**39.1**	**42.9**	**55.7**	**32.3**
ANC as CaCO3	----	0.1	% CaCO3		**4.1**	**4.0**	**4.4**	**5.7**	**3.3**
Fizz Rating	----	0	Fizz Unit		**2**	**2**	**2**	**2**	**2**
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		**9.7**	**10.1**	**10.2**	**10.2**	**9.4**
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		**306**	**497**	**555**	**475**	**439**
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		**0.23**	**0.34**	**0.62**	**0.23**	**2.74**

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G77202	G77203	G77204	G77205	G117133
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2023627-041	EB2023627-042	EB2023627-043	EB2023627-044	EB2023627-045
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		-50.1	133	159	156	-27.3
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		97.8	31.5	6.6	16.0	44.4
ANC as CaCO3	----	0.1	% CaCO3		10.0	3.2	0.7	1.6	4.5
Fizz Rating	----	0	Fizz Unit		2	2	0	1	2
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		8.7	8.3	8.9	8.3	9.9
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		484	729	343	804	678
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		1.56	5.37	5.40	5.64	0.56

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117134	G117135	G117136	G77789	G116078
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-046	EB2023627-047	EB2023627-048	EB2023627-049	EB2023627-050
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-26.1	-22.8	-18.2	-54.3	-62.5
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	29.8	25.9	24.3	55.8	63.4
ANC as CaCO3	----	0.1	% CaCO3	3.0	2.6	2.5	5.7	6.5
Fizz Rating	----	0	Fizz Unit	1	1	1	2	2
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	10.1	10.2	10.1	9.0	10.3
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	711	653	699	483	751
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.12	0.10	0.20	0.05	0.03

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G116079	G77673	G77674	G118081	G118082
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2023627-051	EB2023627-052	EB2023627-053	EB2023627-054	EB2023627-055
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		**-55.2**	**-2.2**	**15.6**	**-9.5**	**93.5**
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		**55.2**	**17.8**	**14.7**	**15.3**	**10.5**
ANC as CaCO3	----	0.1	% CaCO3		**5.6**	**1.8**	**1.5**	**1.6**	**1.1**
Fizz Rating	----	0	Fizz Unit		**2**	**1**	**1**	**1**	**1**
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		**10.5**	**9.8**	**9.0**	**9.5**	**8.8**
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		**1000**	**604**	**711**	**596**	**732**
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		<0.01	**0.51**	**0.99**	**0.19**	**3.40**

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117841	G117842	G117843	G117844	G117845
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-056	EB2023627-057	EB2023627-058	EB2023627-059	EB2023627-060
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	8.8	-10.0	-2.0	5.4	41.4
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	13.8	10.9	10.6	13.0	14.0
ANC as CaCO3	----	0.1	% CaCO3	1.4	1.1	1.1	1.3	1.4
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.7	9.8	10.0	9.7	9.3
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	1170	354	416	508	635
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.74	0.03	0.28	0.60	1.81

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G140689	G140690	G140691	G140692	G140693
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-061	EB2023627-062	EB2023627-063	EB2023627-064	EB2023627-065
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**66.8**	**-8.8**	**-22.5**	**-9.5**	**29.3**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**11.8**	**9.1**	**22.5**	**9.5**	**12.6**
ANC as CaCO3	----	0.1	% CaCO3	**1.2**	**0.9**	**2.3**	**1.0**	**1.3**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**1**	**1**	**1**
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	**7.6**	**9.4**	**9.8**	**9.7**	**9.2**
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	**1040**	**280**	**174**	**163**	**283**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**2.57**	**0.01**	<0.01	<0.01	**1.37**

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G140694	G140695	G140696	G140697	G140698
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-066	EB2023627-067	EB2023627-068	EB2023627-069	EB2023627-070
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-9.2	-10.2	36.7	39.6	-10.6
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	9.2	10.2	10.4	13.6	13.1
ANC as CaCO3	----	0.1	% CaCO3	0.9	1.0	1.1	1.4	1.3
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.6	9.9	9.2	8.3	9.5
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	258	249	372	527	168
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	<0.01	<0.01	1.54	1.74	0.08

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G140699	G140700	G140701	G140264	G140265
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-071	EB2023627-072	EB2023627-073	EB2023627-074	EB2023627-075
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-15.3	26.1	-1.2	4.0	64.0
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	15.6	18.3	9.2	29.7	16.8
ANC as CaCO3	----	0.1	% CaCO3	1.6	1.9	0.9	3.0	1.7
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.7	9.1	9.6	9.3	9.2
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	238	677	413	354	341
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.01	1.45	0.26	1.10	2.64

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G140266	G140267	G140268	G140269	G140270
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2023627-076	EB2023627-077	EB2023627-078	EB2023627-079	EB2023627-080
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	53.7	375	303	49.2	148
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	17.9	14.0	15.6	19.0	26.9
ANC as CaCO3	----	0.1	% CaCO3	1.8	1.4	1.6	1.9	2.7
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.6	8.5	8.4	9.0	8.9
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	372	818	947	351	502
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	2.34	12.7	10.4	2.23	5.71

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G140271	G140272	G140273	G140274	G140275
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2023627-081	EB2023627-082	EB2023627-083	EB2023627-084	EB2023627-085
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		84.9	297	155	83.4	136
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		19.1	14.8	16.3	20.3	16.0
ANC as CaCO3	----	0.1	% CaCO3		1.9	1.5	1.7	2.1	1.6
Fizz Rating	----	0	Fizz Unit		1	1	1	1	1
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		9.3	8.7	9.1	9.2	8.8
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		414	824	562	398	501
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		3.40	10.2	5.60	3.39	4.97

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G140276	G140277	G140278	G140279	G140280
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2023627-086	EB2023627-087	EB2023627-088	EB2023627-089	EB2023627-090
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		104	61.6	124	111	66.3
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		17.0	18.6	19.9	18.7	16.3
ANC as CaCO3	----	0.1	% CaCO3		1.7	1.9	2.0	1.9	1.6
Fizz Rating	----	0	Fizz Unit		1	1	1	1	1
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		8.8	8.7	8.4	8.4	8.9
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		415	337	426	542	407
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		3.96	2.62	4.70	4.23	2.70

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G140281	G77518 113.5 – 114	G116496 492 – 494	----	----
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	----	----
Compound	CAS Number	LOR	Unit		EB2023627-091	EB2023627-093	EB2023627-094	--------	--------
					Result	Result	Result	----	----
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		8.7	-2.1	-14.8	----	----
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		18.2	21.7	19.7	----	----
ANC as CaCO3	----	0.1	% CaCO3		1.8	2.2	2.0	----	----
Fizz Rating	----	0	Fizz Unit		1	1	1	----	----
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		8.9	10.2	10.0	----	----
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		374	791	510	----	----
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.88	0.64	0.16	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2022390**	Page	: 1 of 22
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATT LANDERS	Contact	: Carsten Emrich
Address	: PO BOX 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2020009 - Karara	Date Samples Received	: 18-Aug-2020 13:45
Order number	: ----	Date Analysis Commenced	: 17-Sep-2020
C-O-C number	: ----	Issue Date	: 07-Oct-2020 09:09
Sampler	: ----		
Site	: ----		
Quote number	: BN/248/19 A		
No. of samples received	: 98		
No. of samples analysed	: 98		

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. 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 Inorganics, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, 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 Contact 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.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders EB2022390 and EB2023627 due to the size of the sample numbers. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- EA031 (Saturated Paste pH): NATA accreditation does not cover the performance of this service.
- EA032 (Saturated Paste EC): NATA accreditation does not cover the performance of this service.
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	K102028	K102029	G77177 135.4 - 135.8	G77178 137.1 - 137.5	G77180 140.5 - 141.1
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-001	EB2022390-002	EB2022390-003	EB2022390-004	EB2022390-005
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	26.3	15.5	-30.6	-16.7	-50.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	<0.5	4.4	31.8	17.6	59.1
ANC as CaCO3	----	0.1	% CaCO3	<0.1	0.4	3.2	1.8	6.0
Fizz Rating	----	0	Fizz Unit	0	0	1	1	2
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	4.1	4.7	10.0	10.2	10.2
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	3600	2360	660	642	696
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.86	0.65	0.04	0.03	0.27

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G77188 156.4 - 156.9	G77193 166.2 - 167.0	G77201 183.4 -183.8	G77202 184 - 186	G77203 186 - 188
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2022390-006	EB2022390-007	EB2022390-008	EB2022390-009	EB2022390-010
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		-26.8	-51.3	215	13.8	264
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		27.4	59.9	17.6	12.5	10.0
ANC as CaCO3	----	0.1	% CaCO3		2.8	6.1	1.8	1.3	1.0
Fizz Rating	----	0	Fizz Unit		1	2	1	1	1
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		10.3	10.2	8.2	8.0	8.8
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		576	542	1110	903	400
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.02	0.28	7.61	0.86	8.94

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G77204 188 - 190	G77205 190 - 192	G116331	G116332	G116334
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2022390-011	EB2022390-012	EB2022390-014	EB2022390-015	EB2022390-016
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		148	166	-9.1	-0.5	-8.9
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		12.5	14.3	22.3	19.8	18.1
ANC as CaCO3	----	0.1	% CaCO3		1.3	1.4	2.3	2.0	1.8
Fizz Rating	----	0	Fizz Unit		1	1	1	1	1
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		8.8	8.1	10.4	10.2	10.3
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		402	877	670	755	514
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		5.25	5.91	0.43	0.63	0.30

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G116335	G77908	G77910	G77911	G77912
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2022390-017	EB2022390-018	EB2022390-019	EB2022390-020	EB2022390-021
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		-13.0	0.6	38.7	65.2	11.5
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		18.8	23.9	26.2	19.2	20.0
ANC as CaCO3	----	0.1	% CaCO3		1.9	2.4	2.7	2.0	2.0
Fizz Rating	----	0	Fizz Unit		1	1	1	1	1
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		10.4	10.2	9.9	10.1	9.6
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		653	510	413	550	380
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.19	0.80	2.12	2.76	1.03

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G77917	G77918	G77919	G77921	G77922
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-022	EB2022390-023	EB2022390-024	EB2022390-025	EB2022390-026
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	20.5	-8.3	33.5	10.9	13.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	15.6	11.7	17.0	16.6	7.6
ANC as CaCO3	----	0.1	% CaCO3	1.6	1.2	1.7	1.7	0.8
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.6	10.2	10.0	10.2	9.4
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	365	484	465	551	416
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	1.18	0.11	1.65	0.90	0.70

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G77926	G77927	G77928	G77929	G77930
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-027	EB2022390-028	EB2022390-029	EB2022390-030	EB2022390-031
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	107	39.3	12.3	93.6	108
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	7.5	8.7	7.9	7.7	8.6
ANC as CaCO3	----	0.1	% CaCO3	0.8	0.9	0.8	0.8	0.9
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.2	9.6	9.3	9.5	9.3
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	482	331	295	546	464
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	3.74	1.57	0.66	3.31	3.82

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)				Client sample ID	G77937	G77939	G77946	G77947	G77963
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2022390-032	EB2022390-033	EB2022390-034	EB2022390-035	EB2022390-036
					Result	Result	Result	Result	Result
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		**-55.0**	**69.8**	<0.5	**-6.0**	**-38.4**
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		**59.3**	**10.4**	**29.2**	**15.8**	**54.3**
ANC as CaCO3	----	0.1	% CaCO3		**6.0**	**1.1**	**3.0**	**1.6**	**5.5**
Fizz Rating	----	0	Fizz Unit		**2**	**1**	**1**	**1**	**2**
EA031: pH (saturated paste)									
ø pH (Saturated Paste)	----	0.1	pH Unit		**10.0**	**9.4**	**10.0**	**10.4**	**10.2**
EA032: Electrical Conductivity (saturated paste)									
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm		**349**	**488**	**566**	**662**	**631**
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		**0.14**	**2.62**	**0.97**	**0.32**	**0.52**

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G77983	G77985	G77987	G77988	G77990
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-037	EB2022390-038	EB2022390-039	EB2022390-040	EB2022390-041
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**169**	**780**	**257**	**214**	**-52.4**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**7.0**	<0.5	**2.5**	**5.0**	**58.8**
ANC as CaCO3	----	0.1	% CaCO3	**0.7**	<0.1	**0.2**	**0.5**	**6.0**
Fizz Rating	----	0	Fizz Unit	**0**	**0**	**0**	**0**	**2**
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	**8.0**	**5.2**	**7.6**	**8.1**	**10.6**
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	**1080**	**9230**	**1000**	**876**	**756**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**5.76**	**25.5**	**8.48**	**7.16**	**0.21**

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G77991	G77998	G94029	G94032	G117332
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-042	EB2022390-043	EB2022390-044	EB2022390-045	EB2022390-046
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-86.9	-11.7	-48.0	-21.6	29.5
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	92.4	12.9	52.0	35.1	15.2
ANC as CaCO3	----	0.1	% CaCO3	9.4	1.3	5.3	3.6	1.5
Fizz Rating	----	0	Fizz Unit	2	1	2	2	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	10.0	10.4	10.3	9.6	8.8
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	580	614	678	466	295
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.18	0.04	0.13	0.44	1.46

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117346	G117348	G117349	G117360	G117364
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-047	EB2022390-048	EB2022390-049	EB2022390-050	EB2022390-051
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-62.2	-53.0	-36.8	-38.9	-16.0
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	67.1	62.2	50.9	45.0	17.2
ANC as CaCO3	----	0.1	% CaCO3	6.8	6.3	5.2	4.6	1.8
Fizz Rating	----	0	Fizz Unit	2	2	2	2	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	10.2	10.1	10.6	10.2	10.5
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	563	521	852	522	599
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.16	0.30	0.46	0.20	0.04

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117375	G117384	G117385	G117386	G117387
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-052	EB2022390-053	EB2022390-054	EB2022390-055	EB2022390-056
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-49.6	122	171	523	126
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	60.9	10.2	3.3	15.6	12.0
ANC as CaCO3	----	0.1	% CaCO3	6.2	1.0	0.3	1.6	1.2
Fizz Rating	----	0	Fizz Unit	2	1	0	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	10.0	9.1	8.5	8.1	9.0
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	622	837	755	1550	490
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.37	4.31	5.69	17.6	4.50

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117388	G117389	G117391	G117392	G117393
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-057	EB2022390-058	EB2022390-059	EB2022390-060	EB2022390-061
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	175	240	222	296	153
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	7.9	9.1	10.6	10.4	13.4
ANC as CaCO3	----	0.1	% CaCO3	0.8	0.9	1.1	1.0	1.4
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.5	8.4	8.4	8.1	8.4
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	599	760	756	885	762
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	5.98	8.16	7.61	10.0	5.44

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117394	G117395	G117396	G117397	G117399
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-062	EB2022390-063	EB2022390-064	EB2022390-065	EB2022390-066
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	276	143	169	161	135
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	11.9	19.9	13.1	12.3	13.4
ANC as CaCO3	----	0.1	% CaCO3	1.2	2.0	1.3	1.2	1.4
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.2	8.5	8.4	8.5	8.6
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	899	765	774	702	673
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	9.40	5.33	5.96	5.66	4.85

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117400	G117401	G117402	G117403	G116375
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-067	EB2022390-068	EB2022390-069	EB2022390-070	EB2022390-071
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	223	131	128	44.9	-53.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	15.2	21.1	22.1	33.4	61.2
ANC as CaCO3	----	0.1	% CaCO3	1.6	2.2	2.2	3.4	6.2
Fizz Rating	----	0	Fizz Unit	1	1	1	2	2
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.5	9.0	8.6	9.5	10.4
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	722	577	786	622	697
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	7.79	4.98	4.90	2.56	0.24

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G116376	G116377	G116488	G116490	G116491
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-072	EB2022390-073	EB2022390-074	EB2022390-075	EB2022390-076
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-47.4	-49.4	-23.5	-17.0	-21.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	62.1	56.1	27.2	22.2	25.7
ANC as CaCO3	----	0.1	% CaCO3	6.3	5.7	2.8	2.3	2.6
Fizz Rating	----	0	Fizz Unit	2	2	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	10.4	10.4	10.2	10.2	10.0
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	921	866	530	430	669
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.48	0.22	0.12	0.17	0.15

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G116492	G116493	G116494	G116495	G116496 490 - 492
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-077	EB2022390-078	EB2022390-079	EB2022390-080	EB2022390-081
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-7.6	-14.7	-16.0	-15.1	-18.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	20.2	19.6	20.6	19.7	23.0
ANC as CaCO3	----	0.1	% CaCO3	2.1	2.0	2.1	2.0	2.3
Fizz Rating	----	0	Fizz Unit	1	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	8.7	10.1	10.1	10.0	9.0
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	2800	451	377	398	1420
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.41	0.16	0.15	0.15	0.16

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117859	G117860	G117862	G117866	G117867
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-083	EB2022390-084	EB2022390-085	EB2022390-086	EB2022390-087
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-33.6	21.6	-35.6	-1.8	-0.5
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	35.1	32.2	36.2	22.3	21.0
ANC as CaCO3	----	0.1	% CaCO3	3.6	3.3	3.7	2.3	2.1
Fizz Rating	----	0	Fizz Unit	2	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.4	9.5	10.2	9.6	9.4
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	380	1110	602	483	421
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.05	1.76	0.02	0.67	0.67

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117868	G117496	G117497	G117498	G117499
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-088	EB2022390-089	EB2022390-090	EB2022390-091	EB2022390-092
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	8.8	-14.7	-12.1	-15.0	-18.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	9.3	19.6	17.6	19.9	22.8
ANC as CaCO3	----	0.1	% CaCO3	1.0	2.0	1.8	2.0	2.3
Fizz Rating	----	0	Fizz Unit	0	1	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.4	10.1	10.0	9.8	9.8
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	554	348	383	490	458
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.59	0.16	0.18	0.16	0.13

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117501	G117502	G117503	G117540	G117556
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2022390-093	EB2022390-094	EB2022390-095	EB2022390-096	EB2022390-097
				Result	Result	Result	Result	Result
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-19.5	-4.7	-14.9	-12.0	5.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	23.5	9.3	19.8	19.6	28.2
ANC as CaCO3	----	0.1	% CaCO3	2.4	1.0	2.0	2.0	2.9
Fizz Rating	----	0	Fizz Unit	1	0	1	1	1
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	9.7	10.0	10.1	9.7	10.0
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	532	417	386	311	599
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.13	0.15	0.16	0.25	1.11

Analytical Results

Sub-Matrix: SOLID (Matrix: SOIL)			Client sample ID	G117558	G117562	G117563	----	----
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	EB2022390-098	EB2022390-099	EB2022390-100	--------	--------
				Result	Result	Result	----	----
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-8.9**	**18.0**	**8.8**	**----**	**----**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**28.8**	**7.4**	**8.9**	**----**	**----**
ANC as CaCO3	----	0.1	% CaCO3	**2.9**	**0.8**	**0.9**	**----**	**----**
Fizz Rating	----	0	Fizz Unit	**1**	**0**	**0**	**----**	**----**
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	**10.1**	**9.3**	**9.8**	**----**	**----**
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	**580**	**404**	**488**	**----**	**----**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.65**	**0.83**	**0.58**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2027268**	Page	: 1 of 16
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATT LANDERS	Contact	: Carsten Emrich
Address	: PO BOX 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2020009 - Karara	Date Samples Received	: 16-Oct-2020 10:46
Order number	: ----	Date Analysis Commenced	: 21-Oct-2020
C-O-C number	: ----	Issue Date	: 30-Oct-2020 13:45
Sampler	: ----		
Site	: ----		
Quote number	: BN/248/19 A		
No. of samples received	: 49		
No. of samples analysed	: 49		

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. 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

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 Contact 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.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders (EB2027259 and EB2027268) due to the size of the sample numbers. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- ALS is not NATA accredited for the performance of EN35: Miscellaneous Leaching procedure.

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	G77908 EB2022390018	G77918 EB2022390023	G77998 EB2022390043	G117385 EB2022390054	G117401 EB2022390068
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
					EB2027268-064	EB2027268-066	EB2027268-071	EB2027268-075	EB2027268-080
					Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		**26**	**23**	**47**	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**6**	**13**	**8**	**34**	**35**
Total Alkalinity as CaCO3	----	1	mg/L		**32**	**36**	**54**	**34**	**35**
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		<1	<1	<1	**1**	<1
ED040W: Water Leachable Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	1	mg/L		**16**	**3**	**2**	**65**	**39**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**19**	**5**	**1**	**24**	**24**
ED093W: Water Leachable Major Cations									
Calcium	7440-70-2	1	mg/L		<1	<1	<1	**17**	**9**
Magnesium	7439-95-4	1	mg/L		<1	<1	<1	**4**	**2**
Sodium	7440-23-5	1	mg/L		**6**	**5**	**16**	**8**	**8**
Potassium	7440-09-7	1	mg/L		**27**	**22**	**15**	**13**	**20**
EG020W: Water Leachable Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**3.62**	**3.30**	**1.89**	**0.43**	**0.81**
Antimony	7440-36-0	0.001	mg/L		**0.016**	**0.013**	**0.004**	**0.062**	**0.049**
Arsenic	7440-38-2	0.001	mg/L		**0.004**	**0.181**	**0.034**	**0.006**	**0.008**
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		**0.004**	**0.016**	**0.003**	**0.010**	**0.003**
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		**0.002**	**0.005**	<0.001	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L		**0.003**	**0.004**	**0.004**	**0.001**	**0.002**
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: LEACHATE (Matrix: WATER)				Client sample ID	G77908 EB2022390018	G77918 EB2022390023	G77998 EB2022390043	G117385 EB2022390054	G117401 EB2022390068
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2027268-064	EB2027268-066	EB2027268-071	EB2027268-075	EB2027268-080
					Result	Result	Result	Result	Result
EG020W: Water Leachable Metals by ICP-MS - Continued									
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	**0.004**	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L		**0.002**	**0.014**	**0.018**	**0.006**	**0.004**
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.004**	**0.012**	**0.001**	**0.014**	**0.003**
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.001**	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.006**	**0.006**	**0.005**	**0.011**	**0.016**
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		<0.001	<0.001	<0.001	**0.016**	**0.008**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		**0.01**	**0.04**	**0.01**	<0.01	<0.01
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	7440-62-2	0.01	mg/L		**0.01**	**0.02**	**0.01**	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L		**0.76**	**0.98**	**0.40**	<0.05	<0.05

Analytical Results

Sub-Matrix: LEACHATE (Matrix: WATER)				Client sample ID	G117556 EB2022390097	G117558 EB2022390098	G117568 EB2023627004	G117580 EB2023627013	G140268 EB2023627078
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2027268-085	EB2027268-086	EB2027268-088	EB2027268-093	EB2027268-098
					Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		27	21	5	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		5	5	10	7	7
Total Alkalinity as CaCO3	----	1	mg/L		33	26	15	7	7
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		<1	<1	<1	1	2
ED040W: Water Leachable Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	1	mg/L		21	22	13	38	83
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		21	14	11	24	34
ED093W: Water Leachable Major Cations									
Calcium	7440-70-2	1	mg/L		<1	<1	<1	<1	5
Magnesium	7439-95-4	1	mg/L		<1	<1	<1	<1	4
Sodium	7440-23-5	1	mg/L		21	9	6	7	5
Potassium	7440-09-7	1	mg/L		19	28	15	26	31
EG020W: Water Leachable Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.31	0.14	3.59	0.88	0.09
Antimony	7440-36-0	0.001	mg/L		0.013	0.014	0.007	0.011	0.068
Arsenic	7440-38-2	0.001	mg/L		1.68	1.38	0.095	0.005	<0.001
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		0.001	<0.001	0.005	0.005	0.009
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		0.002	0.001	0.004	0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L		0.001	<0.001	0.005	0.002	<0.001
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: LEACHATE (Matrix: WATER)				Client sample ID	G117556 EB2022390097	G117558 EB2022390098	G117568 EB2023627004	G117580 EB2023627013	G140268 EB2023627078
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2027268-085	EB2027268-086	EB2027268-088	EB2027268-093	EB2027268-098
					Result	Result	Result	Result	Result
EG020W: Water Leachable Metals by ICP-MS - Continued									
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	**0.001**	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L		<0.001	<0.001	**0.001**	<0.001	**0.015**
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		<0.001	<0.001	**0.009**	**0.005**	**0.088**
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.001**
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.006**	**0.006**	**0.009**	**0.011**	**0.031**
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.022**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	**0.03**	**0.02**	<0.01
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	7440-62-2	0.01	mg/L		**0.02**	**0.02**	**0.01**	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L		**0.07**	**0.07**	**0.84**	**0.44**	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G77459 EB2023627020	G77465 EB2023627022	G77469 EB2023627024	G77635 EB2023627033	G77177 EB2022390003
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027268-055	EB2027268-056	EB2027268-057	EB2027268-058	EB2027268-059
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	4.0	----	2.4	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	1.0	----	53.5	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	5.8	----	66.5	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.762	0.443	2.18	3.47	0.028
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.19	0.39	0.53	0.18	0.02
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	0.20	0.39	0.53	0.33	0.14
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	<0.02	<0.02	<0.02	0.15	0.12

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G77201 EB2022390008	G77202 EB2022390009	G77203 EB2022390010	G77673 EB2023627052	G77908 EB2022390018
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027268-060	EB2027268-061	EB2027268-062	EB2027268-063	EB2027268-064
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**2.0**	**----**	**2.1**	**----**	**3.5**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**118**	**----**	**122**	**----**	**3.3**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**129**	**----**	**144**	**----**	**7.8**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**6.57**	**0.677**	**7.59**	**0.425**	**0.661**
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**0.03**	**2.21**	**1.82**	<0.02	**0.54**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.18**	**2.35**	**1.94**	**0.03**	**0.54**
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	**0.15**	**0.14**	**0.12**	**0.03**	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G77910 EB2022390019	G77918 EB2022390023	G77927 EB2022390028	G77939 EB2022390033	G77987 EB2022390039
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027268-065	EB2027268-066	EB2027268-067	EB2027268-068	EB2027268-069
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	7.4	----	2.4	2.1
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	<0.1	----	46.3	135
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	<0.1	----	57.1	149
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	1.74	0.109	1.35	2.46	7.46
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	----	0.22	2.48	0.03	1.81
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	----	0.22	2.54	0.07	1.92
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	----	<0.02	0.06	0.04	0.11

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G77990 EB2022390041	G77998 EB2022390043	G117332 EB2022390046	G117349 EB2022390049	G117384 EB2022390053
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027268-070	EB2027268-071	EB2027268-072	EB2027268-073	EB2027268-074
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**----**	**----**	**----**	**10.2**	**----**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**----**	**----**	**----**	<0.1	**----**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**----**	**----**	**----**	<0.1	**----**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.182**	**----**	**1.23**	**0.413**	**3.76**
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**0.16**	**0.40**	**0.02**	**0.28**	**----**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.54**	**0.43**	**0.19**	**0.66**	**----**
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	**0.38**	**0.03**	**0.17**	**0.38**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G117388 EB2022390057	G117393 EB2022390061	G117396 EB2022390064	G117397 EB2022390065	G117401 EB2022390068
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027268-076	EB2027268-077	EB2027268-078	EB2027268-079	EB2027268-080
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	2.1	----	----	2.1
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	88.8	----	----	72.9
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	102	----	----	88.1
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	5.06	4.49	----	4.71	4.23
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	3.42	2.20	2.30	2.86	2.70
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	3.46	2.32	2.41	2.90	2.74
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	0.04	0.12	0.11	0.04	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G117403 EB2022390070	G118082 EB2023627055	G117841 EB2023627056	G117868 EB2022390088	G117556 EB2022390097
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027268-081	EB2027268-082	EB2027268-083	EB2027268-084	EB2027268-085
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**2.5**	**----**	**3.2**	**----**	**----**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**36.1**	**----**	**7.1**	**----**	**----**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**47.2**	**----**	**14.5**	**----**	**----**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**----**	**2.91**	**0.648**	**0.478**	**0.930**
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**0.25**	**----**	**0.08**	**----**	**0.03**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.33**	**----**	**0.08**	**----**	**0.03**
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	**0.08**	**----**	<0.02	**----**	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G117563 EB2022390100	G117568 EB2023627004	G117569 EB2023627005	G117571 EB2023627007	G117577 EB2023627010
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027268-087	EB2027268-088	EB2027268-089	EB2027268-090	EB2027268-091
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	3.5	3.4	----	3.9	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	3.2	5.4	----	1.7	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	9.5	12.0	----	6.3	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.567	0.601	0.817	0.350	0.413
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.77	0.74	----	0.54	0.44
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	0.77	0.74	----	0.54	0.47
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	<0.02	<0.02	----	<0.02	0.03

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G117579 EB2023627012	G117584 EB2023627016	G140696 EB2023627068	G140701 EB2023627073	G140264 EB2023627074
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027268-092	EB2027268-094	EB2027268-095	EB2027268-096	EB2027268-097
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	3.4	3.0	----	----	3.7
NAG (pH 4.5)	----	0.1	kg H2SO4/t	4.5	11.2	----	----	2.2
NAG (pH 7.0)	----	0.1	kg H2SO4/t	10.3	24.7	----	----	6.8
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.588	1.32	1.30	0.231	0.914
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.77	1.03	0.34	0.14	0.32
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	0.77	1.04	0.35	0.14	0.44
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	<0.02	<0.02	<0.02	<0.02	0.12

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G140268 EB2023627078	G140270 EB2023627080	G140274 EB2023627084	G140278 EB2023627088	G140281 EB2023627091
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027268-098	EB2027268-099	EB2027268-100	EB2027268-101	EB2027268-102
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	2.2	----	----	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	70.7	----	----	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	87.4	----	----	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	8.67	5.00	3.10	3.99	0.705
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	----	2.10	2.54	----	1.44
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	----	2.30	2.55	----	1.48
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	----	0.20	<0.02	----	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	pH and EC of DI water	----	-----	----	----
				Client sampling date / time	19-Oct-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB2027268-103	--------	--------	--------	--------
					Result	----	----	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**6.2**	----	----	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		<1	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2027259**	Page	: 1 of 16
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATT LANDERS	Contact	: Carsten Emrich
Address	: PO BOX 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2020009 - Karara	Date Samples Received	: 16-Oct-2020 10:46
Order number	: ----	Date Analysis Commenced	: 21-Oct-2020
C-O-C number	: ----	Issue Date	: 29-Oct-2020 14:57
Sampler	: VERONICA CANALES		
Site	: ----		
Quote number	: BN/248/19 A		
No. of samples received	: 54		
No. of samples analysed	: 54		

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. 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

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 Contact 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.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders (EB2027268 and EB2027259) due to the size of the sample numbers. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- ALS is not NATA accredited for the performance of EN35: Miscellaneous Leaching procedure.

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	K101595 EB2023549020	K101614 EB2023549039	G77937 EB2022390032	G117866 EB2022390086	G117586 EB2023627018
				Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
					EB2027259-005	EB2027259-009	EB2027259-024	EB2027259-030	EB2027259-037
					Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	**32**	**15**	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**3**	<1	**4**	**18**	**27**
Total Alkalinity as CaCO3	----	1	mg/L		**3**	<1	**35**	**33**	**27**
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		**5**	**4**	<1	<1	<1
ED040W: Water Leachable Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	1	mg/L		**27**	**100**	**3**	**16**	**7**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**42**	**302**	**1**	**16**	**19**
ED093W: Water Leachable Major Cations									
Calcium	7440-70-2	1	mg/L		<1	**14**	**4**	<1	**2**
Magnesium	7439-95-4	1	mg/L		<1	**17**	**1**	<1	<1
Sodium	7440-23-5	1	mg/L		**40**	**157**	**2**	**10**	**6**
Potassium	7440-09-7	1	mg/L		**7**	**18**	**15**	**23**	**28**
EG020W: Water Leachable Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	**0.02**	**0.09**	**2.74**	**1.13**
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	**0.001**	**0.003**	**0.008**
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	**0.094**	**0.462**	**0.051**
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		**0.032**	**0.086**	**0.016**	**0.007**	**0.011**
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	**0.004**	<0.001
Cobalt	7440-48-4	0.001	mg/L		**0.001**	**0.003**	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.001**	**0.004**	**0.005**	**0.001**	<0.001
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L		<0.001	<0.001	<0.001	**0.006**	**0.002**
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: LEACHATE (Matrix: WATER)				Client sample ID	K101595 EB2023549020	K101614 EB2023549039	G77937 EB2022390032	G117866 EB2022390086	G117586 EB2023627018
				Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2027259-005	EB2027259-009	EB2027259-024	EB2027259-030	EB2027259-037
					Result	Result	Result	Result	Result
EG020W: Water Leachable Metals by ICP-MS - Continued									
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L		<0.001	**0.001**	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L		**0.004**	**0.010**	**0.004**	**0.002**	<0.001
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.019**	**0.195**	<0.001	**0.006**	<0.001
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	**0.001**	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.011**	<0.001	**0.002**	<0.001
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.011**	**0.035**	**0.022**	**0.011**	**0.008**
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**0.005**	**0.186**	**0.014**	**0.002**	**0.006**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	**0.03**	<0.01
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.01**	**0.01**	<0.01
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		**0.026**	**0.020**	<0.005	<0.005	<0.005
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Boron	7440-42-8	0.05	mg/L		<0.05	**0.36**	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L		<0.05	**0.16**	<0.05	**1.14**	**0.13**

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	G140267 EB2023627077	G117590 EB2023627029	G116332 EB2022390015	G116375 EB2022390071	G117496 EB2022390089
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
					EB2027259-039	EB2027259-040	EB2027259-042	EB2027259-045	EB2027259-050
					Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	**11**	**59**	**44**	**26**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**13**	**24**	**11**	**11**	**14**
Total Alkalinity as CaCO3	----	1	mg/L		**13**	**36**	**70**	**56**	**41**
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		**1**	<1	<1	<1	<1
ED040W: Water Leachable Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	1	mg/L		**43**	**15**	**13**	**10**	**4**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**26**	**17**	**6**	**12**	**6**
ED093W: Water Leachable Major Cations									
Calcium	7440-70-2	1	mg/L		**3**	<1	<1	**1**	**1**
Magnesium	7439-95-4	1	mg/L		**1**	<1	<1	<1	<1
Sodium	7440-23-5	1	mg/L		**5**	**8**	**10**	**2**	**14**
Potassium	7440-09-7	1	mg/L		**24**	**34**	**47**	**48**	**11**
EG020W: Water Leachable Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.46**	**0.36**	**1.81**	**1.14**	**1.75**
Antimony	7440-36-0	0.001	mg/L		**0.123**	**0.055**	**0.002**	**0.009**	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.011**	**6.99**	**0.110**	**0.090**	**0.006**
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		**0.005**	**0.004**	**0.005**	**0.006**	**0.006**
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.002**	<0.001	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L		**0.002**	<0.001	**0.004**	**0.003**	**0.003**
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: **LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	G140267 EB2023627077	G117590 EB2023627029	G116332 EB2022390015	G116375 EB2022390071	G117496 EB2022390089
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
					EB2027259-039	EB2027259-040	EB2027259-042	EB2027259-045	EB2027259-050
					Result	Result	Result	Result	Result
EG020W: Water Leachable Metals by ICP-MS - Continued									
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L		**0.008**	<0.001	**0.026**	**0.012**	**0.001**
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.008**	<0.001	**0.001**	<0.001	**0.002**
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.008**	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.003**	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.016**	**0.014**	**0.007**	**0.007**	**0.012**
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**0.011**	**0.001**	**0.004**	**0.009**	**0.003**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.01**
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	7440-62-2	0.01	mg/L		<0.01	**0.02**	**0.02**	**0.01**	**0.04**
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	**0.06**	<0.05
Iron	7439-89-6	0.05	mg/L		<0.05	**0.07**	**0.20**	**0.09**	**0.27**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	K101579 EB2023549004	K101584 EB2023549009	K101592 EB2023549017	K101594 EB2023549019	K101595 EB2023549020
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027259-001	EB2027259-002	EB2027259-003	EB2027259-004	EB2027259-005
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**----**	**----**	**5.0**	**----**	**6.8**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**----**	**----**	<0.1	**----**	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**----**	**----**	**6.0**	**----**	**0.6**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.011**	**0.069**	**----**	**----**	**----**
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**0.29**	**0.02**	**----**	**0.12**	**0.05**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.45**	**0.11**	**----**	**0.14**	**0.05**
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	**0.16**	**0.09**	**----**	**0.02**	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	K101600 EB2023549025	K101609 EB2023549034	K101611 EB2023549036	K101614 EB2023549039	K101629 EB2023549054
			Client sampling date / time	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00	07-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027259-006	EB2027259-007	EB2027259-008	EB2027259-009	EB2027259-010
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**7.3**	**6.6**	**----**	**5.4**	**6.2**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	**----**	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	<0.1	**0.5**	**----**	**2.0**	**3.3**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.093**	**0.034**	**0.123**	**----**	**----**
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**0.02**	**0.06**	**0.03**	**----**	**0.34**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.10**	**0.12**	**0.03**	**----**	**0.34**
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	**0.08**	**0.06**	<0.02	**----**	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	K101962 EB2023048025	K101970 EB2023048006	K101972 EB2023048008	K101976 EB2023048012	G77518 EB2023627093
			Client sampling date / time	29-Aug-2020 00:00	29-Aug-2020 00:00	29-Aug-2020 00:00	29-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027259-011	EB2027259-012	EB2027259-013	EB2027259-014	EB2027259-015
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**----**	**10.0**	**2.2**	**----**	**4.7**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**----**	<0.1	**59.9**	**----**	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**----**	<0.1	**70.3**	**----**	**2.4**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.091**	**0.242**	**3.31**	**2.53**	**0.543**
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	<0.02	**0.03**	**0.94**	**0.68**	<0.02
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.09**	**0.23**	**0.98**	**0.85**	**0.04**
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	**0.09**	**0.20**	**0.04**	**0.17**	**0.04**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	K101637 EB2023549062	G77072 EB2023627031	G77104 EB2023627032	G77178 EB2022390004	G117133 EB2023627045
			Client sampling date / time	07-Sep-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027259-016	EB2027259-017	EB2027259-018	EB2027259-019	EB2027259-020
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**5.7**	**4.2**	**----**	**8.7**	**----**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	**0.4**	**----**	<0.1	**----**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**1.3**	**7.7**	**----**	<0.1	**----**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**----**	**0.904**	**----**	**0.031**	**0.469**
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**----**	<0.02	<0.02	**0.19**	**0.09**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**----**	<0.02	**0.26**	**0.20**	**0.22**
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	**----**	<0.02	**0.26**	<0.02	**0.13**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G117135 EB2023627047	G77912 EB2022390021	G77930 EB2022390031	G77946 EB2022390034	G77983 EB2022390037
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027259-021	EB2027259-022	EB2027259-023	EB2027259-025	EB2027259-026
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	----	2.4	3.7	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	----	63.3	2.1	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	----	77.7	6.9	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	----	0.740	3.45	0.858	4.79
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	<0.02	0.16	0.44	<0.02	0.90
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	0.06	0.16	0.44	0.11	0.98
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	0.06	<0.02	<0.02	0.11	0.08

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G94029 EB2022390044	G117346 EB2022390047	G116377 EB2022390073	G117867 EB2022390087	G117540 EB2022390096
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027259-027	EB2027259-028	EB2027259-029	EB2027259-031	EB2027259-032
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**----**	**10.4**	**9.9**	**3.5**	**----**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**----**	<0.1	<0.1	**4.3**	**----**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**----**	<0.1	<0.1	**10.3**	**----**
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**----**	**0.150**	**0.193**	**0.566**	**0.212**
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**0.10**	**0.12**	<0.02	**0.09**	**----**
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	**0.39**	**0.56**	**0.14**	**0.10**	**----**
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	**0.29**	**0.44**	**0.14**	<0.02	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G117562 EB2022390099	G117565 EB2023627001	G117570 EB2023627006	G117576 EB2023627009	G117586 EB2023627018
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027259-033	EB2027259-034	EB2027259-035	EB2027259-036	EB2027259-037
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	----	----	----	3.2
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	----	----	----	6.7
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	----	----	----	12.5
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.683	----	1.15	0.398	0.640
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.24	0.56	0.45	----	0.59
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	0.24	0.56	0.45	----	0.60
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	<0.02	<0.02	<0.02	----	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	G117587 EB2023627019	G140267 EB2023627077	G77183 EB2023627037	G116332 EB2022390015	G116078 EB2023627050
				Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit		EB2027259-038	EB2027259-039	EB2027259-041	EB2027259-042	EB2027259-043
					Result	Result	Result	Result	Result
EA011: Net Acid Generation									
pH (OX)	----	0.1	pH Unit		**----**	**2.2**	**----**	**4.6**	**10.2**
NAG (pH 4.5)	----	0.1	kg H2SO4/t		**----**	**109**	**----**	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t		**----**	**147**	**----**	**4.6**	<0.1
EA026 : Chromium Reducible Sulfur									
Chromium Reducible Sulphur	----	0.005	%		**0.704**	**11.2**	**0.239**	**0.540**	**----**
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		**----**	**1.12**	**0.08**	<0.02	**----**
EP003TC: Total Carbon (TC) in Soil									
Total Carbon	TC	0.02	%		**----**	**1.13**	**0.20**	**0.02**	**----**
EP003TIC: Total inorganic Carbon (TIC) in Soil									
Total Inorganic Carbon	----	0.02	%		**----**	<0.02	**0.12**	**0.02**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G117348 EB2022390048	G116488 EB2022390074	G116496 EB2022390081	G117843 EB2023627058	G117844 EB2023627059
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027259-044	EB2027259-046	EB2027259-047	EB2027259-048	EB2027259-049
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	8.6	----	4.7	3.5
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	<0.1	----	<0.1	5.0
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	<0.1	----	2.5	10.5
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.256	0.111	0.131	0.248	0.522
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.41	<0.02	<0.02	<0.02	0.12
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	0.87	0.03	<0.02	<0.02	0.12
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	0.46	0.03	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	G117496 EB2022390089	G117502 EB2022390094	G140689 EB2023627061	G140693 EB2023627065	G140695 EB2023627067
			Client sampling date / time	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00	11-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027259-050	EB2027259-051	EB2027259-052	EB2027259-053	EB2027259-054
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	----	----	2.5	----	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	----	----	40.0	----	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	----	----	52.1	----	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.134	0.123	2.31	1.17	----
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	<0.02	<0.02	0.36	----	0.28
EP003TC: Total Carbon (TC) in Soil								
Total Carbon	TC	0.02	%	<0.02	<0.02	0.36	----	0.28
EP003TIC: Total inorganic Carbon (TIC) in Soil								
Total Inorganic Carbon	----	0.02	%	<0.02	<0.02	<0.02	----	<0.02

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EMERSON CLASS NUMBER TEST REPORT

Test Method: AS 1289 3.8.1

Client	RGS Environmental Pty Ltd	**Report No.**	20100581-EM
		Workorder No.	7946
Address	PO Box 3091, Sunnybank South QLD 4109	**Test Date**	18/11/20-26/11/20
		Report Date	26/11/2020
Project	2020009 - Karara		

Sample No.	20100581	20100582	20100583	20100584	20100585	20100586	20100587
Client ID	EB2023627046 - G117134 - MKD065	EB2023627029 - G117590 - MKD023	EB2023627037 - G77183 - MKD044	EB2023627048 - G117136 - MKD065	EB2023627049 - G77789 - MKD073	EB2022390078 - G116493 - MKD087	EB2022390048 - G117348 - MKD084
Depth (m)	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied
Description	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey
Emerson Class Number	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Sample No.	20100588	20100589	20100590	20100591	20100592	20100593	20100594
Client ID	EB2022390071 - G116375 - MKD087	EB2022390074 - G116488 - MKD087	EB2022390076 - G116491 - MKD087	EB2022390077 - G116492 - MKD087	EB2022390079 - G116494 - MKD087	EB2022390081 - G116496 - MKD087	EB2022390083 - G117859 - MKD096
Depth (m)	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied
Description	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey
Emerson Class Number	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Sample No.	20100595	20100596	20100597	20100598	20100599	20100600	-
Client ID	EB2022390080 - G116495 - MKD087	EB2022390092 - G117499 - MKD107	EB2022390095 - G117503 - MKD107	EB2023627062 - G140690 - MKD123	EB2023627067 - G140695 - MKD123	EB2023627071 - G140699 - MKD123	-
Depth (m)	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	-
Description	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	GRAVEL - grey	-
Emerson Class Number	**3**	**3**	**3**	**3**	**3**	**3**	**-**

NOTES/REMARKS:

Sample/s supplied by the client

Tested with Distilled water at 22.2°C

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Tested at Trilab Brisbane Laboratory

Authorised Signatory

C. Park

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Laboratory No. 9926

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	RGS Environmental Pty Ltd	**Report No.**	20100581-G
		Workorder No.	7946
Address	PO Box 3091, Sunnybank South QLD 4109	**Report Date**	26/11/2020
Project	2020009 - Karara		

Sample No.	20100581	20100582	20100583	20100586	20100587	20100588	20100589
Test Date	18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020
Client ID	EB2023627046 - G117134 - MKD065	EB2023627029 - G117590 - MKD023	EB2023627037 - G77183 - MKD044	EB2022390078 - G116493 - MKD087	EB2022390048 - G117348 - MKD084	EB2022390071 - G116375 - MKD087	EB2022390074 - G116488 - MKD087
Depth (m)	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied
Moisture (%)	0.1	0.1	0.0	0.0	0.1	0.0	0.1
AS SIEVE SIZE (mm)	**PERCENT PASSING**						
150							
75							
63							
53							
37.5	100	100					
26.5	96	98	100	100	100	100	100
19	80	88	76	90	91	88	72
13.2	44	41	34	40	50	41	29
9.5	32	23	22	26	29	25	17
6.7	24	14	13	17	19	17	11
4.75	18	10	9	12	14	12	7
2.36	11	5	5	8	8	7	4
1.18	7	3	3	5	4	4	2
0.600	4	2	2	3	3	2	1
0.425	3	2	1	2	2	2	1
0.300	3	2	1	2	2	2	1
0.150	2	1	1	1	1	1	1
0.075	2	1	1	1	1	1	0

NOTES/REMARKS:

Sample/s supplied by the client

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Tested at Trilab Brisbane Laboratory

Authorised Signatory

C. Park

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POINT LOAD TEST REPORT

Test Method: AS 4133.4.1

Client	RGS Environmental Pty Ltd	**Report No.**	20100581-PL
		Workorder No.	0007946
Address	PO Box 3091, Sunnybank South QLD 4109	**Test Date**	1/12/1930
		Report Date	4/12/2020
Project	2020009 - Karara		

Sample No.	20100581	20100582	20100583	20100586	20100587	20100588	20100589
Client ID	EB2023627046 - G117134 - MKD065	EB2023627029 - G117590 - MKD023	EB2023627037 - G77183 - MKD044	EB2022390078 - G116493 - MKD087	EB2022390048 - G117348 - MKD084	EB2022390071 - G116375 - MKD087	EB2022390074 - G116488 - MKD087
Depth (m)	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied
I_S (MPa)	12.05	12.51	6.78	17.30	9.21	12.51	19.55
$I_{S(50)}$ (MPa)	8.07	7.98	4.52	11.40	5.45	8.06	11.55
Load Direction	Irregular Lump	Irregular Lump	Irregular Lump	Irregular Lump	Irregular Lump	Irregular Lump	Irregular Lump

Sample No.	20100593	20100595	20100599				
Client ID	EB2022390081 - G116496 - MKD087	EB2022390080 - G116495 - MKD087	EB2023627067 - G140695 - MKD123				
Depth (m)	Not Supplied	Not Supplied	Not Supplied				
I_S (MPa)	30.72	22.44	18.24				
$I_{S(50)}$ (MPa)	18.79	14.35	11.87				
Load Direction	Irregular Lump	Irregular Lump	Irregular Lump				

NOTES/REMARKS: Tested as received + Irregular Lump

Sample/s supplied by the client

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Tested at Trilab Brisbane Laboratory

Authorised Signatory

N. Maddison

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Laboratory No. 9926

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	RGS Environmental Pty Ltd	**Report No.**	20100593-G
		Workorder No.	7946
Address	PO Box 3091, Sunnybank South QLD 4109	**Report Date**	26/11/2020
Project	2020009 - Karara		

Sample No.	20100593	20100595	20100599				
Test Date	18/11/2020	18/11/2020	18/11/2020				
Client ID	EB2022390081 - G116496 - MKD087	EB2022390080 - G116495 - MKD087	EB2023627067 - G140695 - MKD123				
Depth (m)	Not Supplied	Not Supplied	Not Supplied				
Moisture (%)	0.1	0.0	0.0				
AS SIEVE SIZE (mm)	**PERCENT PASSING**						
150							
75							
63							
53							
37.5							
26.5	100	100	100				
19	88	86	83				
13.2	46	37	34				
9.5	29	23	22				
6.7	20	15	17				
4.75	15	10	12				
2.36	9	6	7				
1.18	5	4	4				
0.600	3	3	2				
0.425	3	2	2				
0.300	2	2	2				
0.150	1	1	1				
0.075	1	1	1				

NOTES/REMARKS:

Sample/s supplied by the client

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Tested at Trilab Brisbane Laboratory

Authorised Signatory

C. Park

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AGGREGATE TEST REPORT

Client	RGS Environmental Pty Ltd	**Report No.**	20111738-AGG
		WorkOrder No	7946
Address	PO Box 3091, Sunnybank South QLD 4109	**Test Date**	3/12/2020
		Report Date	3/12/2020
Project	2020009 - Karara		
Client ID	Composite Sample	**Depth (m)**	Various

TEST RESULTS

AS 1141.4 Bulk Density of Aggregates	Uncompacted Bulk Density	1.43	t/m^3
	Compacted Bulk Density	1.61	t/m^3
	Moisture Condition	Dry	
	Nominal Size	20	mm

Remarks

Sample/s supplied by client

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Tested at Trilab Brisbane Laboratory

Authorised Signatory

C. Park

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MINE WASTE AND
WATER MANAGEMENT