APPENDIX D

Soils Report

STRATEGIC MINERALS
CORPORATION

Soil Report
for the Big Vein South Gold Project

Prepared for Hansen Environmental Consulting
on behalf of Strategic Minerals Corporation Pty Ltd
Prepared by GT Environmental Pty Ltd

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1 INTRODUCTION

GT Environmental (GTE) was commissioned by Strategic Minerals Corporation to complete a soil and land suitability assessment as part of the Environmental Assessment Report (EAR) for the Big Vein South Gold Project (the project).

1.1 Project Overview

The project involves the construction and operation of an open cut gold mine on a greenfield site in North Queensland. The soil study area covers an area of approximately 2,265 hectares (ha) and is located approximately 100 km north of Richmond and 380 km west of Townsville (Figure 1).

Open cut mining will be conducted using excavators and trucks. Gold ore will be processed on site to produce gold dore (solid bars containing gold alloy). The mine's peak production rate will be up to 1.95 million tonnes per annum (Mtpa) of run of mine (ROM) gold ore, yielding up to approximately 100,000 ounces of gold dore per annum. The mine life will be approximately 11 years.

The following mining and ore processing activities will be undertaken as part of the project:

- Developing three open cut pits, as follows:
    - The main Big Vein South Pit (BVS Pit) located in the centre of the soil study area (Figure 2). Waste rock from this pit will be hauled by truck and stored in the Central and Southern Waste Rock Dumps (WRDs).
    - Two small satellite pits, BV1 Pit and BV2 Pit, located in the northern part of the soil study area (Figure 2). Waste rock from these pits will be stored in the Northern WRD.
- Transporting mined ore in haul trucks from the open cut pits to the ROM area ore stockpiles located near the mine processing facilities at the southern end of the soil study area site (Figure 2).
- Processing ore from the BV1 and BV2 Pits in the first 2 years of mining using Heap Leach Pads and gold elution. Processing ore mined from the BVS Pit in an on-site Carbon In-Leach (CIL) Plant from Year 3 onwards. The heap leaching process will generate spent heap leach residues. These residues will be reprocessed in the CIL Plant over the life of the mine. The CIL Plant will generate wet tailings and dewatered tailings. Wet tailings will be pumped to a Tailings Storage Cell. Dewatered tailings will be stored with waste rock in the Central and Southern WRDs.
- Transporting dore bars from the site via plane to a refinery.

The majority of the mine infrastructure will be located at the southern end of the soil study area (Figure 2). Key mine infrastructure will include ore processing facilities, workshop,

warehouse, administration buildings, haul roads and access roads, vehicle servicing, refuelling and wash down facilities, fuel storage facilities, diesel and solar power station, water supply and water management infrastructure. Workforce accommodation and a private airstrip will also be located at the southern end of the soil study area.

1.2 Scope of Work

This purpose of the soil and land suitability assessment is to provide a baseline assessment of the soil types within the soil study area, and the suitability of these soils for agricultural and rehabilitation activities.

The assessment has been undertaken in accordance with the relevant parts of the Queensland guideline *Land – EIS information guideline ESR/2020/5303* (Department of Environment and Science, 2022) (the EIS Information Guideline for Land). The EIS Information Guideline for Land requires that soil types, horizons and profiles are described in accordance with relevant, best-practice guidelines and methods, including the *Australian soil and land survey field handbook* (National Committee on Soil and Terrain, 2009), the *Guidelines for surveying soil and land resources* (McKenzie et al. 2008), the *Australian soil classification* (Isbell, 2016) and the *Queensland soil and land resource survey information guidelines* (Department of Resources 2021).

1.3 Report

The report structure is as follows:

- A description of the project setting (Section 2);
- A description of the assessment methods and relevant guidelines (Section 3);
- Identification and description of soil types, profiles and horizons present within the soil study area (Section 4);
- An assessment of the baseline land suitability class and agricultural land class of the soils within the soil study area (Section 5); and
- An assessment of the soil suitability for reuse in mine rehabilitation activities, including determination of applicable soil stripping depths (Section 6).

2 PROJECT SETTING

2.1 Land Use

The dominant land use in the soil study area is pastoral activity, specifically cattle grazing. A stock route traverses the southern end of the soil study area, alongside a gazetted road reserve. Two farm dams are located in the soil study area, which provide water sources for cattle.

No cropping activities are undertaken within the project site. There are no Strategic Cropping Areas, Priority Agricultural Areas, Priority Living Areas or Strategic Environmental Areas, as defined by the Regional Planning Interests Act 2014 (Qld), within the project site. The land within the soil study area is not subject to any Property or Project Plans approved under the Soil Conservation Act 1986 (Qld).

2.2 Topography and Hydrology

The local topography transitions from elevated rocky plateaus and ridgelines to the flatter, low-lying Woolgar River (as shown in Figure 2).

The Woolgar River is a locally significant watercourse. In the vicinity of the soil study area, the Woolgar River has a well-defined channel that is set within a narrow, discontinuous floodplain. The river channel contains a braided low flow channel with sand sheet deposits, bars and islands that have been formed by the extensive suspended sediment deposition during flow events.

Several plateaus and ridgelines extend into the soil study area and form local catchment boundaries (as shown in Figure 2). Several unnamed tributaries form on the slopes of the plateaus and ridgelines of these catchments (as shown in Figure 2). The unnamed tributaries coalesce on the flatter ground that is located between the plateaus and ridgelines and drain towards the Woolgar River valley.

The Woolgar River and associated drainage features exhibit highly ephemeral, short duration, surface water flows that contain elevated suspended sediment loads. This is expected given the catchment features and geology setting.

2.3 Regional Geology

The soil study area is located at the northern margin of the Eromanga Basin, a sedimentary basin that was deposited in the Mesozoic era. Locally, the Eromanga Basin overlies a Proterozoic basement. The Proterozoic basement is part of the North Australian Craton, one of Australia's major mineral provinces.

The Eromanga Basin and Proterozoic basement have been extensively modified by weathering and erosion. The weathered profile extends to depths of up to 40 m below ground level in the soil study area.

The soil study area stratigraphy includes the following (in descending order):

- Alluvium associated with the Woolgar River and its floodplain.
- The weathered in-situ rocks of the Eromanga Basin and Proterozoic basement (herein called the 'weathered profile').
- Fresh (i.e. unweathered) Jurassic strata of the Eromanga Basin.
- Fresh Proterozoic basement rocks, including the target gold ore.

3 METHODOLOGY

3.1 Overview

The soil assessment comprised a desktop study, a detailed field survey and data analysis and interpretation.

This soil survey was scoped and conducted in accordance with the *Guidelines for Surveying Soil and Land Resources* (McKenzie et al., 2008). These guidelines were developed to provide for a consistent approach to soil survey methodology across Australia.

Soil characteristics and soil profiles have been described in accordance with the *Australian Soil and Land Survey Field Handbook* (Gunn et al., 1988; National Committee on Soil and Terrain, 2009), *Queensland Soil and Land Resource Survey Information Guideline* (Department of Resources, 2021) and *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (Department of Environment and Science, 2021).

Soils have been grouped according to their parent material and position in the landscape and classified in accordance with the *Australian Soil Classification* (Isbell, 2021). Soils have also been correlated to soils identified in key regional soil assessments, previously mapped at a 1:1,000,000 scale (Perry et al., 1964).

Collection of soil samples for laboratory analysis was undertaken based on Land Suitability Assessment Techniques (LSAT) outlined in the *Technical Guidelines for Environmental Management of Exploration and Mining in Queensland* (DME, 1995), *Queensland Soil and Land Resource Survey Information Guideline* (Department of Resources, 2021) and *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (Department of Environment and Science, 2021).

The physical and chemical properties of soils relevant to the potential for erosion has been determined for representative samples down the soil profile based on field and laboratory assessment of dispersive attributes including but not limited to texture, R1 dispersion and emerson aggregate test results.

Interpretation of the field and analytical results were undertaken with review against *Interpreting Soil Analysis for agricultural use in Queensland* (Baker, D.E. and Eldershaw, V.J. 1993), *Analytical Methods and interpretations used by the Agricultural Chemical Branch, QDPI, for soil and land use surveys*. (Bruce, R.C. and Rayment, G.F. 1982), *Soil Testing and Some Test Interpretations used by the QDPI*. (Bruce, R.C. and Rayment, G.F. 1984), *Soil Salinity and Sodicity. In, Fergus IF (ed.), Understanding Soils and Soil Data* (Shaw, R.J. 1988); Soil Analysis, an Interpretation Manual (Peveril, K.I., Sparrow, L.A. and Reuter, 1999) and *Interpreting Soil Test Results* (Hazelton, P.A. and Murphy, B.W. 2007).

Determination of land suitability for the soil study area has been conducted based on the *Guidelines for Agricultural Land Evaluation in Queensland* (GALE) (DSITI & DNRM, 2015), *Regional Land Suitability Frameworks for Queensland* (DSITI & DNRM, 2013), *Queensland Soil and Land Resource Survey Information Guideline* (Department of Resources, 2021) and *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (Department of Environment and Science, 2021).

The suitability of soils for rehabilitation have been assessed using the field and laboratory assessment of texture, fertility, dispersive and structural attributes.

Groupings of soils with similar attributes are described as soil types in *Land—EIS information guideline* (Department of Environment and Science, 2022). Soil types are defined either as the Australian Soil Classification (ASC) suborder or Soil Profile Class (SPC) within *Queensland Soil and Land Resource Survey Information Guideline* (Department of Resources, 2021). For the purpose of this assessment and in order to adhere to the more relevant *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (Department of Environment and Science, 2021), SPC terminology and assessment will be used.

The following sections provide a detailed description of the desktop study and field work methodology.

3.2 Desktop Study

GTE reviewed the available soils and land resources information for the soil study area to develop preliminary soil types and to inform the development of the field survey program.

3.2.1 Regional Soil Reports and Documentation

The following soils reports and publicly available information were reviewed to identify previous soils and land suitability fieldwork and recommendations relevant to the soil study area, and to determine potential field sampling locations:

- Queensland Globe.

  The database shows that there is 1:2,000,000 regional scale soil mapping (*Atlas of Australian Soils* (Northcote et al., 1960-1968)) for the soil study area. The following four soil landscapes are mapped within the soil study area:

  - Fa26 – Earthy loams on strongly undulating lands with short steep slopes.
  - JJ11 – Pale sands on low hilly/hilly dissected sandstone plateaus, often with steep sided gorges and ravines.
  - AB35 – Earthy soils on gently undulating plains.
  - Ms18 – Yellow massive earths on gently undulating plains.

- Perry et al. (1964), *General Report on Lands of the Leichhardt-Gilbert Area, 1953-54*

  This report describes a total of 61 land systems across the Leichhardt-Gilbert area in north Queensland and comprises of 117,000 square miles. It provides land use

limitation information for each soil type, including climate, moisture supply, fertility, wetness, flooding frequency, rockiness, topography, soil physical condition, vegetation, erodibility, landscape complexity and salinity. The information on land use limitations is useful in assisting in the development of recommendations for the stripping and reuse of soils in the soil study area. This report is also referenced within Queensland Globe under the database, Land Resource Mapping 1:1,000,000.

Queensland globe indicated the following four land systems mapped within and adjacent the soil study area:

- Strathpark – Gently sloping timbered plains near the centre of the area.
- Torwood – Broken sandstone tablelands generally timbered with lancewood.
- Strathmore – Timbered plains near the centre of the area.
- Hampstead – Gently sloping timbered plateau somewhat south-east of the centre of the area

Further review of the report indicates that Cockatoo, Currajong, Norman, Elliot and Skeletal soil types could potentially be present within the soil study area and its surrounds.

3.2.2 Satellite Imagery

Satellite Imagery from Google Earth (accessed on 1 October 2020) was reviewed as part of the desktop study. Preliminary soil type mapping boundaries were identified using this imagery.

3.3 Field Work

3.3.1 Survey Timing

The field survey was undertaken between 24 and 31 October 2020.

3.3.2 Survey Team

The fieldwork was led by associate environmental consultant Reece McCann and assisted by field technician Brett Larkin.

3.3.3 Survey Techniques

Preliminary survey sites were derived from the desktop review of background information, existing available soils information and an examination of aerial photography patterns. The specific locations of the survey sites were further refined in the field based on available site access, and the location being a sound representation of the soil types within the soil study area.

Free survey and transect techniques (Gunn et al., 1988; McKenzie et al., 2008) were used to verify, sample and assign boundaries to each SPC. Free survey is a commonly used method in land assessment as it enables flexibility in site selection (over grid mapping techniques), to

achieve a more accurate and time effective result. It is well suited to detailed-scale surveys and is commonly used in soil surveys for resource projects in Queensland. Transect techniques were utilised where free survey was unable to be conducted and included sampling at regular intervals along a gradient to reveal the pattern of soil variation. This information was then extrapolated to adjacent areas.

The soil types within the project site were generally accessible. However, for safety it was occasionally necessary to collect additional supplementary information on these soil types from more accessible locations outside the project site boundary. The data collected from these supplementary sites was reviewed to ensure it is representative of the project site conditions and has been incorporated into the findings of the soil survey where relevant.

Two types of soil survey site were undertaken – detailed sites and observation sites, and these are described below.

Detailed Sites

Detailed surveys were undertaken at 22 sites (Figure 3). The detailed sites were used to describe the range of soil profile morphological attributes as per the *Australian Soil and Land Survey Field Handbook* (National Committee on Soil and Terrain, 2009) including landforms, slope, surface conditions, rock cover, major vegetation and soil colour (as per Munsell Color [2009] Soil Colour Charts). At each detailed site, an assessment was also made of the quality, depth and quantities of reusable soil.

The soil profile at each detailed site was typically excavated using a 50 mm hand auger. The hand auger method is a technically suitable method for characterising the soil profile. Soil profiles were undertaken in accordance with the *Guidelines for Surveying Soil and Land Resources* (McKenzie et al., 2008).

The information recorded from the 22 detailed sites included:

- Location (GDA2020) and type of soil observation (e.g. erosion exposed cutting or hand auger);
- Major vegetation types;
- Landform type, position of the site and slope gradient;
- Surface condition (e.g. presence of cracks, surface crust, rocks, stones and cobbles, erosion status, microrelief);
- Types and vertical extent of soil horizons;
- Colour (as per Munsell Color [2009] Soil Colour Charts) and mottling of each horizon;
- Observations of field texture, pH, presence and abundance of segregations, coarse fragments, structure, consistence and pedality and moisture content for each horizon;
- Presence of organic matter, roots and prevalence of biological activity;

- Presence of gleyed horizons, iron staining, jarosite presence and field pH; and
- Photographs of the soil profile and surrounding landscape.

The data collected from the detailed sites is presented in Appendix A.

Observation Sites

Observation surveys were undertaken at 53 sites (Figure 3). These sites were used to confirm the SPC and refine mapped soil boundaries.

Basic soil attributes were recorded at each observation site to confirm the SPC, and surface conditions including rock, slope percentage, landform type and position, major vegetation and land condition were also noted. The data collected from the observation sites is presented in Appendix B.

3.3.4 Laboratory Analysis

Soil samples were collected from each SPC present in the soil study area. For each of the sampled SPC (i.e. Nine units in total), the soil samples were collected from the detailed site that was considered to be most representative of that SPC.

A total of 46 soil samples were collected and submitted for laboratory analysis. Soil sampling of profiles was conducted as per McKenzie et al. (2008), with samples taken at standard depths incorporating the surface and every horizon change in the soil profile (typically at depths of 0.0-0.10 m, 0.30-0.40 m, 0.60-0.70 m, 0.90-1.00 m and 1.40-1.50 m). These depths were modified for sites in which field observations revealed soil horizons intersecting at these nominated depths, to ensure samples were collected in each separate horizon, and not across multiple horizons or in sub-horizon boundaries.

Laboratory analysis was undertaken to assist in determining the overall characterisation of the soils and to establish the physical and chemical limitations of soils. Laboratory testing was also used to identify soils that may require specific management measures.

Samples were analysed at Environmental Analysis Laboratory (EAL) who are accredited by the National Association of Testing Authority (NATA) and additionally certified by the Australasian Soil and Plant Analysis Council (ASPAC).

The laboratory analysis for surface soil horizons included the following parameters.

- pH (1:5);
- Electrical Conductivity (EC [1:5]);
- Chloride;
- Bicarbonate extractable P;
- Exchangeable Cations (Ca, Mg, Na, K);
- Cation Exchange Capacity (CEC);
- Calcium/Magnesium (Ca/Mg) Ratio;

- Exchangeable Sodium Percentage (ESP);
- Total N, Nitrates, Ammonia;
- Organic matter content;
- Particle Size Analysis (PSA) – Hydrometer Method (Coarse Sand [CS], Fine Sand [FS], Silt, Clay);
- R1 Dispersion;
- Emmerson Aggregate Test (EAT);
- Sulfate-Sulfur, Total Sulfur; and
- Metals - Total (Mn, B, Cu, Fe, Zn).

Samples lower in the soil profile were also analysed for a suite of parameters (pH, EC, chloride, exchangeable ions, CEC, Ca/Mg Ratio, ESP, PSA, EAT and R1 dispersion) that enabled GTE to determine soil reuse potential for rehabilitation of disturbed areas. The rationale for the selection of individual analyses is presented in Table 3-1.

The laboratory analytical results were used in conjunction with the field assessment results to determine the soil material that is suitable for stripping and reuse during rehabilitation. The laboratory results are summarised in Section 4 and detailed in Appendix C.

Table 3-1: Analytical Program and Number of Samples

Laboratory Analysis	Number of Samples Analsyed[1]	Justification
In situ measurements	Field pH 94	Used for 'on the spot' estimates of pH and to confirm the effective soil depth.
pH	27	Measurement of pH is a useful indicator of various soil properties (e.g. values >8.5 usually indicate high exchangeable sodium levels and the presence of carbonates and nutrient availability limitations).
Electrical Conductivity	27	The measure of electrical conductivity is used as a means of appraising soil salinity. The electrical conductance increases with soluble salt content and thus allows simple interpretation of salinity.
Chloride Content	27	The chloride anion is usually present in soil associated with sodium. It is highly mobile making it a valuable indicator of salt and water movement. It provides additional confirmation of soil salinity.
Bicarbonate Extractable Phosphorus (Colwell)	9	Bicarbonate extractable P (Bicarb. extr. P) is routinely measured to assess P fertility. The Bicarb. extr. P test provides reliable and consistent data across a wide range of pH values from strongly acid to strongly alkaline and is more useful than alternatives (e.g. acid extr. P).
CEC, Exchangeable Cations, Ca/MG ratio, ESP	27	The amounts and relative proportions of the exchangeable cations in soil have important effects on both physical and chemical properties. High levels of exchangeable sodium cause dispersion and increased swelling, reducing water movement and affecting near surface aeration, whereas exchangeable calcium flocculates colloids and would reduce swelling tendencies. Excessively high or low concentrations of one or the other of the cations may impact buffering capacity and, as a result, soil nutrient availability.
Available Nitrogen, Ammonia (total N, nitrate)	27	Testing provides an indication of the general fertility of soils and thus their suitability as a topdressing agent.
Organic Matter	9	Testing for soil organic matter provides an indication of the general fertility of soils and thus suitability as a topdressing agent. It also provides information on stored potential nutrients which may not yet be accessible to plants but may become available in the future.
PSA (<2 mm)	27	Particle size distribution data provides an assessment of the composition of a soil (based on the dominant grain size in a soil). This assists with confirmation of field observations as well as providing better grounds for identification of SPC and water holding capacity.

Laboratory Analysis	Number of Samples Analsyed[1]	Justification
R1 Dispersion	27	The measure of R1 dispersion is useful when used in conjunction with ESP and the Ca/Mg ratio for predicting soil physical behaviour.
Emerson Aggregate Test	27	The measure of Emerson Aggregate Test (EAT) is useful when determining soil physical behaviour.
Micronutrients	9	The analysis of aluminum, copper, zinc, manganese, and iron will assess potential natural concentrations of these heavy metals in the soil as well as any phytotoxicity issues that may exist.
Sulfate-Sulfur, Total Sulfur	27	Total levels of sulfur help identify whether organic matter or gypsum are present in a soil profile.

1. Total number of samples with laboratory analysis. Includes samples outside the scope of the soil study area.

4 SOIL TYPES AND MAPPING

A total of nine SPCs were identified within the soil study area (as shown in Figure 3).

Table 4-1 lists the SPCs in the soil study area and provides a description of the SPC concept (i.e. A group of similar soil profiles with a defined central concept and range of values including basic soil morphology, position in the landscape, and parent material).

Individual SPCs have been classified in accordance with the *Australian Soil Classification* (Isbell, 2002). Comparable land systems, as described by Perry et al (1964), are also provided in Table 4-1.

The detailed sites and representative sites for soil sampling and laboratory analysis are also listed in Table 4-1. Detailed descriptions of each SPC are provided in the following sections (Sections 4.1 to 4.1).

Table 4-1: Summary of the SPCs in the Soil Study Area

SPC	SPC Concept Description	Australian Soil Classification (Major Order/Sub-order)	Land System (Perry et al., 1964)	Area (ha)	Unique Mapping Areas (UMAs)	Detailed Sites (*Representative Sites)
1	Moderately deep, slightly acidic, black loam and brown sandy loam subsoil	Brown Kandosol	Strathpark	499	1, 6, 18, 21, 25	1*, 8, 10, 12, 30
2	Moderately deep, moderately acidic, black firm sandy loam with brown sandy loam to strongly alkaline, extremely sodic, sandy clay loam subsoil	Red Kandosol	Strathpark	80	3, 23	2*
3	Very shallow, rocky, strongly acidic, black sandy loam on steep hills on sedimentary rock	Leptic Rudosol	Strathpark	189	9, 13, 17, 22	3*
4	Moderately deep, moderately acidic, brown loamy sand on red, moderately alkaline, sandy clay loam subsoil	Red Kandosol	Strathpark	132	11, 15	5*
5	Shallow, hard-setting, slightly acidic, brown sands on brown sandy clay loam on sedimentary rock	Brown Kandosol	Strathpark	208	8, 16, 21	6*, 9
6	Moderately deep, firm, moderately alkaline, grey clay loam on strongly alkaline, extreme salinity and sodic, brown clay loam subsoil	Brown Kandosol	Strathpark	23	4, 7, 14	7*

SPC	SPC Concept Description	Australian Soil Classification (Major Order/Sub-order)	Land System (Perry et al., 1964)	Area (ha)	Unique Mapping Areas (UMAs)	Detailed Sites (*Representative Sites)
7	Deep, soft, moderately acidic, reddish brown sandy loam on red sandy clay loam subsoil	Red Kandosol	Strathpark, Hampstead, Strathmore	961	24	11, 13, 14, 15, 16, 18*, 27, 28
8	Shallow, hard setting, neutral, brown sandy loam with red sandy loam subsoil on metamorphic rock	Red Tenosol	Torwood	80	2, 19	29*
9	Very shallow, hard setting, strongly acidic, yellowish-brown sandy clay loam on sedimentary rock	Leptic Rudosol	Torwood	93	10, 12, 20	31*

4.1 Soil Profile Class 1: Moderately deep, slightly acidic, black loam and brown sandy loam subsoil

Overview

SPC 1 is a moderately deep, slightly acidic, black loam and brown sandy loam subsoils. The basic ASC is a brown Kandosol and is associated with lower slopes, plains and creeks.

SPC 1 has moderate limitations that make it suitable for mangoes and eggplant cropping, severe limitations for bananas and extreme limitations for peanut, rice and sorghum cropping. SPC 1 is suitable as limited cropping land and sown pastures.

Soil characteristics and chemistry

Laboratory data indicate the following attributes for this SPC:

- Gradational texture of sands to sandy loam;
- pH (laboratory analysis) ranges from neutral to moderately acidic;
- Electrical conductivity is moderate to very low;
- Chloride is very low;
- Cation exchange capacity (CEC) ranges are low to very low;
- In the topsoil, the CEC is 6.5 meq/100 and the exchangeable sodium percentage (ESP) is 1. For soils with a CEC of greater than 3 meq/100, ESP results are considered a reliable indicator of sodicity. If the ESP is less than 6% of the cation exchange capacity the soils are classed as non-sodic. Soils with an ESP of 6% or greater are classed as sodic. Hence, the topsoil of this soil type is non-sodic.
- In the subsoil, the ESP results are low (1-2%). However, the CEC is less than 3 meq/100 so the ESP results are not a reliable indicator of sodicity.
- Calcium to magnesium (Ca:Mg) ratios are very high;
- Nitrogen levels in topsoil are very low;
- Micronutrients indicate moderate levels for copper, manganese and zinc;
- Emerson aggregate test (EAT) results indicate slaking in topsoil. Subsoil results show slight dispersion above 0.75 mbgl. However, the particle size analysis indicates subsoils are sandy loam to loamy sand and therefore the EAT results are likely to overestimate dispersion.
- R1 dispersion testing confirms that these materials have low potential for dispersion;
- The level of bicarbonate extractable phosphorus present is high in topsoil; and
- Organic carbon levels in topsoil are low.

Representative site

Site 1 was selected as a representative site of this SPC.

A site description and soil profile morphology summary are presented in Table 4-2. The soil chemistry results for this SPC are presented in Table 4-3.

Table 4-2: Land Summary SPC 1

Item	Description
Representative Site	1
Representative Site photograph	
Location GDA2020 ZONE 54	741485 7810185
Current Use	Native woodland
Site survey type	Detailed, 50 mm hand auger
Vegetation	Tall to mid height woodland including Eucalyptus crebra (Narrow-leaved Ironback), as well as Eucalyptus leptophleba (Molloy red box) and Eucalyptus camaldulensis (Red gum)
Disturbance	No effective disturbance;
Landform element / pattern	Gently undulating plain
Microrelief	No microrelief
Drainage	Moderate well drained (Class 4)
Permeability (LRA, 2021)	Moderate Permeability (Class 3)
Erosion Observed	No erosion observed
Slope (%)	1.0 / 1.0
Surface coarse fragments	No coarse fragments
Surface condition	Hard setting
SPC ASC Order/Suborder	Brown Kandosol
Site ASC Order (s)	Haplic Eutrophic Brown Kandosol; moderately thick, non-gravelly, loamy, loamy, deep (Confidence level 1) ASC Coded Classification (Isbell, 2021): 1KAABAHCDAELLW
Land System / Soils Concept (Perry et al., 1964)	Strathpark / Cockatoo

Item	Description
K-Factor (Rosewell, 1993)	0.040
Land suitability summary	Land Suitability, Regional Frameworks: . Moderate (3) limitations for mangoes and eggplant. Severe (4) limitations for bananas. Extreme (5) limitations for soybean, mungbean and sorghum. Agricultural Suitability Class: B
Soil quality for mine rehabilitation	Stripped topsoils to 0.30 mbgl may be reused in rehabilitation activities with no amelioration required. Subsoils to a depth of 1.00 mbgl are suitable for stripping and reuse as subsoil in rehabilitation activities.
Total area (ha)	499

Soil Profile Morphology Summary



Horizon Depth (m), Boundary	Field Texture	Grade of Pedality Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Notes
A11 0.00-0.16 Abrupt 5-20mm	Loam fine sand	Massive Loose	Nil inclusions or segregations	10YR3/2 very dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Medium 2-5mm Few	0.10 / 6.0	Nil
A12 0.16-0.49 Abrupt 5-20mm	Loam fine sand	Massive Loose	Nil inclusions or segregations	10YR3/3 dark brown Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2 mm Few	0.30 / 6.0	
B21 0.48-0.74 Clear 20-50mm	Sandy loam	Massive Loose	Nil inclusions or segregations	10YR3/4 dark yellowish brown Nil mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	0.65 / 6.5	
B22 0.74-1.00 End of borehole (EOBH)	Loamy sand	Massive Loose	<2% coarse fragments <2mm	10YR3/4 dark yellowish brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	0.90 / 6.5	

Table 4-3: Soil Chemistry Results for SPC 1, Representative Site 1

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.75-0.85	0.90-1.00
	A11 horizon	A12 horizon	B21 horizon	B22 horizon	B22 horizon
Soil pH (H20)	6.62	5.95	6.27	6.45	6.41
Soil pH (CaCl2 / 0.01M)	5.4	-[1]	-	-	-
Soil EC (dS/m)	0.024	0.190	0.057	0.041	0.026
Soil Cl (milligrams per kilogram [mg/kg])	31	32	50	14	33
Exch. Ca (milli-equivalent per 100 grams [meq/100g])	4.3	5.3	2.0	1.5	1.5
Exch. Mg (meq/100g)	1.14	1.24	0.44	0.38	0.40
Exch. K (meq/100g)	1.01	0.23	<0.12	<0.12	<0.12
Exch. Na (meq/100g)	<0.065	0.09	<0.065	<0.065	<0.065
CEC (meq/100g)	6.5	6.8	2.6	2.0	2.0
Ca/Mg (ratio)	3.7	4.3	4.5	4.0	3.7
ESP (%Na/CEC)	1	1	2	2	2
Nitrate (mg/kg)	2.1	-	-	-	-
Ammonia (mg/kg)	4.2	-	-	-	-
Total Nitrogen (mg/kg)	0.04	-	-	-	-
Sulfate-S (mg/kg)	1.4	-	-	-	-
Total S (%)	<50	-	-	-	-
Zinc (mg/kg)	2.4	-	-	-	-
Mn (mg/kg)	42	-	-	-	-
Iron (mg/kg)	29	-	-	-	-
Copper (mg/kg)	0.40	-	-	-	-
Boron (mg/kg)	0.21	-	-	-	-
Silicon (mg/kg)	40	-	-	-	-
Tot Organic Carbon (%)	1.3	-	-	-	-
Organic Matter (%)	1.3	-	-	-	-
P (mg/kg)	27	-	-	-	-
Disp Ratio (R1)	0.53	0.58	0.39	0.37	0.32
EAT (No.)	5	5	5	8	8

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.75-0.85	0.90-1.00
	A11 horizon	A12 horizon	B21 horizon	B22 horizon	B22 horizon
Gravel >2mm (%)	0	0	0	0	0
CS >50µm (%)	60	65	81	85	85
CS >20µm (%)	71	71	86	87	87
2-50µm-Silt (%)	25	20	9	7	8
2-20µm-Silt (%)	14	14	4	4	5
Clay <2µm (%)	15	15	11	9	7
Texture	Loam	Loam	Sandy Loam	Sandy Loam	Loamy Sand
PAWC Assessment					
Horizon Depth (m)	0.16	0.33	0.25	0.16	0.10
PAWC per horizon (mm)	9.60	19.80	12.50	8.00	4.00
PAWC Total	53.90				

1. '-' indicates laboratory analysis was not conducted for this sample.

4.2 Soil Profile Class 2: Moderately deep, moderately acidic, black firm sandy loam with brown sandy loam to strongly alkaline, extremely sodic, sandy clay loam subsoil

Overview

SPC 2 is a moderately deep, moderately acidic, black firm sandy loam with brown sandy loam to strongly alkaline, extremely sodic, sandy clay loam subsoil. The basic ASC is a red Kandosol and is associated with levels plains. Vegetation includes tall woodlands of narrow leaved ironbark and other eucalyptus species including Eucalyptus Microneural (Gilbert River Box).

SPC 2 has moderate limitations that make it suitable for mangoes and eggplant cropping, severe limitations for bananas and extreme limitations for peanut, rice and sorghum cropping. SPC 2 is suitable as limited cropping land and sown pastures.

Soil characteristics and chemistry

Laboratory data indicate the following attributes for this SPC:

- Textures included sandy loams varying to sandy clay loam at 0.90 mbgl;
- pH (laboratory analysis) is slightly acidic in topsoils and very strongly alkaline in subsoils;
- Chloride is very low in topsoil and varies between very low and low in subsoil;
- Very low electrical conductivity in the topsoils, increases to high in subsoils;
- CEC ranges are low in topsoils, increasing to high in subsoils;
- ESP is non-sodic in topsoil increasing to strongly and extremely sodic in subsoils. CEC results are above 3 cmol(+)=kg-1 for topsoil and generally within 3 cmol(+)=kg-1. The texture is sandy, this would indicate that ESP results may not be relied upon as an indicator of sodicity;
- Ca:Mg ratios are very high in topsoil decreasing to high in subsoils;
- Nitrogen levels in topsoil are low;
- Micronutrients indicate moderate levels of manganese and zinc, and low levels for copper;
- EAT reports no dispersion in topsoil with complete dispersion in subsoils;
- The level of bicarbonate extractable phosphorus present is high in topsoil; and
- Organic carbon levels in topsoil are moderate.

Representative site

Site 2 was selected as a representative site of this SPC.

A site description and soil profile morphology summary are presented in Table 4-4. The soil chemistry results for this SPC are presented in Table 4-5.

Table 4-4: Land Summary SPC 2

Item	Description
Representative Site	2
Representative Site photograph	
Location GDA2020 ZONE 54	740040 7809628
Current Use	Native woodland
Site survey type	Detailed, 50 mm hand auger
Vegetation	Tall woodland forest including narrow leaved ironbark with occasional Gilbert river box
Disturbance	Nil disturbance
Landform element /pattern	Level plain
Microrelief	No microrelief
Drainage	Moderately - well drained (Class 4)
Permeability (LRA, 2021)	Moderate Permeable (Class 3)
Erosion Observed	No erosion observed
Slope (%)	<1.0 / <1.0
Surface coarse fragments	No coarse fragments
Surface condition	Firm
SPC ASC Order/Suborder	Red Kandosol
Site ASC Order (s)	Haplic Eutrophic Red Kandosol; moderately thick, non-gravelly, sandy, loamy, deep (Confidence level 1) ASC Coded Classification (Isbell, 2021): 1KAAAAHCDBEKLW
Land System / Soils Concept (Perry et al., 1964)	Strathpark / Cockatoo
K-Factor (Rosewell, 1993)	0.030
Land suitability summary	Land Suitability, Regional Frameworks: Moderate (3) limitations for mangoes and eggplant. Severe (4) limitations for bananas. Extreme (5) limitations for soybean, mungbean and sorghum.

Item	Description
	Agricultural Suitability: B
Soil quality for mine rehabilitation	Stripped topsoils to 0.35 mbgl may be reused in rehabilitation activities with no amelioration required. Subsoils to a depth of 1.00 mbgl may be stripped and reused as subsoil in rehabilitation activities if other allocation volumes of subsoils have been used. Subsoil placement may require the use of gypsum and visual inspection of soils prior to placement.
Total area (ha)	80
Soil Profile Morphology Summary	



Horizon Depth (m), Boundary	Field Texture	Grade of Pedality Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Notes
A11 0.00-0.13 Clear 20-50mm	Sandy loam	Massive Loose	Nil inclusions or segregations	10YR3/2 very dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Common	0.05 / 6.0	Nil
A12 0.13-0.38 Clear 20-50mm	Loamy sand	Massive Loose	Nil inclusions or segregations	10YR3/3 dark brown Nil mottles or bleaching	Dry Well drained	Nil roots	0.20 / 7.5	
B2 0.38-1.00 EOBH	Sandy loam	Massive Loose	2-10% coarse fragments 2-6mm	2.5Y4/3 dark brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	0.60 / 8.5 0.90 / 8.5	

Table 4-5: Soil Chemistry Results for SPC 2, Representative Site 2

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.70-0.80	0.90-1.00
	A11 horizon	A12 horizon	B2 horizon	B2 horizon	B2 horizon
Soil pH (H20)	6.35	8.52	10.19	10.12	10.08
Soil pH (CaCl2 / 0.01M)	5.5	-[1]	-	-	-
Soil EC (dS/m)	0.043	0.099	0.509	0.393	0.378
Soil Cl (mg/kg)	71	102	79	101	132
Exch. Ca (meq/100g)	3.6	1.0	0.5	0.3	0.2
Exch. Mg	0.63	0.51	0.24	0.17	0.14

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.70-0.80	0.90-1.00
	A11 horizon	A12 horizon	B2 horizon	B2 horizon	B2 horizon
(meq/100g)					
Exch. K (meq/100g)	0.43	0.16	0.04	0.04	0.06
Exch. Na (meq/100g)	0.08	0.44	2.50	2.39	2.62
CEC (meq/100g)	4.8	2.1	3.2	2.9	3.0
Ca/Mg (ratio)	5.8	2.0	1.9	1.6	1.1
ESP (%Na/CEC)	2	20	77	83	88
Nitrate (mg/kg)	7.8	-	-	-	-
Ammonia (mg/kg)	4.0	-	-	-	-
Total Nitrogen (mg/kg)	0.14	-	-	-	-
Sulfate-S (mg/kg)	2.6	-	-	-	-
Total S (%)	103	-	-	-	-
Zinc (mg/kg)	2.4	-	-	-	-
Mn (mg/kg)	20	-	-	-	-
Iron (mg/kg)	93	-	-	-	-
Copper (mg/kg)	0.3	-	-	-	-
Boron (mg/kg)	0.33	-	-	-	-
Silicon (mg/kg)	37	-	-	-	-
Tot Organic Carbon (%)	2.21	-	-	-	-
Organic Matter (%)	2.21	-	-	-	-
P (mg/kg)	16	-	-	-	-
Disp Ratio (R1)	0.32	0.40	0.62	0.60	0.62
EAT (No.)	8	1	1	1	1
Gravel >2mm (%)	0	0	0	0	0
CS >50µm (%)	84	82	69	71	73
CS >20µm (%)	87	87	76	76	77
2-50µm-Silt (%)	7	11	12	10	8
2-20µm-Silt (%)	4	6	5	5	3
Clay <2µm (%)	9	7	19	19	20
Texture	Sandy Loam	Loamy Sand	Sandy Loam	Sandy Loam	Sandy Clay Loam
PAWC Assessment					
Horizon Depth (m)	0.13	0.25	0.22	0.30	0.10
PAWC per	6.50	10.00	11.00	15.00	6.00

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.70-0.80	0.90-1.00
	A11 horizon	A12 horizon	B2 horizon	B2 horizon	B2 horizon
horizon (mm)					
PAWC Total	48.50				

1. '-' indicates laboratory analysis was not conducted for this sample.

4.3 Soil Profile Class 3: Very shallow, rocky, strongly acidic, black sandy loam on steep hills on sedimentary rock

Overview

SPC 3 is a very shallow, rocky, strongly acidic, black sandy loam on steep hills on sedimentary rock. The basic ASC is a leptic Rudosol and is associated with steep hill country. Vegetation includes sparse shrublands and Acacia Shirleyi (Lancewood) woodlands with bedrock exposed on the surface.

SPC 3 has extreme limitations due to the location on steep hills and minimal soil. It is unsuitable for cropping and only suitable for light grazing.

Soil characteristics and chemistry

Laboratory data indicate the following attributes for this SPC:

- Very shallow loamy sand on bedrock outcrops;
- pH (laboratory analysis) is strongly acidic;
- Very low electrical conductivity;
- Chloride is very low;
- CEC ranges are very low;
- ESP is non-sodic. The CEC results are below 3 cmol(+)=kg-1 as well as a sandy loam texture indicates that ESP results may not be relied upon as an indicator of sodicity;
- Ca:Mg ratios are high;
- Nitrogen levels in topsoil are very low;
- Micronutrients indicate moderate levels of manganese and low levels for copper and zinc;
- EAT reports no dispersion or slaking;
- The level of bicarbonate extractable phosphorus present is high in topsoil; and
- Organic carbon levels in topsoil are low.

Representative site

Site 3 was selected as a representative site of this SPC.

A site description and soil profile morphology summary are presented in Table 4-6. The soil chemistry results for this SPC are presented in Table 4-7.

Table 4-6: Land Summary SPC 3

Item	Description
Representative Site	3
Representative Site photograph	
Location GDA2020 ZONE 54	740686 7808732
Current Use	Sparse tall woodlands consisting of lancewood
Site survey type	Detailed, 50 mm hand auger
Vegetation	Sparse vegetation
Disturbance	Nil disturbance
Landform element /pattern	Steep hill, crest
Microrelief	Nil microrelief
Drainage	Well drained (Class 5)
Permeability (LRA, 2021)	Highly Permeable (Class 4)
Erosion Observed	Nil erosion
Slope (%)	30+ over crest edge
Surface coarse fragments	2-10% coarse fragments, 20-60mm, 80% Bedrock
Surface condition	Firm
SPC ASC Order/Suborder	Leptic Rudosol
Site ASC Order (s)	Acidic Lithic Leptic Rudosol; slightly gravelly, sandy, very shallow (Confidence level 1) ASC Coded Classification (Isbell, 2021): 1TECYCZAIFKT
Land System / Soils Concept (Perry et al., 1964)	Strathpark / Skeletal sand and rock outcrop
K-Factor (Rosewell, 1993)	0.030
Land suitability summary	Land Suitability, Regional Frameworks: Extreme (5) limitations for cane, cucurbits, tomatoes, soybean, mungbean and sorghum. Agricultural Suitability Class: C3
Soil quality for mine rehabilitation	Not suitable for reuse in rehabilitation activities
Total area (ha)	189

Item	Description
Soil Profile Morphology Summary	



Horizon Depth (m), Boundary	Field Texture	Grade of Pedality Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Notes
A1 0.00-0.17 EOBH	Loamy sand	Single grain Loose	2-10% coarse fragments 2-6mm	10YR3/2 very dark greyish brown Nil mottles or bleaching	Dry Rapidly drained	Medium 2-5mm Few	0.10 / 5.5	0.00-0.10

Table 4-7: Soil Chemistry Results for SPC 3, Representative Site 3

Analysis (Unit)	Sample Depth (mbgl)
	0.00-0.10
	A1 horizon
Soil pH (H20)	5.20
Soil pH (CaCl2 / 0.01M)	4.6
Soil EC (dS/m)	0.047
Soil Cl (mg/kg)	20
Exch. Ca (meq/100g)	0.5
Exch. Mg (meq/100g)	0.24
Exch. K (meq/100g)	0.14
Exch. Na (meq/100g)	<0.065
CEC (meq/100g)	1.3
Ca/Mg (ratio)	1.9
ESP (%Na/CEC)	1
Nitrate (mg/kg)	15.2
Ammonia (mg/kg)	10.4
Total Nitrogen (mg/kg)	0.04
Sulfate-S (mg/kg)	3.0

Analysis (Unit)	Sample Depth (mbgl)
	0.00-0.10
	A1 horizon
Total S (%)	<50
Zinc (mg/kg)	<0.5
Mn (mg/kg)	6
Iron (mg/kg)	75
Copper (mg/kg)	0.1
Boron (mg/kg)	0.11
Silicon (mg/kg)	6
Tot Organic Carbon (%)	1.11
Organic Matter (%)	1.11
P (mg/kg)	17
Disp Ratio (R1)	0.04
EAT (No.)	8
Gravel >2mm (%)	0
CS >50µm (%)	92
CS >20µm (%)	92
2-50µm-Silt (%)	0
2-20µm-Silt (%)	0
Clay <2µm (%)	8
Texture	Sandy Loam
PAWC Assessment	
Horizon Depth (m)	0.17
PAWC per horizon (mm)	8.50
PAWC Total	8.50

4.4 Soil Profile Class 4: Moderately deep, moderately acidic, brown loamy sand on red, moderately alkaline, sandy clay loam subsoil

Overview

SPC 4 is a moderately deep, moderately acidic, brown loamy sand on red, moderately alkaline, sandy clay loam subsoil. The basic ASC is a red Kandosol and is associated with lower slopes and flat plains of gently undulating plains. Vegetation includes tall woodlands of Narrow Leaved Ironbark, Red Gum and Melaleuca Fluviatilis (River Tea Tree).

SPC 4 has moderate limitations that make it suitable for mangoes and eggplant cropping, severe limitations for bananas and extreme limitations for peanut, rice and sorghum cropping. SPC 4 is suitable as limited cropping land and sown pastures.

Soil characteristics and chemistry

Laboratory data indicate the following attributes for this SPC:

- Uniform to gradational textures of loamy sands to clayey sands with sandy clay loam at 0.90 mbgl;
- pH (laboratory analysis) is slightly acidic in topsoil to moderately alkaline in subsoils;
- Electrical conductivity is low in topsoil to very low in subsoils;
- Chloride is very low;
- CEC ranges are very low;
- ESP is non-sodic. CEC results are below 3 cmol(+)=kg-1 as well as the sandy texture indicates that ESP results may not be relied upon as an indicator of sodicity;
- Ca:Mg ratios are very high;
- Nitrogen levels in topsoil are very low;
- Micronutrients indicate moderate levels of manganese and zinc, and low levels for copper;
- EAT reports no dispersion or slaking;
- The level of bicarabonate extractable phosphorus present is high in topsoil; and
- Organic carbon in topsoil is low.

Representative site

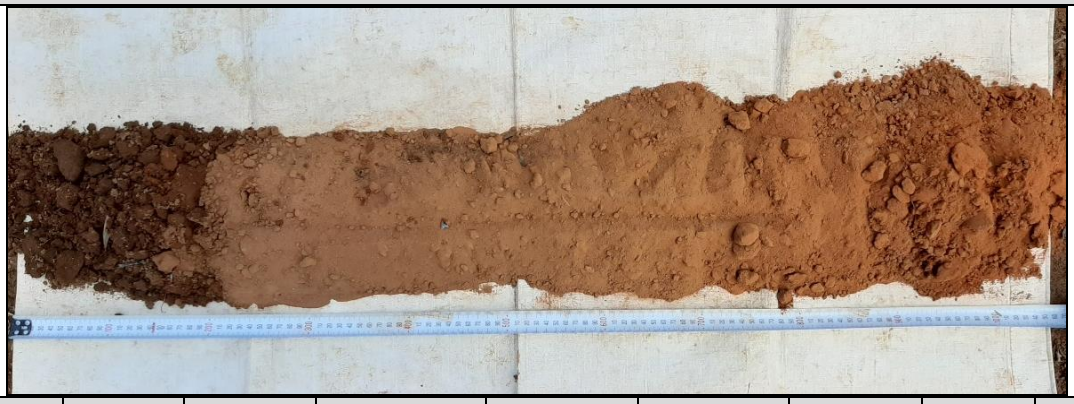
Site 5 was selected as a representative site of this SPC.

A site description and soil profile morphology summary are presented in Table 4-8. The soil chemistry results for this SPC are presented in Table 4-9.

Table 4-8: Land Summary SPC 4

Item	Description
Representative Site	5
Representative Site photograph	
Location GDA2020 ZONE 54	738544 7808620
Current Use	Native woodland
Site survey type	Detailed, 50 mm hand auger
Vegetation	Native tall woodland forests of Narrow leaved ironbark, Red gums and River tea trees
Disturbance	No disturbance observed
Landform element /pattern	Flat plain
Microrelief	No microrelief observed
Drainage	Moderate well drained (Class 4)
Permeability (LRA, 2021)	Moderately Permeable (Class 3)
Erosion Observed	No erosion observed
Slope (%)	<1.0 / <1.0
Surface coarse fragments	No coarse fragments
Surface condition	Soft
SPC ASC Order/Suborder	Red Kandosol
Site ASC Order (s)	Haplic Eutrophic Red Kandosol, moderately thick, non-gravelly, sandy, loamy, deep (Confidence level 1) ASC Coded Classification (Isbell, 2021): 1KAAAAHCDBEKLW
Land System / Soils Concept (Perry et al., 1964)	Strathpark / Cockatoo
K-Factor (Rosewell, 1993)	0.020
Land suitability summary	Land Suitability, Regional Frameworks: Moderate (3) limitations for mangoes and eggplant. Severe (4) limitations for bananas. Extreme (5) limitations for soybean, mungbean and sorghum. Agricultural Suitability Class: B
Soil quality for mine rehabilitation	Stripped topsoils to 0.20 mbgl may be reused in rehabilitation activities with no amelioration required. Subsoils to a depth of 1.00 mbgl are suitable for stripping and reuse as subsoil in rehabilitation

Item	Description
	activities.
Total area (ha)	132
Soil Profile Morphology Summary	



Horizon Depth (m), Boundary (Bdy)	Field Texture	Grade of Pedality Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Notes
A1 0.00–0.20 Abrupt 5-20mm	Loamy sand	Weak Very weak	Nil inclusions or segregations	7.5YR3/3 dark brown Nil mottles or bleaching	Moderately moist Rapidly drained	Fine 1-2mm Common	0.10 / 6.0	0.00-0.10 0.25-0.30 0.50-0.60 0.70-0.80 0.90-1.00
A2 0.20-0.80 Clear 20-50mm	Loamy sand	Massive Loose	Nil inclusions or segregations	5YR5/6 yellowish red Nil mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.30 / 6.0 0.60 / 6.0	
B2 0.80-1.00 EOBH	Clayey sand	Massive Weak / loose	Nil inclusions or segregations	5YR4/6 yellowish red Nil mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	0.90 / 7.0	

Table 4-9: Soil Chemistry Results for SPC 4, Representative Site 5

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.25-0.30	0.50-0.60	0.70-0.80	0.90-1.00
	A1 horizon	A2 horizon	A2 horizon	A2 horizon	B2 horizon
Soil pH (H20)	6.26	7.82	8.11	8.06	7.99
Soil pH (CaCl2 / 0.01M)	5.6	-[1]	-	-	-
Soil EC (dS/m)	0.067	0.013	0.015	0.017	0.021
Soil Cl (mg/kg)	11	22	42	13	11
Exch. Ca (meq/100g)	2.6	1.3	1.2	1.5	2.0
Exch. Mg (meq/100g)	0.32	0.24	0.31	0.47	0.63
Exch. K (meq/100g)	0.19	0.17	0.13	0.23	0.33
Exch. Na (meq/100g)	<0.065	0.05	0.01	0.02	0.02
CEC (meq/100g)	3.1	1.8	1.6	2.2	2.9

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.25-0.30	0.50-0.60	0.70-0.80	0.90-1.00
	A1 horizon	A2 horizon	A2 horizon	A2 horizon	B2 horizon
Ca/Mg (ratio)	8.1	5.4	3.8	3.3	3.1
ESP (%Na/CEC)	0	3	1	1	1
Nitrate (mg/kg)	28.2	-	-	-	-
Ammonia (mg/kg)	6.3	-	-	-	-
Total Nitrogen (mg/kg)	0.04	-	-	-	-
Sulfate-S (mg/kg)	1.1	-	-	-	-
Total S (%)	<50	-	-	-	-
Zinc (mg/kg)	1.1	-	-	-	-
Mn (mg/kg)	12	-	-	-	-
Iron (mg/kg)	14	-	-	-	-
Copper (mg/kg)	0.3	-	-	-	-
Boron (mg/kg)	0.23	-	-	-	-
Silicon (mg/kg)	19	-	-	-	-
Tot Organic Carbon (%)	0.59	-	-	-	-
Organic Matter (%)	0.70	-	-	-	-
P (mg/kg)	17	-	-	-	-
Disp Ratio (R1)	0.34	0.36	0.49	0.50	0.52
EAT (No.)	8	8	8	8	8
Gravel >2mm (%)	0	0	0	0	0
CS >50µm (%)	83	85	86	79	71
CS >20µm (%)	89	93	91	84	77
2-50µm-Silt (%)	11	9	6	8	9
2-20µm-Silt (%)	5	0	1	2	3
Clay <2µm (%)	6	7	8	13	20
Texture	Loamy Sand	Sand	Sand	Sandy Loam	Sandy Clay Loam
PAWC Assessment					
Horizon Depth (m)	0.20	0.30	0.20	0.10	0.20
PAWC per horizon (mm)	8.00	12.00	8.00	5.00	12.00
PAWC Total	45.00				

1. '-' indicates laboratory analysis was not conducted for this sample.

4.5 Soil Profile Class 5: Shallow, hard-setting, slightly acidic, brown sands on brown sandy clay loam on sedimentary rock

Overview

SPC 5 is a shallow, hard-setting, slightly acidic, brown sands on brown sandy clay loam on sedimentary rock. The basic ASC is a brown Kandosol and is associated with undulating rises. Vegetation includes sparse tall woodlands of Narrow leaved Ironbark.

SPC 5 has severe limitations for mangoes, bananas and eggplant cropping and extreme limitations for peanut, rice and sorghum cropping.

Soil characteristics and chemistry

Laboratory data indicate the following attributes for this SPC, excluding subsoils for the very shallow phase:

- Texture varies from sand to sandy clay loam textures;
- pH (laboratory analysis) is slightly acidic in topsoil to neutral and slightly acidic in subsoils;
- Electrical conductivity is moderate;
- Chloride is very low;
- CEC ranges are very low;
- ESP is non-sodic for topsoil but sodic in subsoils. CEC results are close to 3 cmol(+)=kg-1 which indicates that ESP results may be relied upon as an indicator of sodicity for A12 horizon;
- Ca:Mg ratios are very high in topsoil decreasing to moderate in subsoils;
- Nitrogen levels in topsoil are very low;
- Micronutrients indicate moderate levels of manganese and zinc, and low levels for copper;
- EAT reports no dispersion in topsoil, some dispersion in subsoils to 0.30 mbgl and non-dispersive from 0.30 mbgl;
- R1 dispersion is low;
- The level of bicarbonate extractable phosphorus present is moderate in topsoil; and
- Organic carbon in topsoil is low.

Representative site

Site 6 was selected as a representative site of this SPC.

A site description and soil profile morphology summary are presented in Table 4-10. The soil chemistry results for this SPC are presented in Table 4-11.

Table 4-10: Land Summary SPC 5

Item	Description
Representative Site	6
Representative Site photograph	
Location GDA2020 ZONE 54	739594 7808320
Current Use	Native woodland
Site survey type	Detailed, 50 mm hand auger
Vegetation	Tall, sparse woodlands including narrow leaved ironbark
Disturbance	No effective disturbance; hoofed animals
Landform element /pattern	Undulating rises, mid slope
Microrelief	No microrelief observed
Drainage	Moderately well drainage (Class 4)
Permeability (LRA, 2021)	Moderately Permeable (Class 3)
Erosion Observed	No erosion observed
Slope (%)	5
Surface coarse fragments	20-50% 6-20mm, 5-10% 20-60mm
Surface condition	Hard setting
SPC ASC Order/Suborder	Brown Kandosol
Site ASC Order (s)	Sodic Leptic Brown Kandosol; thin, moderately gravelly, sandy, loamy, shallow (Confidence level 1) ASC Coded Classification (Isbell, 2021): 1KABACYEOAHKLU
Land System / Soils Concept (Perry et al., 1964)	Strathpark / Cockatoo
K-Factor (Rosewell, 1993)	0.015
Land suitability summary	Land Suitability, Regional Frameworks: Severe (4) limitations for mangoes, bananas and eggplant. Extreme (5) limitations for peanut, rice and sorghum. Agricultural Suitability Class: C2

Item	Description
Soil quality for mine rehabilitation	Stripped topsoils to 0.15 mbgl may be reused in rehabilitation activities with no amelioration required. Subsoils to a depth of 0.45 mbgl may be suitable as subsoil for reuse in rehabilitation activities with recommendations.
Total area (ha)	208
Soil Profile Morphology Summary	



Horizon Depth (m), Boundary (Bdy)	Field Texture	Grade of Pedality Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Notes
A11 0.00-0.10 Sharp <5mm	Clayey sand	Massive Loose	20-50% coarse fragments 6-20mm	10YR3/3 dark brown Nil mottles or bleaching	Dry Well drained	Fine 1-2mm Few	0.05 / 6.0	0.00-0.07 0.10-0.20 0.30-0.40
B21 0.10-0.24 Clear 5-20mm	Clayey sand	Weak Loose	20-50% coarse fragments 6-20mm 2-10% coarse fragments 20-60mm	2.5Y5/6 light olive brown Nil mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	0.20 / 6.5	
B22 0.24-0.45 EOBH - Refusal on hard pan / rock	Clayey sand	Massive Loose	10-20% coarse fragments 6-20mm	2.5Y5/4 light olive brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	0.40 / 6.5	

Table 4-11: Soil Chemistry Results for SPC 5, Representative Site 6

Analysis (Unit)	Sample Depth (mbgl)		
	0.00-0.10	0.10-0.20	0.30-0.40
	A1 horizon	A12 horizon	A22 horizon
Soil pH (H20)	6.64	6.77	6.18
Soil pH (CaCl2 / 0.01M)	5.8	-[1]	-
Soil EC (dS/m)	0.014	0.015	0.010
Soil Cl (mg/kg)	17	8	11
Exch. Ca (meq/100g)	2.1	1.1	0.7

Analysis (Unit)	Sample Depth (mbgl)		
	0.00-0.10	0.10-0.20	0.30-0.40
	A1 horizon	A12 horizon	A22 horizon
Exch. Mg (meq/100g)	0.56	1.34	0.81
Exch. K (meq/100g)	0.27	0.16	0.19
Exch. Na (meq/100g)	<0.065	0.31	0.09
CEC (meq/100g)	2.9	2.9	1.8
Ca/Mg (ratio)	3.8	0.8	0.9
ESP (%Na/CEC)	0	11	5
Nitrate (mg/kg)	0.8	-	-
Ammonia (mg/kg)	1.2	-	-
Total Nitrogen (mg/kg)	0.06	-	-
Sulfate-S (mg/kg)	1.1	-	-
Total S (%)	<50	-	-
Zinc (mg/kg)	0.8	-	-
Mn (mg/kg)	11	-	-
Iron (mg/kg)	22	-	-
Copper (mg/kg)	0.2	-	-
Boron (mg/kg)	0.25	-	-
Silicon (mg/kg)	13	-	-
Tot Organic Carbon (%)	0.97	-	-
Organic Matter (%)	0.97	-	-
P (mg/kg)	14	-	-
Disp Ratio (R1)	0.36	0.53	0.53
EAT (No.)	8	2	8
Gravel >2mm (%)	0	0	0
CS >50µm (%)	87	66	76
CS >20µm (%)	91	73	81
2-50µm-Silt (%)	6	14	12
2-20µm-Silt (%)	2	7	7
Clay <2µm (%)	7	20	12
Texture	Sand	Sandy Clay Loam	Sandy Loam
PAWC Assessment			
Horizon Depth (m)	0.10	0.14	0.21
PAWC per horizon (mm)	4.00	8.40	10.50
PAWC Total	22.90		

1. '-' indicates laboratory analysis was not conducted for this sample.

4.6 Soil Profile Class 6: Moderately deep, firm, moderately alkaline, grey clay loam on strongly alkaline, extreme salinity and sodic, brown clay loam subsoil

Overview

SPC 6 is a moderately deep, firm, moderately alkaline, grey clay loam on strongly alkaline, extreme salinity and sodic, brown clay loam subsoil. The basic ASC is a brown Kandosol and is associated with flat plains. Vegetation is near non-existent on cracking clay surface.

SPC 6 has severe limitations that make it suitable for mangoes, bananas and eggplant cropping and extreme limitations for peanut, rice and sorghum cropping. SPC 6 is suitable for grazing on native pastures.

Soil characteristics and chemistry

Laboratory data indicate the following attributes for this SPC:

- Gradational textures of light clays and clay loams;
- pH (laboratory analysis) is moderately alkaline in topsoils increasing slightly to strongly alkaline in subsoils;
- Electrical conductivity is low in topsoils and extreme in subsoils from 0.20 mbgl;
- Chloride is very low in topsoils increasing to extreme levels in subsoil;
- CEC ranges are low in topsoil varying between low and moderate in subsoils;
- ESP is sodic in topsoil and extremely sodic in subsoils form 0.20 mbgl. CEC results are above to 3 cmol(+)=kg-1 which indicates that ESP results may be relied upon as an indicator of sodicity;
- Ca:Mg ratios are high in topsoil decreasing slightly to moderate in subsoils;
- Nitrogen levels in topsoil are very low;
- Micronutrients indicate moderate levels for copper, manganese and zinc;
- EAT reports some dispersion in topsoil, increasing to complete dispersion in subsoils from 0.20 mbgl;
- R1 dispersion overall is low;
- The level of bicarbonate extractable phosphorus present is high in topsoil; and
- Organic carbon in topsoil is very low.

Representative site

Site 7 was selected as a representative site of this SPC.

A site description and soil profile morphology summary are presented in Table 4-12. The soil chemistry results for this SPC are presented in Table 4-13.

Table 4-12: Land Summary SPC 6

Item	Description
Representative Site	7
Representative Site photograph	
Location GDA2020 ZONE 54	738636 7808181
Current Use	Sparse, near desolate area with fringe vegetation consisting of Ironbark
Site survey type	Detailed, 50 mm hand auger
Vegetation	Very sparse vegetation
Disturbance	Limited clearing observed
Landform element /pattern	Gently undulating plain, alluvial flat
Microrelief	No microrelief observed
Drainage	Moderately well drained (Class 4)
Permeability (LRA, 2021)	Moderately Permeable (Class 3)
Erosion Observed	Sheet and gully erosion observed
Slope (%)	1.0 / 1.0
Surface coarse fragments	<2% coarse fragments, 2-6mm
Surface condition	Firm
SPC ASC Order/Suborder	Brown Kandosol
Site ASC Order (s)	Sodic Eutrophic Brown Kandosol; moderately thick, non-gravelly, clay loamy, clayey, deep (Confidence level 1) ASC Coded Classification (Isbell, 2021): 1KAABAHEOBMOW
Land System / Soils Concept (Perry et al., 1964)	Strathpark / Vanrook
K-Factor (Rosewell, 1993)	0.030
Land suitability summary	Land Suitability, Regional Frameworks: Severe (4) limitations for mangoes, bananas and eggplant. Extreme (5) limitations for peanut, rice and sorghum. Agricultural Suitability Class: C2

Item	Description
Soil quality for mine rehabilitation	Not suitable for reuse in rehabilitation activities.
Total area (ha)	23
Soil Profile Morphology Summary	



Horizon Depth (m), Boundary (Bdy)	Field Texture	Grade of Pedality Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Notes
A11 00.0-0.18 Clear 20-50mm	Light clay	Weak Firm	Nil inclusions or segregations	10YR4/2 dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	0.10 / 8.0	Nil
A12 0.18-0.30 Abrupt 5-20mm	Light clay	Weak Firm	Nil inclusions or segregations	10YR4/3 brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	0.25 / 8.0	
B21 0.30-0.80 Clear 20-50mm	Silty clay loam	Weak Firm	Nil inclusions or segregations	10YR5/4 yellowish brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	0.60 / 8.5	
B21 0.80-1.00 EOBH	Clayey sand	Weak Weak	Nil inclusions or segregations	10YR5/4 yellowish brown Nil mottles or bleaching	Dry Well drained	Nil roots	0.90 / 8.5	

Table 4-13: Soil Chemistry Results for SPC 6, Representative Site 7

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.70-0.80	0.90-1.00
	A1 horizon	A2 horizon	A2 horizon	A2 horizon	B2 horizon
Soil pH (H20)	8.14	7.88	8.16	8.51	8.74
Soil pH (CaCl2 / 0.01M)	7.0	-[1]	-	-	-
Soil EC (dS/m)	0.084	4.092	4.843	2.980	1.464
Soil Cl (mg/kg)	94	3793	3222	2160	1211
Exch. Ca (meq/100g)	6.9	7.4	5.9	3.9	1.8

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.70-0.80	0.90-1.00
	A1 horizon	A2 horizon	A2 horizon	A2 horizon	B2 horizon
Exch. Mg (meq/100g)	4.36	5.65	4.90	3.47	2.20
Exch. K (meq/100g)	0.48	0.24	0.21	0.16	0.14
Exch. Na (meq/100g)	1.24	3.98	4.89	3.67	2.68
CEC (meq/100g)	13.0	17.3	15.9	11.2	6.8
Ca/Mg (ratio)	1.6	1.3	1.2	1.1	0.8
ESP (%Na/CEC)	10	23	31	33	39
Nitrate (mg/kg)	2.2	-	-	-	-
Ammonia (mg/kg)	0.2	-	-	-	-
Total Nitrogen (mg/kg)	0.03	-	-	-	-
Sulfate-S (mg/kg)	10.8	-	-	-	-
Total S (%)	<50	-	-	-	-
Zinc (mg/kg)	0.6	-	-	-	-
Mn (mg/kg)	8	-	-	-	-
Iron (mg/kg)	9	-	-	-	-
Copper (mg/kg)	1.3	-	-	-	-
Boron (mg/kg)	0.42	-	-	-	-
Silicon (mg/kg)	63	-	-	-	-
Tot Organic Carbon (%)	0.44	-	-	-	-
Organic Matter (%)	0.44	-	-	-	-
P (mg/kg)	17	-	-	-	-
Disp Ratio (R1)	0.52	0.34	0.43	0.63	0.54
EAT (No.)	2	1	1	1	1
Gravel >2mm (%)	0	0	0	0	0
CS >50µm (%)	42	23	17	30	57
CS >20µm (%)	51	33	29	42	66
2-50µm-Silt (%)	28	40	41	37	17
2-20µm-Silt (%)	20	29	29	25	8
Clay <2µm (%)	29	38	42	33	26
Texture	Clay Loam	Sandy Clay Loam	Silty Clay	Clay Loam	Clay Loam
PAWC Assessment					
Horizon Depth (m)	0.18	0.12	0.40	0.10	0.20

Analysis (Unit)	Sample Depth (mbgl)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.70-0.80	0.90-1.00
	A1 horizon	A2 horizon	A2 horizon	A2 horizon	B2 horizon
PAWC per horizon (mm)	14.40	7.20	40.00	8.00	16.00
PAWC Total	85.60				

1. '-' indicates laboratory analysis was not conducted for this sample.

4.7 Soil Profile Class 7: Deep, soft, moderately acidic, reddish brown sandy loam on red sandy clay loam subsoil

Overview

SPC 7 is a deep, soft, moderately acidic, reddish brown sandy loam on red sandy clay loam subsoil. The basic ASC is a red Kandosol and is associated with undulating plains and rises and is the dominant SPC to the south, south west of the soil study area. Vegetation includes tall woodlands of mixed vegetation including Corymbia Setosa (Bloodwoods) and Erythrophleum Chlorostachys (Ironwood).

SPC 7 has moderate limitations that make it suitable for mangoes and eggplant cropping, severe limitations for bananas and extreme limitations for peanut, rice and sorghum cropping. SPC 7 is suitable as limited cropping land and sown pastures.

Soil characteristics and chemistry

Laboratory data indicate the following attributes for this SPC:

- Gradational texture of sands to sandy clay loam;
- pH (laboratory analysis) is moderately acidic in topsoil varying from slightly acidic to moderately acidic in subsoils;
- Electrical conductivity is very low;
- Chloride is very low;
- CEC ranges are very low;
- ESP is non-sodic in topsoil and varies from being sodic to 0.50 mbgl to non-sodic 0.50 mbgl and below. Review of CEC results below to 3 cmol(+)=kg-1 indicates that ESP results may not be relied upon as an indicator of sodicity;
- Ca:Mg ratios are high in topsoil and decreases to low in subsoils at 1.40 mbgl;
- Nitrogen levels in topsoil is very low;
- Micronutrient levels indicate moderate levels of manganese and low levels for copper and zinc;
- EAT reports no dispersion or slaking;
- R1 dispersion is low in topsoil, increases slightly to moderate at 0.20 to 0.30 mbgl and then decreases with depth to low levels;
- The level of bicarbonate extractable phosphorus present is moderate in topsoil; and
- Organic carbon in topsoil is low.

Representative site

Site 18 was selected as a representative site of this SPC.

A site description and soil profile morphology summary are presented in Table 4-14. The soil chemistry results for this SPC are presented in Table 4-15.

Table 4-14: Land Summary SPC 7

Item	Description
Representative Site	18
Representative Site photograph	
Location GDA2020 ZONE 54	744760 7804883
Current Use	Native woodland
Site survey type	Detailed, 50 mm hand auger
Vegetation	Mixed vegetation including bloodwood and ironwood
Disturbance	No disturbance observed
Landform element /pattern	Undulating rises, mid slope
Microrelief	No microrelief observed
Drainage	Moderately well drained (Class 4)
Permeability (LRA, 2021)	Moderately Permeable (Class 3)
Erosion Observed	No erosion observed
Slope (%)	<5
Surface coarse fragments	No coarse fragments
Surface condition	Soft
SPC ASC Order/Suborder	Red Kandosol
Site ASC Order (s)	Haplic Mesotrophic Red Kandosol; moderately thick, non-gravelly, sandy, clay loamy, very deep (Confidence level 1) ASC Coded Classification (Isbell, 2021): 1KAAAAGCDBEKMX
Land System / Soils Concept (Perry et al., 1964)	Strathpark, Hampstead, Strathmore / Cockatoo
K-Factor (Rosewell, 1993)	0.030
Land suitability summary	Land Suitability, Regional Frameworks: Moderate (3) limitations for mangoes and eggplant. Severe (4) limitations for bananas. Extreme (5) limitations for soybean, mungbean and sorghum. Agricultural Suitability Class: B

Item	Description
Soil quality for mine rehabilitation	Topsoils between 0.00 m and 0.30 mbgl may be stripped and reused for topdressing in rehabilitation activities. Subsoils are not suitable for reuse in rehabilitation activities. Stripped topsoils to 0.30 mbgl may be reused in rehabilitation activities with no amelioration required. Subsoils to a depth up to 1.50 mbgl are suitable for stripping and reuse as subsoil in rehabilitation activities.
Total area (ha)	961
Soil Profile Morphology Summary	



Horizon Depth (m), Boundary (Bdy)	Field Texture	Grade of Pedality Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Notes
A11 0.00-0.20 Sharp <5mm	Loamy sand	Massive Loose	Nil inclusions or segregations	7.5YR3/4 dark reddish brown Nil mottles or bleaching	Moderately moist Rapidly drained	Medium 2-5mm Few	0.10 / 6.0	Road nearby
A12 0.20-0.41 Abrupt 5-20mm	Loamy sand	Massive Loose	Nil inclusions or segregations	2.5YR4/6 yellowish red Nil mottles or bleaching	Moderately moist Rapidly drained	Very fine <1mm Few	0.30 / 6.0	
B21 0.41-0.96 Gradual 50-100mm	Sandy loam	Massive Loose	Nil inclusions or segregations	2.5YR4/6 yellowish red Nil mottles or bleaching	Dry Rapidly drained	Very fine <1mm Few	0.60 / 6.0	
B22 0.96-1.50 EOBH	Sandy loam	Massive Loose	Nil inclusions or segregations	2.5YR4/8 red Nil mottles or bleaching	Dry Well drained	Nil roots	1.10 / 6.0	

Table 4-15: Soil Chemistry Results for SPC 7, Representative Site 18

Analysis (Unit)	Sample Depth (mbgl)					
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	1.10-1.20	1.40-1.50
	A11 horizon	A12 horizon	B21 horizon	B21 horizon	B21 horizon	B22 horizon
Soil pH (H20)	5.97	6.37	5.89	5.84	5.83	5.80
Soil pH (CaCl2 / 0.01M)	5.1	-[1]	-	-	-	-
Soil EC (dS/m)	0.024	0.009	0.004	0.003	0.002	0.002
Soil Cl (mg/kg)	25	29	27	23	22	10
Exch. Ca (meq/100g)	1.3	0.6	0.2	0.3	0.2	0.1
Exch. Mg (meq/100g)	0.23	0.26	0.20	0.26	0.49	0.69
Exch. K (meq/100g)	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Exch. Na (meq/100g)	<0.065	0.12	<0.065	<0.065	<0.065	<0.065
CEC (meq/100g)	1.6	1.0	0.5	0.6	0.8	0.9
Ca/Mg (ratio)	5.5	2.3	1.2	1.0	0.5	0.2
ESP (%Na/CEC)	0	11	3	2	1	1
Nitrate (mg/kg)	5.8	-	-	-	-	-
Ammonia (mg/kg)	2.0	-	-	-	-	-
Total Nitrogen (mg/kg)	0.02	-	-	-	-	-
Sulfate-S (mg/kg)	3.8	-	-	-	-	-
Total S (%)	<50	-	-	-	-	-
Zinc (mg/kg)	<0.5	-	-	-	-	-
Mn (mg/kg)	12	-	-	-	-	-
Iron (mg/kg)	36	-	-	-	-	-
Copper (mg/kg)	0.2	-	-	-	-	-
Boron (mg/kg)	<0.1	-	-	-	-	-
Silicon (mg/kg)	12	-	-	-	-	-
Tot Organic Carbon (%)	0.69	-	-	-	-	-
Organic Matter (%)	0.77	-	-	-	-	-
P (mg/kg)	12	-	-	-	-	-
Disp Ratio (R1)	0.26	0.68	0.36	0.37	0.19	0.14
EAT (No.)	8	8	8	8	8	8
Gravel >2mm (%)	0	0	0	0	0	0
CS >50µm (%)	91	87	83	81	79	75
CS >20µm (%)	90	89	87	82	80	77
2-50µm-Silt (%)	0	2	5	2	2	2
2-20µm-Silt (%)	1	1	1	1	1	1
Clay <2µm (%)	9	10	12	17	19	22

Analysis (Unit)	Sample Depth (mbgl)					
	0.00-0.10	**0.20-0.30**	**0.50-0.60**	**0.80-0.90**	**1.10-1.20**	**1.40-1.50**
	A11 horizon	**A12 horizon**	**B21 horizon**	**B21 horizon**	**B21 horizon**	**B22 horizon**
Texture	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Clay Loam	Sandy Clay Loam
PAWC Assessment						
Horizon Depth (m)	0.20	0.21	0.39	0.16	0.24	0.30
PAWC per horizon (mm)	10.00	10.50	19.50	8.00	14.40	18.00
PAWC Total	80.40					

1. '-' indicates laboratory analysis was not conducted for this sample.

4.8 Soil Profile Class 8: Shallow, hard setting, neutral, brown sandy loam with red sandy loam subsoil on metamorphic rock

Overview

SPC 8 is a shallow, hard setting, neutral, brown sandy loam with red sandy loam subsoil on metamorphic rock. The basic ASC is a red Tenosol and is associated with rolling low hills. Vegetation includes mid-dense to sparse tall woodlands of Narrow Leaved Ironbark and medium shrubbery.

SPC 8 has severe limitations for mangoes and bananas and extreme limitations for eggplant, peanut, rice and sorghum land uses that make it unsuitable for cropping activities. SPC 6 is suitable as grazing on native pastures.

Soil characteristics and chemistry

Laboratory data indicate the following attributes for this SPC, excluding subsoils for the very shallow phase:

- Uniform sandy loam textures;
- pH (laboratory analysis) is neutral;
- Electrical conductivity is low;
- Chloride is very low;
- CEC ranges are very low;
- ESP is non-sodic. CEC results are above to 3 cmol(+)=kg-1 and textures of sandy loam indicate that ESP results may be relied upon as an indicator of sodicity;
- Ca:Mg ratios are very high in topsoil decreasing to high in subsoils;
- EAT reports no dispersion or slaking;
- Nitrogen levels in topsoil is very low;
- Micronutrient levels indicate moderate levels of manganese, low levels for zinc and very low levels of copper;
- EAT reports is non dispersive;
- R1 dispersion is low;
- The level of bicarbonate extractable phosphorus present is very low in topsoil; and
- Organic carbon in topsoil is very high.

Representative site

Site 29 was selected as a representative site of this SPC.

A site description and soil profile morphology summary are presented in Table 4-16. The soil chemistry results for this SPC are presented in Table 4-17.

Table 4-16: Land Summary SPC 8

Item	Description
Representative Site	29
Representative Site photograph	
Location GDA2020 ZONE 54	741326 7810064
Current Use	Native woodland
Site survey type	Detailed, 50 mm hand auger
Vegetation	Tall, mid dense forest of ironbark
Disturbance	No effective disturbance
Landform element /pattern	Rolling low hills, simple slope
Microrelief	No microrelief observed
Drainage	Well drained (Class 5)
Permeability (LRA, 2021)	Highly permeable (Class 4)
Erosion Observed	No erosion observed
Slope (%)	15
Surface coarse fragments	20-50% coarse fragments 20-60mm
Surface condition	Hard setting
SPC ASC Order/Suborder	Red Tenosol
Site ASC Order (s)	Basic Lithic Red Tenosol; moderately thick, gravelly, sandy, loamy, shallow (Confidence level 2) ASC Coded Classification (Isbell, 2021): 2TEAAARBGKLU
Land System / Soils Concept (Perry et al., 1964)	Torwood / n/a
K-Factor (Rosewell, 1993)	0.030
Land suitability summary	Land Suitability, Regional Frameworks: Severe (4) limitations for mangoes and bananas. Extreme (5) limitations for eggplant, peanut, rice and sorghum. Agricultural Suitability Class: C2

Item	Description
Soil quality for mine rehabilitation	Topsoils between 0.00 and 0.35 mbgl may be reused in rehabilitation activities with no amelioration required. Subsoil is not available for reuse in rehabilitation activities.
Total area (ha)	80
Soil Profile Morphology Summary	



Horizon Depth (m), Boundary (Bdy)	Field Texture	Grade of Pedality Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Notes
A1 0.00-0.11 Abrupt 5-20mm	Loamy sand	Massive to weak Loose	10-20% coarse fragments 2-6mm	7.5YR5/6 yellowish red Nil mottles or bleaching	Dry Well drained	Fine 1-2mm Few	0.05 / 6.5	-
A2 0.11-0.37 EOBH Hard pan / Rock	Loamy sand	Massive to weak Loose	10-20% coarse fragments 2-6mm	5YR5/8 yellowish red Nil mottles or bleaching	Dry Well drained	Very fine <1mm Few	0.25 / 6.5	

Table 4-17: Soil Chemistry Results for SPC 8, Representative Site 29

Analysis (Unit)	Sample Depth (mbgl)	
	0.00-0.10	0.20-0.30
	A1 horizon	A2 horizon
Soil pH (H20)	6.76	6.67
Soil pH (CaCl2 / 0.01M)	5.6	-[1]
Soil EC (dS/m)	0.011	0.011
Soil Cl (mg/kg)	11	9
Exch. Ca (meq/100g)	2.7	3.5
Exch. Mg (meq/100g)	0.95	1.93
Exch. K (meq/100g)	0.25	0.19
Exch. Na (meq/100g)	<0.065	<0.065
CEC (meq/100g)	3.9	5.6

Analysis (Unit)	Sample Depth (mbgl)	
	0.00-0.10	0.20-0.30
	A1 horizon	A2 horizon
Ca/Mg (ratio)	2.9	1.8
ESP (%Na/CEC)	0	1
Nitrate (mg/kg)	0.6	-
Ammonia (mg/kg)	2.6	-
Total Nitrogen (mg/kg)	0.03	-
Sulfate-S (mg/kg)	3.1	-
Total S (%)	<50	-
Zinc (mg/kg)	<0.5	-
Mn (mg/kg)	11	-
Iron (mg/kg)	5	-
Copper (mg/kg)	<0.1	-
Boron (mg/kg)	<0.1	-
Silicon (mg/kg)	17	-
Tot Organic Carbon (%)	0.43	-
Organic Matter (%)	11 (Organic Carbon)	-
P (mg/kg)	4.5	-
Disp Ratio (R1)	0.39	0.46
EAT (No.)	8	8
Gravel >2mm (%)	0	0
CS >50µm (%)	81	72
CS >20µm (%)	86	79
2-50µm-Silt (%)	10	11
2-20µm-Silt (%)	5	4
Clay <2µm (%)	9	17
Texture	Sandy Loam	Sandy Loam
PAWC Assessment		
Horizon Depth (m)	0.11	0.26
PAWC per horizon (mm)	5.50	13.00
PAWC Total	18.50	

1. '-' indicates laboratory analysis was not conducted for this sample.

4.9 Soil Profile Class 9: Very shallow, hard setting, strongly acidic, yellowish-brown sandy clay loam on sedimentary rock

Overview

SPC 9 is a very shallow, hard setting, strongly acidic, yellowish-brown sandy clay loam on sedimentary rock. The basic ASC is a Leptic Rudusol and is associated with undulating rises. Vegetation includes very sparse tall woodlands of Lancewood on gravelly surface.

SPC 9 has severe limitations for mangoes and bananas and extreme limitations for eggplant, peanut, rice and sorghum land uses that make it unsuitable for cropping activities. It is only suitable for light grazing.

Soil characteristics and chemistry

Laboratory data indicate the following attributes for this SPC:

- Very shallow sandy clay loam on continuous gravel layers and bedrock;
- pH (laboratory analysis) is strongly acidic;
- Very low electrical conductivity;
- Chloride is very low;
- CEC ranges is very low;
- ESP is strongly sodic. Review of CEC results below 3 cmol(+)=kg-1 indicates that ESP results may not be relied upon as an indicator of sodicity.
- Ca:Mg ratios are low;
- Nitrogen levels in topsoil is very low;
- Micronutrient levels indicate moderate levels of manganese and low levels for copper and zinc;
- EAT reports no dispersion or slaking;
- R1 dispersion is low;
- The level of bicarobonate extractable phosphorus present is moderate; and
- Organic carbon in topsoil is low.

Representative site

Site 31 was selected as a representative site of this SPC.

A site description and soil profile morphology summary are presented in Table 4-18. The soil chemistry results for this SPC are presented in Table 4-19.

Table 4-18: Land Summary SPC 9

Item	Description
Representative Site	31
Representative Site photograph	
Location GDA2020 ZONE 54	747722 7809635
Current Use	Native woodland
Site survey type	Detailed, 50 mm hand auger
Vegetation	Very sparse woodland including lancewood
Disturbance	No disturbance observed
Landform element /pattern	Undulating Rise, simple slope
Microrelief	No microrelief observed
Drainage	Well drained (Class 5)
Permeability (LRA, 2021)	Moderately permeable (Class 3
Erosion Observed	Gully erosion
Slope (%)	15
Surface coarse fragments	>90% coarse fragments 20-60mm
Surface condition	Hard setting
SPC ASC Order/Suborder	Leptic Rudosol
Site ASC Order (s)	Acidic Lithic Leptic Rudosol; thin, slightly gravelly, clay loamy, very shallow (Confidence level 2) ASC Coded Classification (Isbell, 2021): 2RUCYCZAIAFMZT
Land System / Soils Concept (Perry et al., 1964)	Torwood / n/a
K-Factor (Rosewell, 1993)	0.025
Land suitability summary	Land Suitability, Regional Frameworks: Severe (4) limitations for mangoes and bananas. Extreme (5) limitations for eggplant, peanut, rice and sorghum. Agricultural Suitability Class: C3
Soil quality for mine rehabilitation	Topsoil stripping is not suitable for reuse in rehabilitation activities due to location, rockiness and dispersive limitations.
Total area (ha)	93

Item	Description
Soil Profile Morphology Summary	



Horizon Depth (m), Boundary	Field Texture	Grade of Pedality Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Notes
A1 0.00-0.10 Refusal on continuous gravel layer	Loam	Massive, loose	2-10% coarse fragments 2-6mm	10YR4/6 dark yellowish brown Nil mottles or bleaching	Dry Well drained	No	0.10 / 6.0	0.00-0.10

Table 4-19: Soil Chemistry Results for SPC 9, Representative Site 31

Analysis (Unit)	Sample Depth (mbgl)
	0.00-0.10
	A1 horizon
Soil pH (H20)	5.55
Soil pH (CaCl2 / 0.01M)	4.5
Soil EC (dS/m)	0.069
Soil Cl (mg/kg)	34
Exch. Ca (meq/100g)	0.1
Exch. Mg (meq/100g)	1.30
Exch. K (meq/100g)	<0.12
Exch. Na (meq/100g)	0.39
CEC (meq/100g)	2.5
Ca/Mg (ratio)	0.1
ESP (%Na/CEC)	16
Nitrate (mg/kg)	1.4
Ammonia (mg/kg)	4.2
Total Nitrogen (mg/kg)	<0.02

Analysis (Unit)	Sample Depth (mbgl)
	0.00-0.10
	A1 horizon
Sulfate-S (mg/kg)	2.6
Total S (%)	<50
Zinc (mg/kg)	<0.5
Mn (mg/kg)	6
Iron (mg/kg)	28
Copper (mg/kg)	0.2
Boron (mg/kg)	<0.1
Silicon (mg/kg)	14
Tot Organic Carbon (%)	0.39
Organic Matter (%)	0.39
P (mg/kg)	13
Disp Ratio (R1)	0.53
EAT (No.)	8
Gravel >2mm (%)	0
CS >50µm (%)	62
CS >20µm (%)	69
2-50µm-Silt (%)	15
2-20µm-Silt (%)	9
Clay <2µm (%)	22
Texture	Sandy Clay Loam
Horizon Depth (m)	0.10
PAWC per horizon (mm)	6.00
PAWC Total	6.00

5 LAND SUITABILITY ASSESSMENT

5.1 Introduction

A land suitability assessment has been undertaken to classify the soil types and mapping units (described in Section 4) according to their suitability for relevant land uses. The land suitability assessment has been undertaken in accordance with GALE (DSITI & DNRM, 2015), Regional Frameworks (DSITI and DNRM, 2013) with reference to Queensland Soil and Land Resource Survey Information Guideline (Department of Resources, 2021) and Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment (Department of Environment and Science, 2021).

GALE (DSITI and DNRM, 2015) and the Regional Frameworks (DSITI and DNRM, 2013) give specific information for appropriate land uses and their associated limitations. The Regional Frameworks were reviewed in conjunction with GALE (DSITI and DNRM, 2015) to assist with assessing land suitability in the study area.

In general, the tasks undertaken with reference to GALE (DSITI and DNRM, 2015) and the Regional Frameworks (DSITI and DNRM, 2013) included:

- Identification of potentially relevant agricultural land uses. A land use is a combination of crop type/species and crop management system.
- Description of the land use requirements/limitations for the agricultural land uses.
- Identification of soil and land attributes that describe the limitations.
- Determining the limitation categories for each attribute.
- Assigning each limitation category to a land suitability subclass.
- Assigning an overall land suitability class to each SPC for each agricultural land use.

GALE defines five Land Suitability Classes for use in Queensland (Table 5-1) in which the land suitability for agriculture (i.e. cropping or grazing) decreases progressively from Land Suitability Class 1 to Class 5, based on the severity of the land use limitations.

Table 5-1: Land Suitability Classes

Land Suitability Class	Suitability	Limitations	Definition
1	Suitable	Negligible	Highly productive land requiring only simple management practices to maintain economic production.
2	Suitable	Minor	Land with limitations that either constrain production or require more than the simple management practices of class 1 land to maintain economic production.
3	Suitable	Moderate	Land with limitations that either further constrain production or require more than those management practices of class 2 land to maintain economic production.

Land Suitability Class	Suitability	Limitations	Definition
4	Unsuitable	Severe	Currently unsuitable land. The limitations are so severe that the sustainable use of the land in the proposed manner is precluded. In some circumstances, the limitations may be surmountable with changes to knowledge, economics or technology.
5	Unsuitable	Extreme	Land with extreme limitations that preclude any possibility of successful sustained use of the land in the proposed manner.

Land rated in Land Suitability Classes 1 to 3 is considered suitable for agricultural land use with negligible to moderate limitations. The long-term benefits obtained from using Land Suitability Classes 1 to 3 land for agriculture typically outweigh the inputs required to initiate and maintain agricultural production. It should be noted that with the use of soil improvement techniques (e.g. fertiliser), Class 3 land may be just as productive as Class 1 or 2 land.

Land rated as Land Suitability Class 4 is currently unsuitable for agricultural land use due to the severity of one or more limitations. However, in some circumstances it may be possible to upgrade Class 4 land to a more suitable class with the implementation of considerable soil improvement measures.

Land rated as Land Suitability Class 5 is considered entirely unsuitable for the specified land use as the limitation(s) are so severe that the inputs required to initiate and maintain the specified land use are not sustainable.

5.2 Agricultural Land Uses, Requirements and Limitations

The Regional Frameworks (DSITI and DNRM, 2013) provides the attributes, limitations and suitability subclass values for land suitability limitations assessment.

In reviewing the Regional Frameworks (DSITI and DNRM, 2013) suitability subclasses and attributes, the following assessments were undertaken:

- an assessment based on the cropping examples outlined in the suitability framework for the Gulf Plains area for cropping based on six subclasses (crops selected from the Regional Frameworks). The crops selected included mangoes, bananas, eggplant, peanuts, rice, and sorghum.
- These crops were identified from review of the Perry et al (1964), Wilson et al (1999) and Regional Frameworks (DSITI and DNRM, 2013) which reported that these crops are grown or may be grown in this part of the Gulf region. Different irrigation strategies for the same crop (e.g. spray, rainfed and furrow irrigation) have been assessed as one assessment per crop, in the favourable class (Lower class number). It states in GALE (DSITI & DNRM, 2015) that different irrigation strategies do not increase the number of crops.

These agricultural land uses were adopted for the land suitability assessment.

5.3 Land and Soil Attributes

The land suitability assessment for cropping is based on the following soil and land attributes:

- climate, precipitation (Cp);
- climate, heat stress (Cs);
- climate, frost (Cf);
- climate, temperature variation (Ct);
- wind erosion (A);
- moisture availability, irrigated crops (M);
- moisture availability, rainfed crops (M);
- nutrient balance, pH (Nr);
- physical restrictions (P);
- soil depth (Pd);
- water erosion (E);
- wetness (W);
- rockiness, all crops (R); and
- gilgai microrelief, all crops (Tm); and
- irrigation efficiency, all furrow irrigated crops (If).

5.4 SPC Assessment, Limitation Categories and Land Suitability Classification

Field and laboratory attributes collected from each of the SPC representative sites were reviewed against the Regional Frameworks (DSITI and DNRM, 2013) limitation (such as climate, precipitation) for each selected land use (i.e. Mangoes).

Table 5-2 presents the summary of Regional Frameworks (DSITI and DNRM, 2013) Land Suitability Classes for representative site SPCs. Table 5-3 presents the individual UMAs (SPC mapped areas where soil attributes such as rockiness or slope vary slightly) and the assessment of that specific limitation.

Sections 5.4.1 to 5.4.16 provide a detailed description of the SPC and individual limitations in the soil study area with their corresponding land suitability class results. Section 5.4.15 provides a summary of the limitations for each SPC. All limitations for each SPC were assessed with the most severe (highest suitability subclass) selected to represent that land use. The land suitability classes for cropping are presented in Figure 4.

Table 5-2: SPC, Land Uses and Regional Frameworks Suitability Subclass Assessment Summary

SPC	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
1	**3**	**4**	**3**	**5**	**5**	**5**
2	**3**	**4**	**3**	**5**	**5**	**5**
3	**5**	**5**	**5**	**5**	**5**	**5**
4	**3**	**4**	**3**	**5**	**5**	**5**
5	**4**	**4**	**4**	**5**	**5**	**5**
6	**4**	**4**	**4**	**5**	**5**	**5**
7	**3**	**4**	**3**	**5**	**5**	**5**
8	**4**	**4**	**5**	**5**	**5**	**5**
9	**4**	**4**	**5**	**5**	**5**	**5**

Individual UMAs of each SPC were assessed for land suitability classes against the rule set selected and representative SPC assessment in Table 5-2.

This review of detailed and check observation site field data included surface and profile attributes, slope, rockiness, and depth of soil profile. Table 5-3 includes UMAs where land suitability classes were amended. These amendments have been presented in Figure 5.

Table 5-3: Land Suitability Classes, Limitation and Regional Frameworks Assessment UMAs distinct from SPCs

SPC	UMA	Land Use Limitations and Assessment					
		Mangoes	Bananas	Eggplant	Peanut	Rice	Sorghum
1	-	No Limitations Amendments to UMAs					
2	-	No Limitations Amendments to UMAs					
3	-	No Limitations Amendments to UMAs					
4	-	No Limitations Amendments to UMAs					
5	-	No Limitations Amendments to UMAs					
6	-	No Limitations Amendments to UMAs					
7	-	No Limitations Amendments to UMAs					
8	19	**4**	**4**	**4 (Limitation updated based on slope of observation**	**5**	**5**	**5**

SPC	UMA	Land Use Limitations and Assessment					
		Mangoes	Bananas	Eggplant	Peanut	Rice	Sorghum
				site C81 and water erosion assessment.)			
9	-	No Limitations Amendments to UMAs					

5.4.1 Climate, precipitation (Cp) limitation

The precipitation limitation refers to the amount of rainfall during the growing season and is relevant for irrigated cropping.

A review of the annual rainfall for Richmond Post Office between 1889 and 2020 (Bureau of Meteorology, 2020), indicates that the soil study area a mean annual rainfall less than 500 mm (Level Cr5).

An assessment of the SPCs for this limitation is presented in Table 5-4. This indicates that climate is a severe limitation for sorghum land use in the soil study area. Remaining selected sub class were not assessed as per Regional Frameworks (DSITI and DNRM, 2013).

Table 5-4: Climate Land Suitability Subclass Level

SPC	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
All SPCs	Cr5	-	-	-	-	-	4[1]

1. The limited nominated land uses including African mahogany, Spotted Gum, Maize and Soybean reported suitability subclass 5.

5.4.2 Climate, heat stress (Cs) limitation

The heat stress limitation refers to the solar radiation associated with high temperatures likely to cause damage to leaves and fruit of crops.

An assessment of the SPCs for this limitation is presented in Table 5-5 and is based on maximum daily temperatures for 2019 (Bureau of Meteorology, 2020) for the soil study area.

Results indicate severe limitations for land uses including banana land use, moderate limitations for mangoes and minor limitations across the remaining four land uses.

Table 5-5: Climate, Heat Stress Land Suitability Subclass Level

SPC	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
All SPCs	Cs3	3	4	2	2	2	2

5.4.3 Climate, frost (Cf) limitation

The frost limitation refers to if it likely that frost would need to be considered in site selection and if a management regime is needed for certain frost sensitive crops i.e. less than 4 degrees Celsius.

An assessment of the SPCs for this limitation is presented in Table 5-6 and is based on minimum daily temperatures for 2019 (Bureau of Meteorology, 2020) for the soil study area.

Results indicate that frost is a moderate limitation for land uses including mangoes, bananas, and eggplant. Remaining selected land uses peanut, rice and sorghum indicated minor limitations.

Table 5-6: Climate, Frost Land Suitability Class Level

SPC	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
All SPCs	Cf3	3	3	3	2	2	2

5.4.4 Climate, temperature variation (Ct) limitation

The temperature variation limitation refers to certain crops requiring cooler temperatures for efficient seed setting.

An assessment of the SPCs for this limitation is presented in Table 5-7. Mean monthly temperatures of Hughenden, located to the southeast of the soil study area was assessed (BOM, 2021).

Results indicate that temperature variation is a minor limitation for mangoes, bananas and eggplant. Remaining selected land uses of peanuts, rice and sorghum indicated negligible limitations.

Table 5-7: Climate, Temperature Variation Land Suitability Class Level

SPC	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
All SPCs	Ct1	2	2	2	1	1	1

5.4.5 Wind erosion (A) limitation

Wind erosion refers to the vulnerability of sandy surfaced soils in arid areas to wind erosion.

An assessment of the SPCs for this limitation is presented in Table 5-8.

Results indicate that wind erosion is a severe limitation for SPC 5 for land use sorghum. All remaining SPCs presented negligible to moderate limitations, suitable for selected land uses.

Table 5-8: Wind Erosion Land Suitability Class Level

Land Attribute Level		Land suitability class for selected land uses					
SPC	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
1	A1	1	1	1	1	1	1
2	A2	2	2	2	3	3	3
3	A2	2	2	2	3	3	3
4	A2	2	2	2	3	3	3
5	A2	2	2	2	3	3	4
6	A1	1	1	1	1	1	1
7	A2	2	2	2	3	3	3
8	A2	2	2	2	3	3	3
9	A2	2	2	2	3	3	3

5.4.6 Moisture Supply (M) Irrigated (Ir) and Rainfed (Rf) Crops limitation

Soil moisture supply (also referred to as 'storage') is determined by assessing plant available water capacity (PAWC) to the effective rooting depth (ERD).

For each SPC in the soil study area, the ERD is the depth of shallow impermeable layers in the soil profile or the depth of horizons with high salt concentrations. Where no impermeable or saline layers are present, an ERD of 1.0 m has been adopted in accordance with the Biggs and Philip (1995) method.

PAWC was calculated for each SPC using the methodology for assessing soil water storage in the *Regional Planning Interests Act 08/14: Guideline How to demonstrate that land in the strategic cropping area does not meet the criteria for strategic cropping land* (DSDMIP, 2019), field and chemical data for each SPC. The assigned PAWC values are presented in Table 5-9 and calculated based on laboratory texture, sample depth and horizon depths.

Table 5-9: Assigned PAWC for SPCs

SPC	PAWC (mm/100mm)
1	53.90
2	48.50
3	8.50
4	45.00
5	22.90
6	16.00
7	80.40
8	18.50
9	6.00

Each SPC has been assigned to one of the land attribute levels, based on the PAWC shown in Table 5-9. The SPC land attribute levels for irrigated crops and rainfed crops are presented in Tables 5-10 and 5-11.

Results indicates that in general, moisture supply for their applicable soils PAWC value is a negligible to moderate limitation for SPCs 1, 2, 4,and 7.

Moisture supply for SPCs assessed as having severe limitations including shallow soil profiles for SPCs 3, 5 8 and 9. and high chloride levels for SPC 6 at 0.20 mbgl.

Rainfed irrigation applied specifically to land uses soybean, mungbean and sorghum. All SPCs indicated extreme limitations, as presented in Table 5-12.

Table 5-10: Moisture Availability, Irrigated Crop Land Suitability Class Level

SPC	PAWC	Suitability subclass for Cane	Suitability subclass for Cucurbits	Suitability subclass for Tomatoes	Suitability subclass for Soybean	Suitability subclass for Mungbean	Suitability subclass for Sorghum
1	53.90	3	3	3	3	3	3
2	48.50	3	3	3	3	3	3
3	8.50	4	4	4	4	4	4
4	45.00	3	3	3	3	3	3
5	22.90	4	4	4	4	4	4
6	16.00	4	4	4	4	4	4
7	80.40	2	2	1	1	2	2
8	18.50	4	4	4	4	4	4
9	6.00	4	4	4	4	4	4

1. SPC soil profile is assessed as sand texture (Laboratory PSA Review) throughout the top 1.00m, therefore reported the lowest PAWC value of a full 1.00m soil profile. The lowest class level of less than 40 PAWC has been selected to reflect the minimal PAWC the soil profile is able to be store.

Table 5-11: Moisture Availability, Rainfed Land Suitability Class Level

SPC	PAWC / Value/s	Suitability subclass for Soybean	Suitability subclass for Mungbean	Suitability subclass for Sorghum
1	53.90	5	5	5
2	48.50	5	5	5
3	8.50	5	5	5
4	45.00	5	5	5
5	22.90	5	5	5
6	16.00	5	5	5
7	80.40	5	5	5
8	18.50	5	5	5
9	6.00	5	5	5

5.4.7 Nutrition Balance, pH (Nr) limitation

The soil pH affects the availability of nutrients for plant use and growth. Table 5-12 lists the soil pH nutrition land attribute level of each SPC.

An assessment of the SPCs for this limitation is presented in Table 5-12.

Results indicate that SPC 3 reporting minor limitations across all land uses and all remaining SPCs indicated negligible limitations.

Table 5-12: Soil Nutrition Land Suitability Class Level

Land Attribute Level		Land suitability class for selected land uses					
SPCs	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
1	Nr1	1	1	1	1	1	1
2	Nr2	1	1	1	1	1	1
3	Nr3	2	2	2	2	2	2
4	Nr1	1	1	1	1	1	1
5	Nr1	1	1	1	1	1	1
6	Nr2	1	1	1	1	1	1
7	Nr1	1	1	1	1	1	1
8	Nr1	1	1	1	1	1	1
9	Nr1	1	1	1	1	1	1

1- pH H2O laboratory results referenced. The surface to 0.30 mbgl results assessed.

5.4.8 Soil Physical Restrictions (P) limitation

The soil physical condition relates to the physical condition of soils which affects cropping activities such as the timing of cultivation and the harvesting of root crops. Conditions such as hard setting surfaces, large aggregates and sodicity can create adverse conditions that affect seed germination and seedling development.

An assessment of the SPCs based on this limitation are presented in Table 5-13.

Results indicate that soil physical condition was similar across most SPCs with respect to surface condition, soil texture and structure. SPCs 6 and 9 indicated severe and extreme limitations for peanuts and sorghum. All remaining land uses for all SPCs presented negligible to moderate limitations.

Table 5-13: Soil Physical Restrictions Land Suitability Class Level

Land Attribute Level		Land suitability class for selected land uses					
SPC	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
1	Ps2	2	2	1	1	1	1
2	Ps2	2	2	1	1	1	1

Land Attribute Level		Land suitability class for selected land uses					
SPC	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
3	Ps2	2	2	1	1	1	1
4	Ps2	2	2	1	1	1	1
5	Ps2	2	2	1	1	1	1
6	Ps6	3	3	3	4	3	4
7	Ps2	2	2	1	1	1	1
8	Ps2	2	2	1	1	1	1
9	Ps7	3	3	3	5	3	4

5.4.9 Soil Depth (Pd) limitation

The soil depth relates to the depth limitation relating to physical support for the plant. Land uses may require a deeper soil profile.

An assessment of the SPCs based on this limitation is presented in Table 5-14.

Results indicate that limitations were negligible to moderate for selected land uses for SPCs 1, 2, 4, 6, and 7. Severe to extreme limitations due to soil depth were observed for SPCs 3, 5, 8 and 9.

Table 5-14: Soil Depth Land Suitability Class Level

Land Attribute Level		Land suitability class for selected land uses					
SPCs	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
1	Pd2	1	1	1	1	1	1
2	Pd2	1	1	1	1	1	1
3	Pd5	5	5	4	5	5	5
4	Pd2	1	1	1	1	1	1
5	Pd4	4	4	2	4	4	4
6	Pd2	1	1	1	1	1	1
7	Pd1	1	1	1	1	1	1
8	Pd4	4	4	2	4	4	4
9	Pd5	5	5	4	5	5	5

5.4.10 Water Erosion (E) limitation

Water erosion relates to the loss of soil during the water flow over the surface. Stable soils are preferred for cropping. The assessment of water erosion is based on the k-factor and slope gradient percentage of the landscape.

An assessment of the SPCs based on this limitation is presented in Table 5-15.

Results indicate that water erosion is a negligible to moderate limitation for most land uses for SPCs 1, 2, 4 and 6.

SPCs 5, 7, 8 and 9 reported minor to extreme limitations for the selected land uses. SPC 3 was assessed as having extreme limitations for all selected land uses.

Table 5-15: Water Erosion Land Suitability ClassLevel

Land Attribute Level		Land suitability class for selected land uses					
SPCs	Level	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
1	E13	1	1	2	2	3	3
2	E12	1	1	2	2	2	3
3	E20	5	5	5	5	5	5
4	E12	1	1	2	2	2	3
5	E15	2	2	3	4	4	4
6	E12	1	1	2	2	2	3
7	E15	2	2	3	4	4	4
8	E18	3	4	5	5	5	5
9	E18	3	4	5	5	5	5

5.4.11 Wetness (W) limitation

Wetness relates to the adequate aeration of soil required for plant growth.

An assessment of the SPCs based on this limitation is presented in Table 5-16.

Results indicate that wetness is a negligible to moderate limitation for all SPCs except for SPCs 3 and 8, assessed as negligible limitations for all land uses.

Table 5-16: Wetness Land Suitability Subclass Level

Land Attribute Level		Land suitability class for selected land uses					
SPCs	Level[1]	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
1	W7	3	3	2	3	2	2

Land Attribute Level		Land suitability class for selected land uses					
SPCs	Level[1]	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
2	W6	2	2	2	2	2	2
3	W2	1	1	1	1	1	1
4	W7	3	3	2	3	2	2
5	W7	3	3	2	3	2	2
6	W7	3	3	2	3	2	2
7	W7	3	3	2	3	2	2
8	W2	1	1	1	1	1	1
9	W3	1	1	2	2	2	2

1- The surface to 0.60 mbgl results assessed for plant growth.

5.4.12 Rockiness, all crops (R) limitation

Rockiness refers to the coarse fragments and rock size and percent coverage in the plough zone which would interfere with agricultural machinery located on the surface.

An assessment of the SPCs based on the limitation is presented in Table 5-17.

Results indicate SPCs 3, 8 and 9 presented severe limitations for all selected land uses. All remaining SPCs presented negligible limitations.

Table 5-17: Rockiness Land Suitability Subclass Level

Land Attribute Level		Land suitability class for selected land uses					
SPC	Level	Suitability subclass for Cane	Suitability subclass for Cucurbits	Suitability subclass for Tomatoes	Suitability subclass for Soybean	Suitability subclass for Mungbean	Suitability subclass for Sorghum
1	R1	1					
2	R1	1					
3	R2	4					
4	R1	1					
5	R1	1					
6	R1	1					
7	R1	1					
8	R1	4					
9	R2	4					

5.4.13 Gilgai microrelief, all crops (Tm) limitation

Microrelief can cause uneven and reduced plant productivity due to uneven water distribution, water ponding, and it can also inhibit machine operations.

An assessment of the SPCs based on the limitation is presented in Table 5-18.

Results indicate that microrelief is not present on the soil study site and is a negligible limitation for all SPCs.

Table 5-18: Microrelief Land Suitability Subclass Level

Land Attribute Level		Land suitability class for selected land uses					
SPC	Level	Suitability subclass for Cane	Suitability subclass for Cucurbits	Suitability subclass for Tomatoes	Suitability subclass for Soybean	Suitability subclass for Mungbean	Suitability subclass for Sorghum
1	Tm1	1					
2	Tm1	1					
3	Tm1	1					
4	Tm1	1					
5	Tm1	1					
6	Tm1	1					
7	Tm1	1					
8	Tm1	1					
9	Tm1	1					

5.4.14 Irrigation Efficiency, all furrow irrigated crops (If) limitation

Irrigation efficiency refers to the applied water matching the soil infiltration characteristics to minimise water loss, deep drainage, and waterlogging issues. As outlined in Section 5.2, different irrigation strategies for the same crop (e.g. spray, rainfed and furrow irrigation) have been assessed against the most favourable irrigation method (spray and rainfed) assessment per crop. Therefore, a specific assessment for furrow irrigated methods has been excluded for this assessment.

5.4.15 Regional Frameworks SPC Limitations Summary

The suitability assessments of each limitation in sections 5.4.1 to 5.4.14 are now summarised for each SPC. The overall class for each land use is based on the most extreme (i.e. highest limitation). They have been summarised in Tables 5-19 to 5-27 and presented in Figure 4.

Table 5-19: Summary of Land Suitability Classes, SPC 1

Land Attribute	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
Cp	-	-	-	-	-	4
Cs	3	4	2	2	2	2
Cf	3	3	3	2	2	2
Ct	2	2	2	1	1	1
A	1	1	1	1	1	1
m(Ir)	3	3	3	3	3	3
m(Rf)	-	-	-	5	5	5
Nr	1	1	1	1	1	1
P	2	2	1	1	1	1
Pd	1	1	1	1	1	1
E	1	1	2	2	3	3
W	3	3	2	3	2	2
R	1	1	1	1	1	1
Tm	1	1	1	1	1	1
Overall Class	**3**	**4**	**3**	**5**	**5**	**5**

Table 5-20: Summary of Land Suitability Classes, SPC 2

Land Attribute	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
Cp	-	-	-	-	-	4
Cs	3	4	2	2	2	2
Cf	3	3	3	2	2	2
Ct	2	2	2	1	1	1
A	2	2	2	3	3	3
m(Ir)	3	3	3	3	3	3
m(Rf)	-	-	-	5	5	5
Nr	1	1	1	1	1	1
P	2	2	1	1	1	1
Pd	1	1	1	1	1	1
E	1	1	2	2	2	3
W	2	2	2	2	2	2
R	1	1	1	1	1	1
Tm	1	1	1	1	1	1
Overall Class	**3**	**4**	**3**	**5**	**5**	**5**

Table 5-21: Summary of Land Suitability Classes, SPC 3

Land Attribute	Suitability subclass for Cane	Suitability subclass for Cucurbits	Suitability subclass for Tomatoes	Suitability subclass for Soybean	Suitability subclass for Mungbean	Suitability subclass for Sorghum
Cp	-	-	-	-	-	4
Cs	3	4	2	2	2	2
Cf	3	3	3	2	2	2
Ct	2	2	2	1	1	1
A	2	2	2	3	3	3
m(Ir)	4	4	4	4	4	4
m(Rf)	-	-	-	5	5	5
Nr	2	2	2	2	2	2
P	2	2	1	1	1	1
Pd	5	5	4	5	5	5
E	5	5	5	5	5	5
W	1	1	1	1	1	1
R	4	4	4	4	4	4
Tm	1	1	1	1	1	1
Overall Class	**5**	**5**	**5**	**5**	**5**	**5**

Table 5-22: Summary of Land Suitability Classes, SPC 4

Land Attribute	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
Cp	-	-	-	-	-	4
Cs	3	4	2	2	2	2
Cf	3	3	3	2	2	2
Ct	2	2	2	1	1	1
A	2	2	2	3	3	3
m(Ir)	3	3	3	3	3	3
m(Rf)	-	-	-	5	5	5
Nr	1	1	1	1	1	1
P	2	2	1	1	1	1
Pd	1	1	1	1	1	1
E	1	1	2	2	2	3
W	3	3	2	3	2	2
R	1	1	1	1	1	1
Tm	1	1	1	1	1	1
Overall Class	**3**	**4**	**3**	**5**	**5**	**5**

Table 5-23: Summary of Land Suitability Classes, SPC 5

Land Attribute	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
Cp	-	-	-	-	-	4
Cs	3	4	2	2	2	2
Cf	3	3	3	2	2	2
Ct	2	2	2	1	1	1
A	2	2	2	3	3	4
m(Ir)	4	4	4	4	4	4
m(Rf)	-	-	-	5	5	5
Nr	1	1	1	1	1	1
P	2	2	1	1	1	1
Pd	4	4	2	4	4	4
E	2	2	3	4	4	4
W	3	3	2	3	2	2
R	1	1	1	1	1	1
Tm	1	1	1	1	1	1
Overall Class	**4**	**4**	**4**	**5**	**5**	**5**

Table 5-24: Summary of Land Suitability Classes, SPC 6

Land Attribute	Suitability subclass for Cane	Suitability subclass for Cucurbits	Suitability subclass for Tomatoes	Suitability subclass for Soybean	Suitability subclass for Mungbean	Suitability subclass for Sorghum
Cp	-	-	-	-	-	4
Cs	3	4	2	2	2	2
Cf	3	3	3	2	2	2
Ct	2	2	2	1	1	1
A	1	1	1	1	1	1
m(Ir)	4	4	4	4	4	4
m(Rf)	-	-	-	5	5	5
Nr	1	1	1	1	1	1
P	3	3	3	4	3	4
Pd	1	1	1	1	1	1
E	1	1	2	2	2	3
W	3	3	2	3	2	2
R	1	1	1	1	1	1
Tm	1	1	1	1	1	1
Overall Class	**4**	**4**	**4**	**5**	**5**	**5**

Table 5-25: Summary of Land Suitability Classes, SPC 7

Land Attribute	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
Cp	-	-	-	-	-	4
Cs	3	4	2	2	2	2
Cf	3	3	3	2	2	2
Ct	2	2	2	1	1	1
A	2	2	2	3	3	3
m(Ir)	2	2	1	1	2	2
m(Rf)	-	-	-	5	5	5
Nr	1	1	1	1	1	1
P	2	2	1	1	1	1
Pd	1	1	1	1	1	1
E	2	2	3	4	4	4
W	3	3	2	3	2	2
R	1	1	1	1	1	1
Tm	1	1	1	1	1	1
Overall Class	**3**	**4**	**3**	**5**	**5**	**5**

Table 5-26: Summary of Land Suitability Classes, SPC 8

Land Attribute	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
Cp	-	-	-	-	-	4
Cs	3	4	2	2	2	2
Cf	3	3	3	2	2	2
Ct	2	2	2	1	1	1
A	2	2	2	3	3	3
m(Ir)	4	4	4	4	4	4
m(Rf)	-	-	-	5	5	5
Nr	1	1	1	1	1	1
P	2	2	1	1	1	1
Pd	4	4	2	4	4	4
E	3	4	5	5	5	5
W	1	1	1	1	1	1
R	4	4	4	4	4	4
Tm	1	1	1	1	1	1
Overall Class	**4**	**4**	**5**	**5**	**5**	**5**

Table 5-27: Summary of Land Suitability Classes, SPC 9

Land Attribute	Suitability subclass for Mangoes	Suitability subclass for Bananas	Suitability subclass for Eggplant	Suitability subclass for Peanut	Suitability subclass for Rice	Suitability subclass for Sorghum
Cp	-	-	-	-	-	4
Cs	3	4	2	2	2	2
Cf	3	3	3	2	2	2
Ct	2	2	2	1	1	1
A	2	2	2	3	3	3
m(Ir)	4	4	4	4	4	4
m(Rf)	-	-	-	5	5	5
Nr	1	1	1	1	1	1
P	3	3	3	5	3	4
Pd	5	5	4	5	5	5
E	3	4	5	5	5	5
W	1	1	2	2	2	2
R	4	4	4	4	4	4
Tm	1	1	1	1	1	1
Overall Class	**5**	**5**	**5**	**5**	**5**	**5**

5.4.16 Agricultural Land Classes

Agricultural land classes (ALCs) are based on a simple hierarchical scheme that is applicable across Queensland. It allows the interpreted land evaluation data to indicate the location and extent of agricultural land that can be used for a wide range of land uses with minimal land degradation.

This evaluation scheme has evolved through various guidelines and state planning policies and is currently referenced in the GALE (DSITI & DNRM, 2015).

Table 5-28 outlines the ALC ranging from crop land (A), to limited crop land (class B), Pasture land (Class C) to non-agricultural land (Class D). The overall suitability classes for each SPC (Section 5.4.15) are assessed against the number of land uses and their suitability class.

Table 5-28: Agricultural Land Classes

Agricultural Land Class	Land Suitability (Cropping)[1]	Description	Number of Crops	Land Use Suitability Class
Crop Land	A	Land that is suitable for a wide range[2] of current and potential crops with nil to moderate limitations to production.	>=4	1-3
	A1	Suitable for a wide range of current and potential broadacre and horticultural[3] crops.	>=4	1-3
	A2	Suitable for a wide range of current and potential horticultural crops only.	>=4	1-3
Limited Crop Land	**B**	Land that is suitable for a narrow range[4] of crops. The land is suitable for sown pastures and may be suitable for a wider range of crops with changes to knowledge, economics or technology.	<=3	1-3
Pasture Land	**C**	Land that is suitable only for improved or native pastures due to limitations that preclude continuous cultivation for crop production. Some areas may tolerate a short period of ground disturbance for pasture establishment.	n/a	4/5
	C1	Suitable for grazing sown pastures requiring ground disturbance for establishment; or native pastures on higher fertility soils.	n/a	4/5
	C2	Suitable for grazing native pastures, with or without the introduction of pasture species, and with lower fertility soils than C1.	n/a	4/5
	C3	Suitable for light grazing of native pastures in accessible areas and includes steep land more suited to forestry or catchment protection.	n/a	5
Non-Agricultural Land[5]	**D**	Land not suitable for agricultural use, including land alienated from agricultural use.	n/a	5
Complex Classes	**A/C** **A/D** **B/C** **C/D**	Land that is a complex of class A, B, C or D land where it is not possible to delineate the land class at the map scale. The dominant class is the first code in the sequence and is assumed to be >50% of the area, but <70%[6].	n/a	-

1. Land Suitability Classes are a guide to assess ALC. Section 5.1 of this report and Table 11 of GALE provide a description of Land Suitability Classes and their correlation to ALC,
2. A wide range of crops is four or more crop types of local commercial significance.
3. Horticulture includes intensively grown small crops (e.g. vegetables) as well as tree crops (e.g. grown for nuts, seeds or fruit). Silviculture (plantation forestry) is not included.
4. A narrow range of crops is three or fewer crop types (broadacre or horticulture) of local commercial significance. Silviculture (plantation forestry) may be included. Crops with similar agronomic requirements e.g. maize and grain sorghum, peaches and nectarines are not generally regarded as different crop types. Different management regimes (including irrigation strategies) for the same crop do not increase the number of crops.
5. Non-agricultural land includes land that cannot be placed in any of the other land classes and includes land such as urban areas and stream channels.
6. In cases where two or more land classes are equally dominant and none are greater than 50%, judgement is used to identify the most appropriate agricultural land class/es for the unit.

The outcome of the agricultural land assessment using the ALC evaluation scheme is shown in Table 5-29 of each SPC. The ALCs within the soil study area are shown in Figure 5.

Table 5-29: Agricultural Land Assessment

Agricultural Land Assessment		
Agricultural Land Class	**SPC**	**Area (ha)**
A1	-	-
A2	-	-
B	1, 2, 4, 7	1,672
C1	-	-
C2	5, 6, 8	311
C3	3, 9	282
D	-	-

SPCs 1, 2, 4, and 7 is land that is suitable for a narrow range of crops or pastures.

SPCs 5, 6 and 8 is land that is suitable for grazing of native pastures, with or without the introduction of pasture species.

SPCs 3 and 9 is land that is suitable for light grazing of native pastures in accessible areas.

6 SOIL RESOURCES ASSESSMENT

All SPCs in the soil study area have been assessed to determine their suitability for stripping and reuse for rehabilitation activities.

An assessment of soil resources has been undertaken based on GTE's experience in soil reuse for mine rehabilitation and with reference to the Elliot and Veness (1981) selection process, the suitability criteria for the use of soils as growth media (DME, 1995) and Mine Rehabilitation, Leading Practice Sustainable Development Program for the Mining Industry (Australian Government, 2016). This assessment considered relevant soil observations and laboratory data collected from each SPC.

Table 6-1 provides a summary of the topsoil and subsoil thicknesses within the project site and their suitability for reuse in rehabilitation activities. The required amelioration measures are also listed. Topsoil stripping depths are presented in Figure 6.

In summary:

- Topsoil from all 9 SPCs is suitable for reuse in rehabilitation activities. Topsoil should be reused in the following order of preference:
    - SPCs 2 and 8; then
    - SPCs 4, 5 and 7; then
    - SPC 1; then
    - SPCs 3 and 9; then
    - SPC 6.
- Topsoil from SPC 3, 6 and 9 require amelioration measures as described in the table below (including the application of gypsum and/or lime and blending of topsoils, as necessary). The application rates and blending ratios will be determined as part of detailed rehabilitation design. In addition, topsoil may benefit from the application of organic matter during reuse to improve soil structure, reduce runoff and improve vegetation re-establishment.
- Subsoil from 5 SPCs (SPC 1, 2, 4, 5 and 7) is suitable for reuse in rehabilitation activities. Subsoil from SPCs 1, 4, and 7 should be preferentially reused before using subsoil from SPC 2 and 5.
- Subsoil from SPC 6 is saline and sodic and is not amenable to amelioration. Hence, subsoil from this SPC is not suitable for reuse in rehabilitation activities.
- Subsoil is not present in SPC 3, 8 and 9.

Table 6-1: Soil Resources in the Soil Study Area

Topsoil			
SPC	**Topsoil Depth Interval (mbgl)**	**Suitable for Reuse in Rehabilitation Activities**	**Required Amelioration and Management Measures for Soil Reuse in Rehabilitation Activities**
1	0.00 to 0.30	Yes	None required
2	0.00 to 0.35	Yes	None required
3	0.00 to 0.15	Yes	In order to increase the pH level of this topsoil for use in rehabilitation activities, the application of agricultural lime is required or alternatively, blending of this topsoil with topsoil from SPC 1, 2, 4, 5 and/or 8.
4	0.00 to 0.20	Yes	None required
5	0.00 to 0.15	Yes	None required
6	0.00 to 0.15	Yes	The application of gypsum is required to reduce the sodicity/dispersive attributes of this topsoil.
7	0.00 to 0.30	Yes	None required
8	0.00 to 0.35	Yes	None required
9	0.00 to 0.10	Yes	The application of gypsum is required to reduce the sodicity/dispersive attributes of the topsoil.
Subsoil			
SPC	**Subsoil Depth Interval (mbgl)**	**Suitable for Reuse in Rehabilitation Activities**	**Required Amelioration and Management Measures for Soil Reuse in Rehabilitation Activities**
1	0.30 to 1.00	Yes	None required
2	0.35 to 1.00	Yes	Visual inspection required prior to reuse of subsoil to confirm that there are no signs of dispersion or erosion. If the visual inspection identifies dispersion and/or erosion, the application of gypsum is required to reduce the sodicity/dispersive attributes of this subsoil. Avoid placement on steeply sloping ground.
3	No subsoil present	Not applicable	
4	0.20 to 1.00	Yes	None required

5	0.15 to 0.45	Yes	Visual inspection required prior to reuse of subsoil to confirm that there are no signs of dispersion or erosion. If the visual inspection identifies dispersion and/or erosion, the application of gypsum is required to reduce the sodicity/dispersive attributes of this subsoil. Avoid placement on steeply sloping ground.
6	0.15 to 1.00	No	Not applicable
7	0.30-1.50	Yes	None required
8	No subsoil present	Not applicable	
9	No subsoil present	Not applicable	

7 CONCLUSION

The key conclusions of the soil assessment are as follows:

- Nine SPC soil types are present in the soil study area.
- The suitability of each SPC for a range of agricultural land uses has been assessed. In overview, the conclusions of the land suitability assessment are as follows:
    - SPCs 1, 2, 4, and 7 are assessed as class B, land that is suitable for a narrow range of crops or pastures;
    - SPCs 5, 6 and 8 are assessed as class C2, land that is suitable for grazing of native pastures, with or without the introduction of pasture species; and
    - SPCs 3 and 9 are assessed as class C3, land that is suitable for light grazing of native pastures in accessible areas.
- The suitability of soils for reuse in mine rehabilitation has been assessed. In summary, topsoil from all SPCs is suitable for reuse in rehabilitation activities. Topsoil from SPCs 3, 6 and 9 require additional amelioration measures.
- SPCs 1, 2, 4, 5 and 7 contain subsoil horizons that are suitable for reuse in mine rehabilitation, if required.

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9 GLOSSARY OF TERMS

The following descriptions are of terms used in the text of this report.

ASC. Australian soil class.

ASPAC. Australasian Soil and Plant Analysis Council.

Cation Exchange Capacity (CEC). The maximum positive charge required to balance the negative charge on colloids (clays and other charged particles). The units are milli-equivalents per 100 grams of material or centimoles of charge per kilogram of exchanger. CEC is often used as a measure of soil fertility and nutrient retention capacity.

Clay. A soil material composed of particles finer than 0.002 mm. When used as a soil texture group such soils contain at least 35% clay.

Dermosol. Soils with structured B2 horizons and lacking strong texture contrast between A and B horizons.

Dispersion. A process by which species in solution mix with a second solution, thus reducing in concentration. In the case of sodic soils it will predispose the soil material to lose structure and disseminate into the solution.

Dispersion Ratio (R1). The measurement of soil dispersion when used in conjunction with ESP and the Ca/Mg ratio for predicting soil physical behaviour.

Effective Soil Depth. The depths of which vegetation roots may readily penetrate the soil profile and have access to water and nutrients.

EIS. Environmental Impact Statement.

Electrical Conductivity (EC). The EC of water is a measure of its ability to conduct an electric current. The EC of soils will vary depending on the texture and amount of moisture held by the soil particles. Electrical conductance increases with soluble salt content and thus allows simple interpretation of salinity.

Emmerson Aggregate Test. The test classifies the behavior of soil aggregates, when immersed, on their coherence in water.

Erosion. The displacement of soil, rock or dissolved material by wind or water flow from one location on the earth and then travels to another location.

Exchangeable Sodium Percentage (ESP). The amount of sodium as a proportion of all cations in a soil is termed the Exchangeable Sodium Percentage. It is calculated by dividing the exchangeable sodium by the cation exchange capacity (CEC), multiplied by 100. ESP values greater than 6% are considered sodic, with values greater than 15% considered very sodic. ESP = (Exchangeable sodium (meq/100g)/Cation exchange capacity (meq/100g)) x 100.

Field pH. The measurement of the pH in the field by a Manutec Pty Ltd, Soil pH Test Kit. This kit consists of pH dye indicator, Barium Sulphate and reference colour chart.

Gleyed. Indicative of permanent or periodic intense reduction due to wetness and is characterised by greying, bluish or greenish colour, generally of low chroma. Mottling may be prominent as well as rusty root channel mottling.

Gradational. The lower boundary between soil layers (horizons) has a gradual transition to the next layer. The solum (soil horizon) becomes gradually more clayey with depth.

Gradient. The rate of inclination of a slope. The degree of deviation from the horizontal.

Hectare (ha). A metric unit of square measure, equal 10,000 square metres.

Horizon. An individual soil layer, based on texture and colour, which differs from those above and below.

Jarosite. Iron sulfate mineral found in Acid Sulfate Soils. Form distinct butter or straw coloured mottles with a hue of 2.5Y or yellower and a value chroma of 6 or more.

Kandosol. Soils that have well-developed B2 horizons in which the major part if massive or has only a weak grade of structure (compare with tenic B horizon and cemented pans) and have a maximum clay content in some part of the B2 horizon which exceeds 15% (i.e. heavy sand loam, SL+).

Loam. A medium textured soil of approximate composition 10-25% clay, 25-50% silt and >50% sand.

LSAT. Land Suitability Assessment Techniques.

Massive. Refers to the condition of the soil layer in which the layer appears to be as a coherent or solid mass which is largely devoid of peds.

Mbgl. Metres below ground level.

Meter pH. The measurement of the pH in the field by utilising a TPS Aqua-CP/A meter.

Microrelief. Refers to relief up to a few metres about the plane of the land surface with alternating mounds and depressions formed due to clay horizons shrinking and swelling with alternate drying and wetting cycles.

Millimetres (mm). Unit of measurement, one thousandth of a metre.

Metres (m). Unit of measurement, the SI base unit of length.

Mottles. Areas of contrasting colour in the overall soil colour which are caused by anerobic conditions as a result of poor aeration. Usually an indicator of poor drainage and retention of water.

Mtpa. Million tonnes per annum.

Mdtpa. Million dry tonnes per annum.

NATA. National Association of Testing Authority.

Ped. An individual natural soil aggregate. In an undisturbed state peds will group together to form larger aggregates.

Pedality. Describes a soil in which some or all of the soil material occurs in the form of peds in the moist state.

pH. A logarithmic index for the concentration of hydrogen ions in an aqueous solution, which is used as a measure of acidity.

Profile. The solum. This includes the soil A and B horizons and is basically the depth of soil to weathered rock.

Representative Site. A location deemed very representative of the SPC for which detailed characterisation is to be done.

ROM. Run of mine.

Soil Profile Class (SPC). Soils grouped into a single management unit on the basis of similar morphology, position on the landscape, substrate and chemistry.

Sodic. Also commonly referred to as a non-saline alkali soil. It is a soil that contains sufficient exchangeable sodium and does not contain appreciable quantities of soluble salts. A term given to soil with a level of exchangeable sodium cations greater than 10-15% of the soils cation exchange capacity (CEC), or soluble sodium cations greater than 10-15 times the square root of soluble calcium and magnesium cations.

Subsoil. Subsurface material comprising the B and C horizons of soils with distinct profiles. They often have brighter colours and higher clay content than topsoils.

Texture. The size of particles in the soil. Texture is divided into six groups, depending on the amount of coarse sand, fine sand, silt and clay in the soil.

Tenosol. Soils with generally only weak pedologic organisation apart from the A horizons.

Topsoil. Part of the soil profile, typically the A1 horizon, containing material which is usually darker, more fertile and better structured than the underlying layers.

Unique Mapping Area (UMA). When the unique set of soil and land attributes associated with an individual polygon are described and collected, the polygon is referred to as a unique mapping area. UMAs assist in identifying different land attributes such as degree of rockiness and slope which may either be part of the same soil type or not.

10 FIGURES

Figure 1 **Soil Study Area Location**

Figure 2 **Soil Study Area Layout**

Figure 3 **Soil Profile Classes**

Figure 4 **Cropping Suitability**

Figure 5 **Agricultural Land Classes**

Figure 6 **Topsoil Stripping Depth**

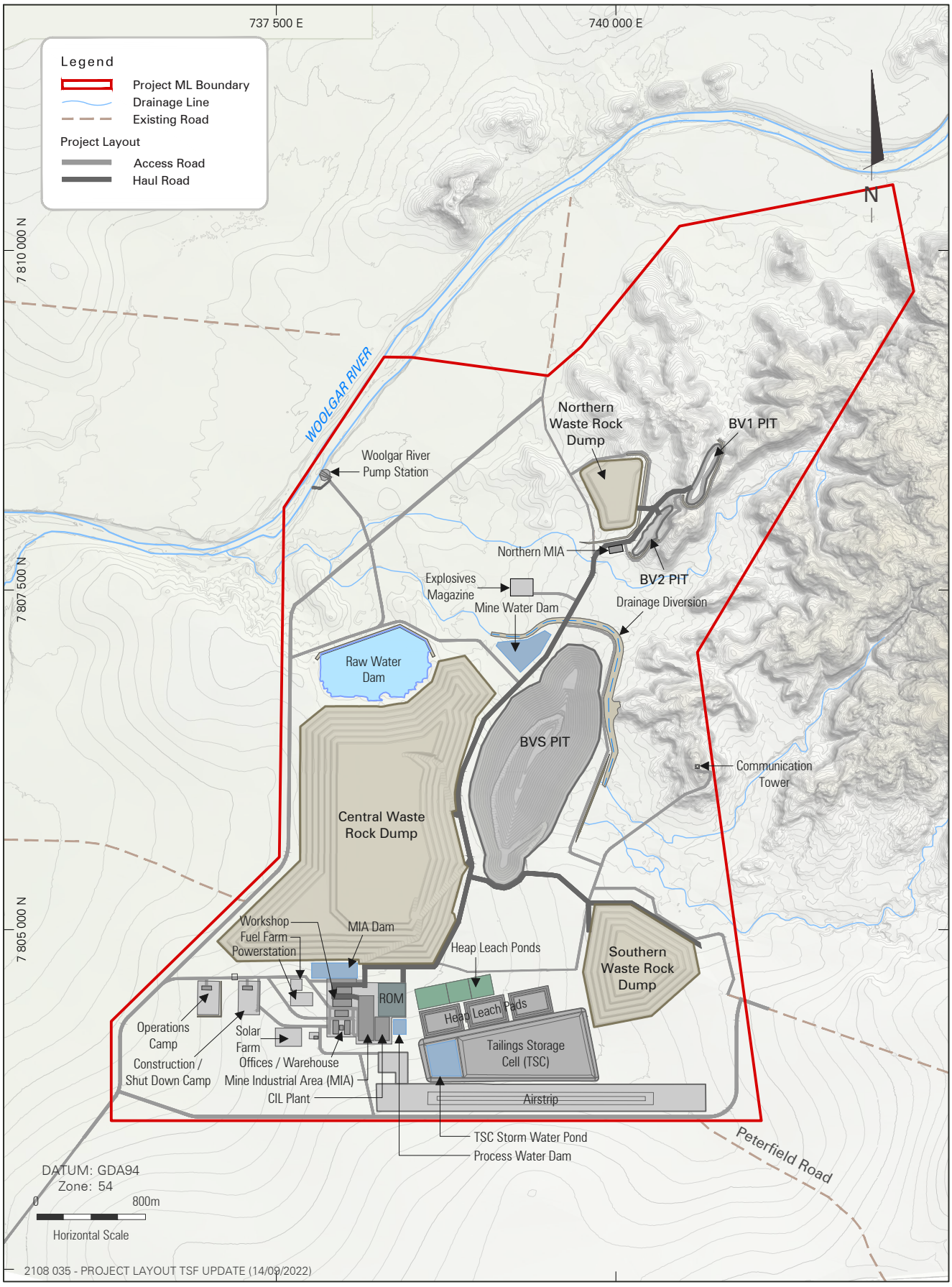


BIG VEIN SOUTH GOLD PROJECT

HANSEN ENVIRONMENTAL CONSULTING

Location Plan

FIGURE 1

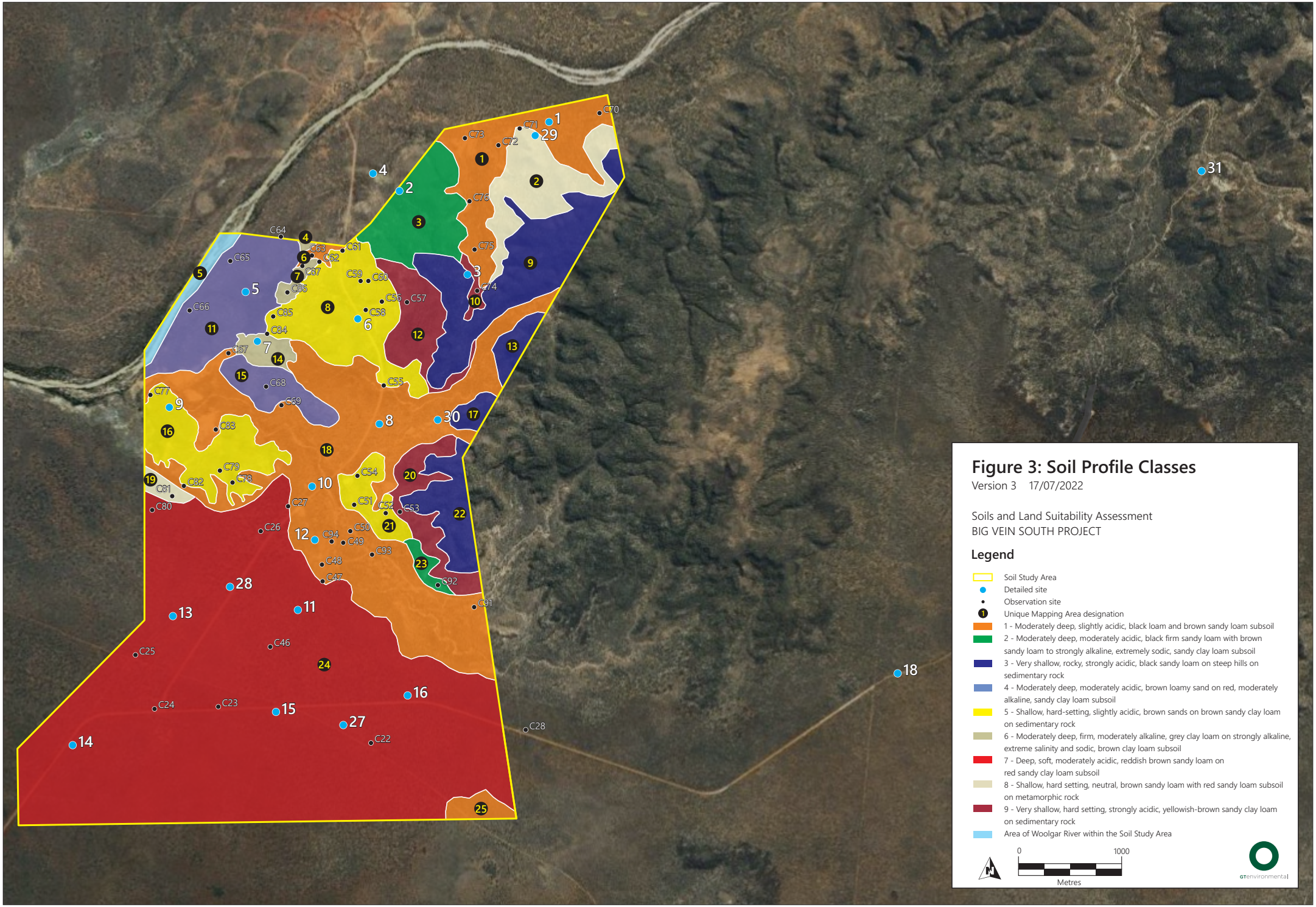


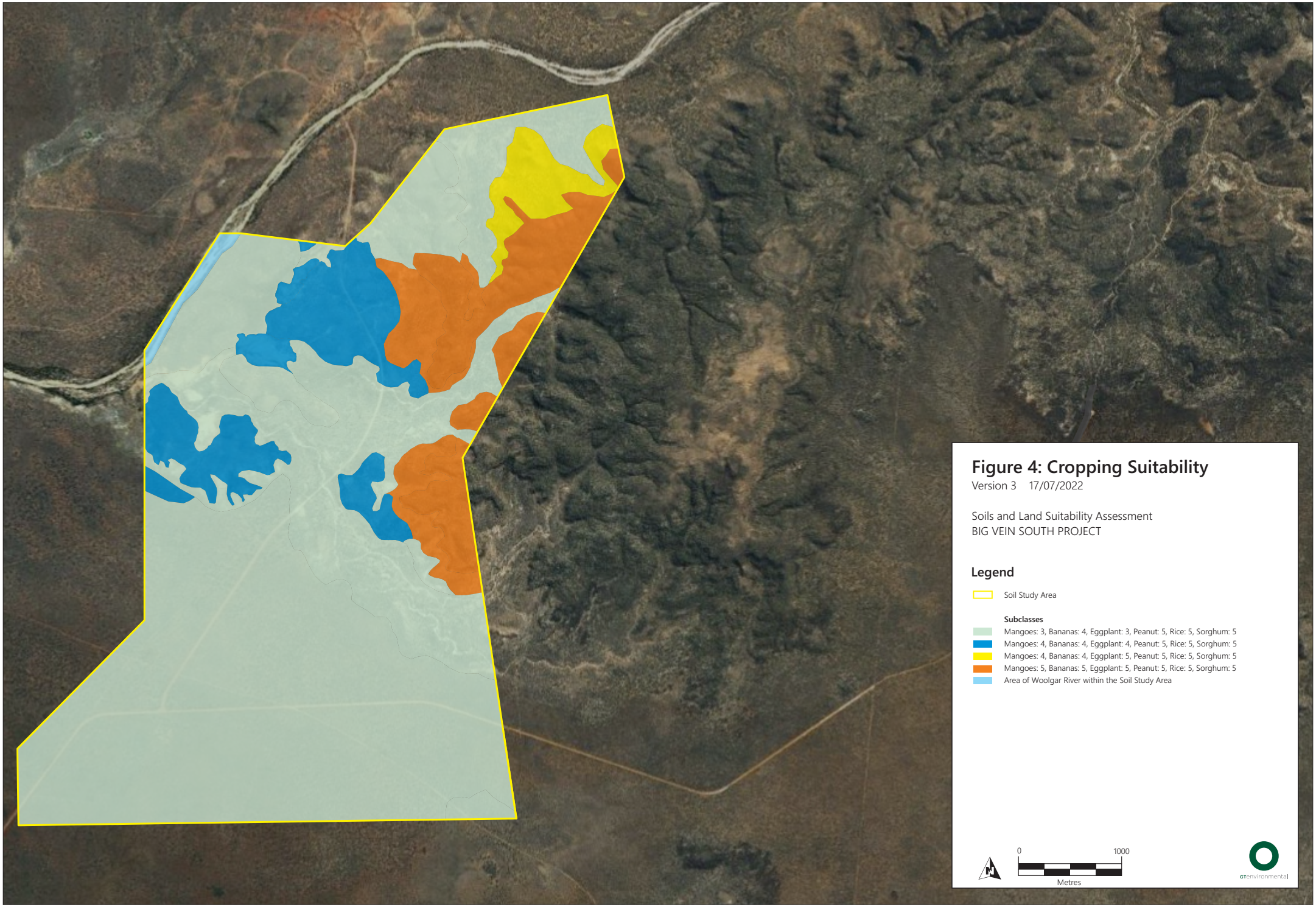
BIG VEIN SOUTH GOLD PROJECT

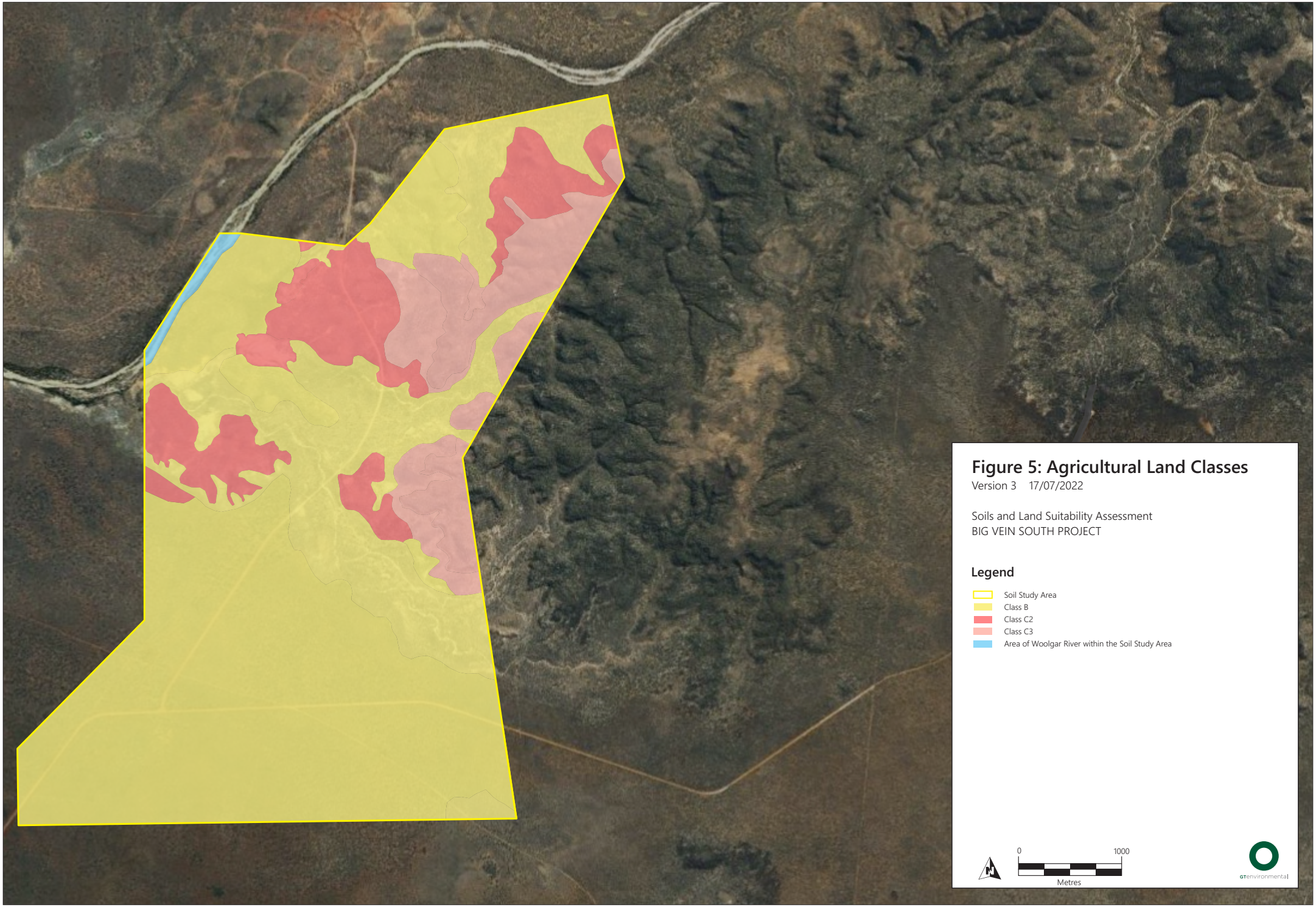
HANSEN ENVIRONMENTAL CONSULTING

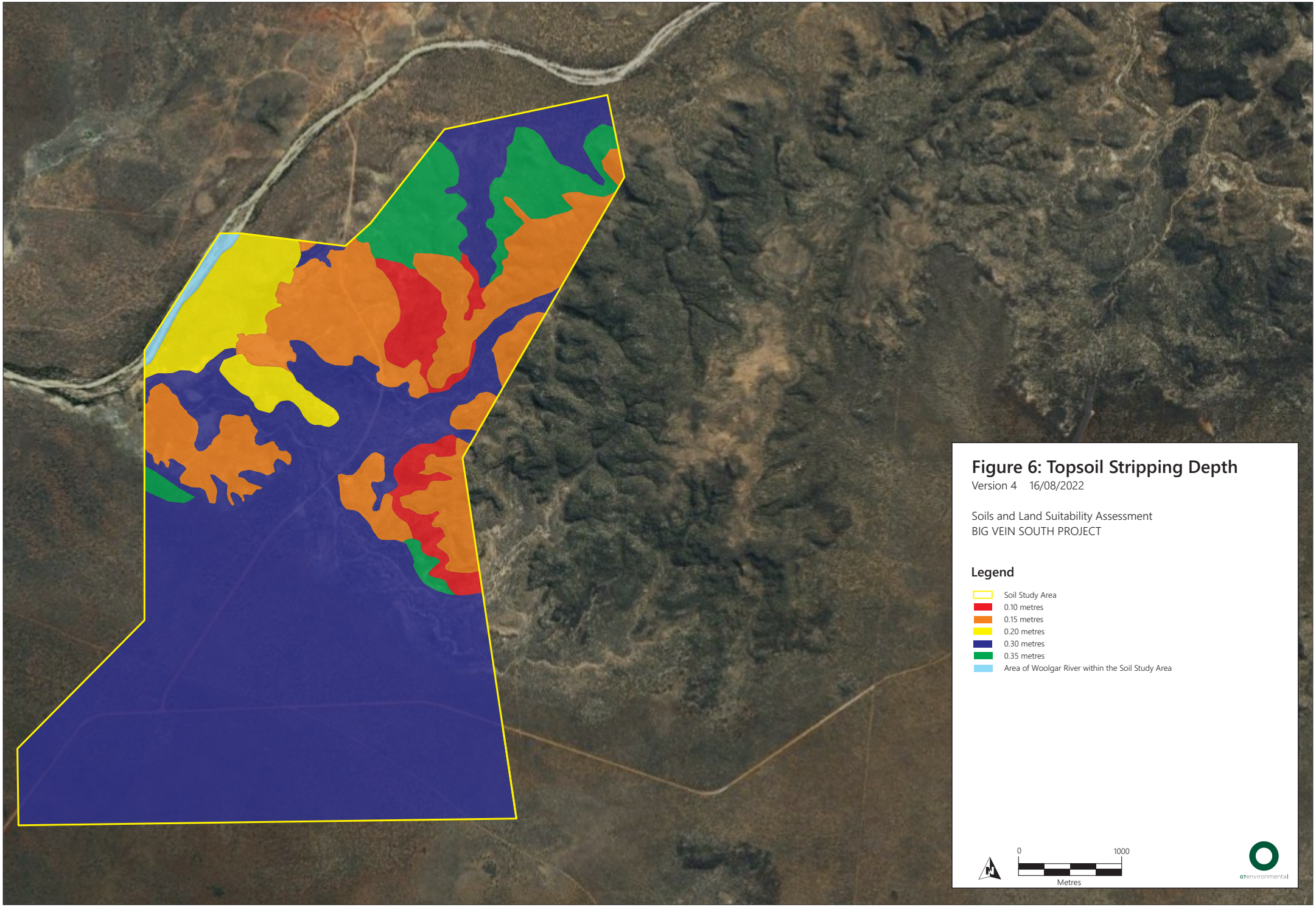
Project Layout

FIGURE 2


Figure 3: Soil Profile Classes
Version 3 17/07/2022
Soils and Land Suitability Assessment
BIG VEIN SOUTH PROJECT
Legend
Soil Study Area
Detailed site
Observation site
Unique Mapping Area designation
1 - Moderately deep, slightly acidic, black loam and brown sandy loam subsoil
2 - Moderately deep, moderately acidic, black firm sandy loam with brown sandy loam to strongly alkaline, extremely sodic, sandy clay loam subsoil
3 - Very shallow, rocky, strongly acidic, black sandy loam on steep hills on sedimentary rock
4 - Moderately deep, moderately acidic, brown loamy sand on red, moderately alkaline, sandy clay loam subsoil
5 - Shallow, hard-setting, slightly acidic, brown sands on brown sandy clay loam on sedimentary rock
6 - Moderately deep, firm, moderately alkaline, grey clay loam on strongly alkaline, extreme salinity and sodic, brown clay loam subsoil
7 - Deep, soft, moderately acidic, reddish brown sandy loam on red sandy clay loam subsoil
8 - Shallow, hard setting, neutral, brown sandy loam with red sandy loam subsoil on metamorphic rock
9 - Very shallow, hard setting, strongly acidic, yellowish-brown sandy clay loam on sedimentary rock
Area of Woolgar River within the Soil Study Area
0
1000
Metres
GTenvironmental


Figure 4: Cropping Suitability
Version 3 17/07/2022
Soils and Land Suitability Assessment
BIG VEIN SOUTH PROJECT
Legend
Soil Study Area
Subclasses
Mangoes: 3, Bananas: 4, Eggplant: 3, Peanut: 5, Rice: 5, Sorghum: 5
Mangoes: 4, Bananas: 4, Eggplant: 4, Peanut: 5, Rice: 5, Sorghum: 5
Mangoes: 4, Bananas: 4, Eggplant: 5, Peanut: 5, Rice: 5, Sorghum: 5
Mangoes: 5, Bananas: 5, Eggplant: 5, Peanut: 5, Rice: 5, Sorghum: 5
Area of Woolgar River within the Soil Study Area
N
0
1000
Metres
GTenvironmental


Figure 5: Agricultural Land Classes
Version 3 17/07/2022
Soils and Land Suitability Assessment
BIG VEIN SOUTH PROJECT
Legend
Soil Study Area
Class B
Class C2
Class C3
Area of Woolgar River within the Soil Study Area
0
1000
Metres
GTenvironmental


Figure 6: Topsoil Stripping Depth
Version 4 16/08/2022
Soils and Land Suitability Assessment
BIG VEIN SOUTH PROJECT
Legend
Soil Study Area
0.10 metres
0.15 metres
0.20 metres
0.30 metres
0.35 metres
Area of Woolgar River within the Soil Study Area
0
1000
Metres
GTenvironmental

11 APPENDICES

Appendix A Detailed Site Descriptions

Appendix B Observation Site Descriptions

Appendix C Laboratory Certificates

Site 1	Soil Profile Class: 1	Location (mE/mS GDA2020 ZONE 54): 741485 7810185	Australian Soil Class: Brown Kandosol / 1KAABAHCDAELLW	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 30/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Alluvial Plain Gently undulating plain 1 %	Narrow leaved Ironbark No microrelief No effective disturbance; hoofed animals	Hard setting No coarse fragments	A11 0.00-0.16 Abrupt 5-20mm	Loam fine sand	Massive Loose	No inclusions or segregations	10YR3/2 very dark greyish brown No mottles or bleaching	Dry Moderately well drained	Medium 2-5mm Few	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.75-0.85 0.90-1.00
			A12 0.16-0.49 Abrupt 5-20mm	Loam fine sand	Massive Loose	No inclusions or segregations	10YR3/3 dark brown No mottles or bleaching	Dry Moderately well drained	Fine 1-2 mm Few	0.30 / 6.0	
			B21 0.48-0.74 Clear 20-50mm	Sandy loam	Massive Loose	No inclusions or segregations	10YR3/4 dark yellowish brown No mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	0.65 / 6.5	
			B22 0.74-1.00 End of Borehole (EOBH)	Loamy sand	Massive Loose	<2% coarse fragments <2mm	10YR3/4 dark yellowish brown No mottles or bleaching	Dry Moderately well drained	No roots	0.90 / 6.5	

Landscape



Surface



Soil Profile



Site 2	Soil Profile Class: 2	Location (mE/mS GDA2020 ZONE 54): 740040 7809628	Australian Soil Class: Red Kandosol / 1KAAAAHCDBEKLW	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 30/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Level plain Flat <1%	Iron Bark No microrelief No effective disturbance; natural gully	Firm No coarse fragments	A11 0.00-0.13 Clear 20-50mm	Sandy loam	Massive Loose	No inclusions or segregations	10YR3/2 very dark greyish brown No mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Common	0.05 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			A12 0.13-0.38 Clear 20-50mm	Loamy sand	Massive Loose	No inclusions or segregations	10YR3/3 dark brown No mottles or bleaching	Dry Well drained	No roots	0.20 / 7.5	
			B2 0.38-1.00 EOBH	Sandy loam	Massive Loose	2-10% coarse fragments 2-6mm	2.5Y4/3 dark brown No mottles or bleaching	Dry Moderately well drained	No roots	0.60 / 8.5 0.90 / 8.5	

Landscape



Surface



Soil Profile



Site 3	Soil Profile Class: 3	Location (mE/mS GDA2020 ZONE 54): 740686 7808732	Australian Soil Class: Black Tenosol / 1TECYCZAIFKT	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 30/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Steep hills, crest 30+%	Lancewood No microrelief No effective disturbance; natural	Firm 2-10% coarse fragments 20-60mm 80% Bedrock	A1 0.00-0.17 EOBH Bedrock	Loamy sand	Single grain Loose	2-10% coarse fragments 2-6mm	10YR3/2 very dark greyish brown No mottles or bleaching	Dry Rapidly drained	Medium 2-5mm Few	0.10 / 5.5	0.00-0.10

Landscape



Surface



Soil Profile



Site 4	**Soil Profile Class:** Not applicable, as SMU polygon not included in project site	**Location (mE/mS GDA2020 ZONE 54):** 739554 7809819	**Australian Soil Class:** Red Kandosol	**Soil Survey Type:** Detailed 50 mm hand auger	**Survey Date:** 29/10/2020

Land use / Landform Pattern / Element / Slope	**Vegetation / Microrelief / Disturbance / Erosion**	**Surface condition / surface rock**	**Soil Profile Description**								
			Horizon / Depth (m / Boundary	**Field Texture**	**Structure / Strength / Pedality**	**Inclusions / Segregations**	**Colour / Mottle / Bleaching**	**Moisture / Drainage**	**Roots Size / Abundance**	**Depth (m) / Field pH**	**Sample (m) / Observations**
Native Woodland Gently undulating plain Flat Slope <1%	Ironbark No microrelief No effective disturbance; hoofed animals	Cracking No coarse fragments	A1 0.00-0.14 Abrupt 5-20mm	Silty loam	Massive Loose	No inclusions or segregations	10YR3/3 dark brown No mottles or bleaching	Dry Well drained	Fine 1-2mm Common	0.10 / 6.0	0.00-0.10 0.20-0.30 0.52-0.60 0.70-0.80 0.90-1.00
			A2 0.14-0.50 Clear 20-50mm	Silty loam	Massive Loose	No inclusions or segregations	7.5YR4/6 strong brown No mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	0.30 / 6.0	
			B2 0.50-1.00 EOBH	Silty clay loam	Massive Loose	No inclusions or segregations	2.5YR4/4 reddish brown No mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	0.60 / 6.5 0.90 / 7.5	

Landscape



Surface



Soil Profile



Site 5	Soil Profile Class: 4	Location (mE/mS GDA2020 ZONE 54): 738544 7808620	Australian Soil Class: Red Kandosol / 1KAAAAHCDBEKLW	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 24/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating plain Flat Slope <1%	Tall woodlands of eucalyptus species. No microrelief No disturbance No erosion	Soft, No coarse fragments No bedrock	A1 0.00–0.20 Abrupt 5-20mm	Loamy sand	Weak Very weak	No inclusions or segregations	7.5YR3/3 dark brown No mottles or bleaching	Moderately moist Rapidly drained	Fine 1-2mm Common	0.10 / 6.0	0.00-0.10 0.25-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			A2 0.20-0.80 Clear 20-50mm	Loamy sand	Massive Loose	No inclusions or segregations	5YR5/6 yellowish red No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.30 / 6.0 0.60 / 6.0	
			B2 0.80-1.00 EOBH	Clayey sand	Massive Weak / loose	No inclusions or segregations	5YR4/6 yellowish red No mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	0.90 / 7.0	

Landscape



Surface



Soil Profile



Site 6	Soil Profile Class: 5	Location (mE/mS GDA2020 ZONE 54): 739594 7808320	Australian Soil Class: Brown Kandosol / 1KABACYEOAHKLU	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 29/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Undulating rises Mid-slope 5%	Sparse narrow leaved ironbark No microrelief No effective disturbance; hoofed animals	Hard setting Coarse fragments: 20-50% 6-20mm 5-10% 20-60mm	A1 0.00-0.10 Sharp <5mm	Clayey sand	Massive Loose	20-50% coarse fragments 6-20mm	10YR3/3 dark brown No mottles or bleaching	Dry Well drained	Fine 1-2mm Few	0.05 / 6.0	0.00-0.10 0.10-0.20 0.30-0.40 Skeletal soil on low rises
			B21 0.10-0.24 Clear 20-50mm	Clayey sand	Weak Loose	20-50% coarse fragments 6-20mm 2-10% coarse fragments 20-60mm	2.5Y5/6 light olive brown No mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	0.20 / 6.5	
			B22 0.24-0.45 EOBH - Refusal on hard pan / rock	Clayey sand	Massive Loose	10-20% coarse fragments 6-20mm	2.5Y5/4 light olive brown No mottles or bleaching	Dry Moderately well drained	No roots	0.40 / 6.5	

Landscape



Surface



Soil Profile



Site 7	Soil Profile Class: 6	Location (mE/mS GDA2020 ZONE 54): 738636 7808181	Australian Soil Class: Brown Dermosol / 1DEABAHEOBMOW	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 30/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native grasslands Gently undulating plain Alluvial flat 1%	Very sparse vegetation on the fringe of the SPC No microrelief Limited clearing Sheet and gully erosion observed	Cracking, minor <2mm <2% coarse fragments 2-6mm	A11 00.0-0.18 Clear 20-50mm	Light clay	Weak Firm	No inclusions or segregations	10YR4/2 dark greyish brown No mottles or bleaching	Dry Moderately well drained	No roots	0.10 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			A12 0.18-0.30 Abrupt 5-20mm	Light clay	Weak Firm	No inclusions or segregations	10YR4/3 brown No mottles or bleaching	Dry Moderately well drained	No roots	0.25 / 8.0	
			B21 0.30-0.80 Clear 20-50mm	Silty clay loam	Weak Firm	No inclusions or segregations	10YR5/4 Yellowish brown No mottles or bleaching	Dry Moderately well drained	No roots	0.60 / 8.5	
			B21 0.80-1.00 EOBH	Clayey sand	Weak Weak	No inclusions or segregations	10YR5/4 Yellowish brown No mottles or bleaching	Dry Well drained	No roots	0.90 / 8.5	

Landscape



Surface



Soil Profile



Site 8	Soil Profile Class: 1	Location (mE/mS GDA2020 ZONE 54): 739810 7807317	Australian Soil Class: Brown Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 29/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating rises Flat	Narrow leaved Ironbark No microrelief Limited clearing	Soft No coarse fragments	A11 0.00-0.13 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	10YR3/2 very dark greyish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Common	0.05 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.75-0.85 0.90-1.00
			A12 0.13-0.43 Clear 20-50mm	Loamy sand	Massive Loose	No inclusions or segregations	10YR3/3 dark brown No mottles or bleaching	Dry Rapidly drained	No roots	0.25 / 6.0	
			B21 0.43-0.74 Gradual 50-100mm	Sandy Loam	Massive Loose	<2% coarse fragments 2-6mm	10YR4/3 brown No mottles or bleaching	Dry Rapidly drained	No roots	0.60 / 6.0	
			B22 0.74-1.00 Gradual 50-100mm	Sandy Loam	Massive Loose	<2% coarse fragments 2-6mm	10YR4/4 Dark yellowish brown No mottles or bleaching	Dry Rapidly drained	No roots	0.90 / 6.0	
			B23 1.00-2.09 EOBH	Sandy Loam	Massive Loose	2-10% coarse fragments <2mm	10YR4/4 Dark yellowish brown No mottles or bleaching	Dry Rapidly drained	No roots	1.50 / 6.0	

Landscape



Surface



Soil Profile



Site 9	Soil Profile Class: 5	Location (mE/mS GDA2020 ZONE 54): 737800 7807490	Australian Soil Class: Shallow Red Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 30/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Rolling hills Crest Wide flat crest area	Sparse shrubbery with ironbark nearby No microrelief No effective disturbance; hoofed animals	Hard setting 2-10% coarse fragments 20-60mm	A11 0.00-0.17 EOBH Refusal on rock	Loamy sand	Massive Loose	10-20% coarse fragments 6-20mm	7.5YR5/4 brown No mottles or bleaching	Dry Well drained	Fine 1-2mm Few	0.10 / 6.5	Three attempts to verify; 0.17m, 0.15m, 0.15m

Landscape



Surface



Soil Profile



Site 10	Soil Profile Class: 1	Location (mE/mS GDA2020 ZONE 54): 739139 7806742	Australian Soil Class: Brown Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 28/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating plain Flat Flat plain with minor undulations	Narrow leaved Ironbark No microrelief Limited clearing	Soft No coarse fragments	A11 0.00 -0.13 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	10YR3/3 dark brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.08 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.92-1.00
			A12 0.13-0.41 Clear 20-50mm	Loamy sand	Massive Loose	No inclusions or segregations	7.5YR4/4 reddish brown No mottles or bleaching	Moderately moist Rapidly drained	Fine 1-2mm Few	0.30 / 6.5	
			B21 0.41-0.92 Gradual 50-100mm	Sandy Loam	Massive Loose	<2% coarse fragments 2-6mm <2% quartz	10YR5/6 Yellowish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.60 / 6.5	
			B22 0.92-1.00 EOBH	Sandy Loam	Massive Loose	<2% coarse fragments 2-6mm <2% quartz	2.5Y4/6 olive brown No mottles or bleaching	Dry Rapidly drained	No roots	0.96 / 7.0	

Landscape



Surface



Soil Profile



Site 11	Soil Profile Class: 7	Location (mE/mS GDA2020 ZONE 54): 739072 7805574	Australian Soil Class: Deep Red Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 29/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating plain 2%	Gums, River Reid Box, slim Eucalypt species. No microrelief No effective disturbance; natural	Soft No coarse fragments	A11 0.00-0.11 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	7.5YR3/3 dark brown No mottles or bleaching	Moderately moist Rapidly drained	Fine 1-2mm Few	0.05 / 6.5	No samples taken Drill pad nearby
			A12 0.11-0.33 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	2.5YR4/4 reddish brown No mottles or bleaching	Moderately moist Rapidly drained	Fine 1-2mm Few	0.25 / 6.5	
			A13 0.33-0.69 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	2.5YR4/6 red No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.60 / 6.5	
			B21 0.69-1.41 Gradual 50-100mm	Sandy loam	Massive Loose	No inclusions or segregations	2.5YR3/6 dark red No mottles or bleaching	Dry Well drained	Fine 1-2mm Few	0.90 / 6.5	
			B22 1.41-2.00 EOBH	Clayey sand	Massive Loose	No inclusions or segregations	2.5YR3/6 dark red No mottles or bleaching	Dry Well drained	No roots	1.60 / 6.5	

Landscape



Surface



Soil Profile



Site 12	Soil Profile Class: 1	Location (mE/mS GDA2020 ZONE 54): 739170 7806235	Australian Soil Class: Brown Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 29/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating rise Mid-slope	Mixed Eucalypt species including Narrow leaved Ironbark No microrelief No effective disturbance; natural	Firm to soft No coarse fragments	A11 0.00-0.13 Sharp <5mm	Loamy sand	Massive Loose	No inclusions or segregations	10YR4/4 Dark yellowish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.05 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-100
			A12 0.13-0.46 Gradual 50-100mm	Loamy sand	Massive Loose	No inclusions or segregations	10YR4/6 Dark yellowish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.30 / 6.5	
			B2 0.46-1.15 Abrupt 5-20mm	Clayey sand	Single grain Loose	No inclusions or segregations	2.5Y5/6 light olive brown No mottles or bleaching	Dry Rapidly drained	Very fine <1mm Few	0.80 / 6.5	
			C 1.15-1.30 Sharp <5mm Weathered sandstone	Sandy loam	Single grain Loose	<2% coarse fragments 2-6mm	2.5Y5/4 light olive brown No mottles or bleaching	Dry Imperfectly drained	No roots	1.25 / 7.0	
			C 1.30-1.60 EOBH Weathered sandstone	Sandy loam	Single grain Loose	2-10% coarse fragments 2-6mm	2.5Y5/4 light olive brown Mottles: 10YR5/6 Yellowish brown	Dry Imperfectly drained	No roots	1.50 / 7.0	

Landscape



Surface



Soil Profile



Site 13	Soil Profile Class: 7	Location (mE/mS GDA2020 ZONE 54): 737871 7805580	Australian Soil Class: Deep Red Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 28/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Level plain Flat 0.5-1.0%	Eucalypt species No microrelief No effective disturbance; natural Vegetation not as dense as site 15	Firm to soft No coarse fragments	A11 0.00-0.16 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	7.5YR3/4 dark reddish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			A12 0.16-0.49 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	5YR4/4 reddish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.30 / 7.5	
			A13 0.49-0.81 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	5YR4/6 yellowish red No mottles or bleaching	Dry Rapidly drained	Very fine <1mm Few	0.60 / 7.5	
			B2 0.81-1.00 EOBH	Sandy loam	Weak Very weak	No inclusions or segregations	5YR3/4 dark reddish brown No mottles or bleaching	Dry Well drained	No roots	0.90 / 7.5	

Landscape



Surface



Soil Profile



Site 14	Soil Profile Class: 7	Location (mE/mS GDA2020 ZONE 54): 736809 7804317	Australian Soil Class: Deep Red Kandosolxx	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 31/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating rises Mid slope 2% slope	Mixed vegetation including eucalyptus species No microrelief No erosion	Soft No coarse fragments	A11 0.00-0.17 Clear 20-50mm	Loamy sand	Massive Loose	No inclusions or segregations	7.5YR3/3 dark brown No mottles or bleaching	Moderately moist Rapidly drained	Fine 1-2mm Few	0.10 / 6.5	No samples taken
			A12 0.17-0.42 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	5YR3/45YR3/4 dark reddish brown No mottles or bleaching	Moderately moist Rapidly drained	Medium 2-5mm Few	0.30 / 6.5	
			B21 0.42-0.80 Gradual 50-100mm	Loamy sand	Massive Loose	No inclusions or segregations	2.5YR4/6 yellowish red No mottles or bleaching	Dry Rapidly drained	Medium 2-5mm Few	0.60 / 6.5	
			B22 0.80-1.00 EOBH	Clayey sand	Massive Loose	No inclusions or segregations	2.5YR4/8 red No mottles or bleaching	Dry Well drained	Fine 1-2mm Few	0.90 / 6.5	

Landscape



Surface



Soil Profile



Site 15	Soil Profile Class: 7	Location (mE/mS GDA2020 ZONE 54): 738748 7804612	Australian Soil Class: Deep Red Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 28/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating rises Flat 0.5-1% slope	Mixed vegetation including eucalyptus species No microrelief Minor limited clearing No erosion	Soft No coarse fragments	A11 0.00-0.17 Clear 20-50mm	Loamy sand	Massive Loose	No inclusions or segregations	7.5YR3/3 dark brown No mottles or bleaching	Moderately moist Rapidly drained	Fine 1-2mm Few	0.10 / 6.5	No samples taken
			A12 0.17-0.42 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	5YR3/4 dark reddish brown No mottles or bleaching	Moderately moist Rapidly drained	Medium 2-5mm Few	0.30 / 6.5	
			B21 0.42-0.80 Gradual 50-100mm	Loamy sand	Massive Loose	No inclusions or segregations	2.5YR4/6 yellowish red No mottles or bleaching	Dry Rapidly drained	Medium 2-5mm Few	0.60 / 6.5	
			B22 0.80-1.00 EOBH	Clayey sand	Massive Loose	No inclusions or segregations	2.5YR4/8 red No mottles or bleaching	Dry Well drained	Fine 1-2mm Few	0.90 / 6.5	

Landscape



Surface



Soil Profile



Site 16	Soil Profile Class: 7	Location (mE/mS GDA2020 ZONE 54): 739996 7804747	Australian Soil Class: Deep Red Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 28/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating rises Flat 0.5-1% slope	Mixed vegetation including eucalyptus species No microrelief Limited clearing	Soft No coarse fragments	A11 0.00-0.21 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	7.5YR3/4 dark reddish brown No mottles or bleaching	Moderately moist Rapidly drained	Fine 1-2mm Few	0.10 / 6.0	No samples taken
			A12 0.21-0.71 Gradual 50-100mm	Loamy sand	Massive Loose	No inclusions or segregations	2.5YR4/6 yellowish red No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.40 / 6.0	
			B2 0.71-1.50 EOBH	Clayey sand	Massive-weak Loose	No inclusions or segregations	2.5YR4/8 red No mottles or bleaching	Dry Rapidly drained	Very fine <1mm Few	0.90 / 6.0 1.40 / 6.0	

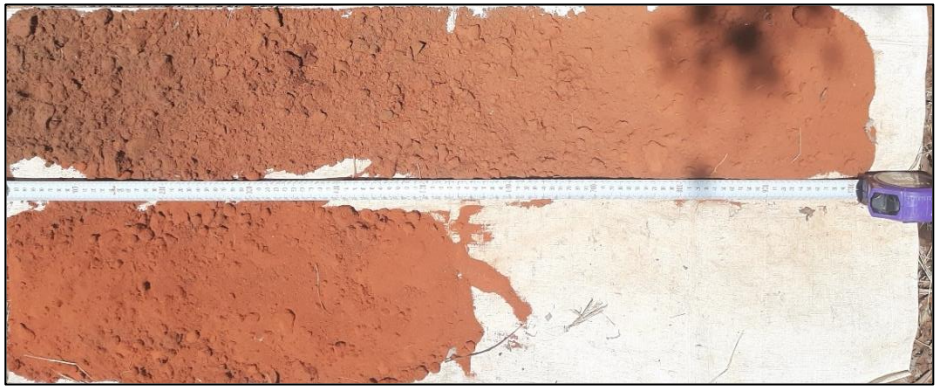
Landscape



Surface



Soil Profile



Site 18	Soil Profile Class: 7	Location (mE/mS GDA2020 ZONE 54): 744760 7804883	Australian Soil Class: Deep Red Kandosol / 1KAAAAGCDBEKMX	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 28/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Undulating rises Mid-slope <5%	Mixed vegetation including Bloodwood No microrelief No effective disturbance; natural No erosion	Soft No coarse fragment	A11 0.00-0.20 Sharp <5mm	Loamy sand	Massive Loose	No inclusions or segregations	7.5YR3/4 dark reddish brown No mottles or bleaching	Moderately moist Rapidly drained	Medium 2-5mm Few	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 1.10-1.20 1.40-1.50 Road nearby
			A12 0.20-0.41 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	2.5YR4/6 yellowish red No mottles or bleaching	Moderately moist Rapidly drained	Very fine <1mm Few	0.30 / 6.0	
			B21 0.41-0.96 Gradual 50-100mm	Sandy Loam	Massive Loose	No inclusions or segregations	2.5YR4/6 yellowish red No mottles or bleaching	Dry Rapidly drained	Very fine <1mm Few	0.60 / 6.0	
			B22 0.96-1.50 EOBH	Sandy loam	Massive Loose	No inclusions or segregations	2.5YR4/8 red No mottles or bleaching	Dry Well drained	No roots	1.10 / 6.0	

Landscape



Surface



Soil Profile



Site 27	Soil Profile Class: 7	Location (mE/mS GDA2020 ZONE 54): 739438 7804443	Australian Soil Class: Deep Red Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 28/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating plain Mid-slope 2%	Mixed vegetation including Eucalyptus species No microrelief No effective disturbance; natural	Soft No coarse fragments	A11 0.00-0.11 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	7.5YR3/4 dark reddish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.05 / 6.0	No samples taken
			A12 0.11-0.54 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	5YR3/4 dark reddish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.30 / 6.0	
			A13 0.54-0.81 Clear 20-50mm	Loamy sand	Massive Loose	No inclusions or segregations	2.5YR4/4 reddish brown No mottles or bleaching	Dry Rapidly drained	Very fine <1mm Few	0.60 / 6.0	
			B21 0.81-1.23 Gradual 50-100mm	Loamy sand	Single grain Loose	No inclusions or segregations	2.5YR4/6 yellowish red No mottles or bleaching	Dry Rapidly drained	Few	0.95 / 6.0	
			B22 1.23-2.00 EOBH	Clayey sand	Massive Loose	No inclusions or segregations	2.5YR4/8 red No mottles or bleaching	Dry Well drained	No roots	1.50 / 6.0	

Landscape



Surface



Soil Profile



Site 28	Soil Profile Class: 7	Location (mE/mS GDA2020 ZONE 54): 738332 7805782	Australian Soil Class: Deep Red Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 28/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating plain Mid-slope 2%	Slim Eucalypt species No microrelief No effective disturbance; natural	Soft No coarse fragments	A11 0.00-0.11 Abrupt 5-20mm	Loamy sand	Massive Loose	No inclusions or segregations	7.5YR3/4 dark reddish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.05 / 6.0	No samples taken
			A12 0.11-0.54 Clear 20-50mm	Loamy sand	Massive Loose	No inclusions or segregations	5YR3/4 dark reddish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.30 / 6.0	
			A13 0.54-0.81 Gradual 50-100mm	Loamy sand	Massive Loose	No inclusions or segregations	2.5YR4/4 reddish brown No mottles or bleaching	Dry Rapidly drained	Very fine <1mm Few	0.60 / 6.0	
			B21 0.81-1.23 Gradual 50-100mm	Clayey sand	Single grain Loose	No inclusions or segregations	2.5YR4/6 yellowish red No mottles or bleaching	Dry Rapidly drained	Few	0.95 / 6.0	
			B22 1.23-2.00 EOBH	Clayey sand	Massive Loose	No inclusions or segregations	2.5YR4/8 red No mottles or bleaching	Dry Well drained	No roots	1.50 / 6.0	

Landscape



Surface



Soil Profile



Site 29	Soil Profile Class: 8	Location (mE/mS GDA2020 ZONE 54): 741326 7810064	Australian Soil Class: Red Tenosol / 2TEAAARBGKLU	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 30/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Rolling low hills Simple slope 15%	Very sparse vegetation with short native grasses No microrelief No effective disturbance; natural	Hard setting 20-50% coarse fragments 20-60mm	A1 0.00-0.11 Abrupt 5-20mm	Loamy sand	Massive to weak Loose	10-20% coarse fragments 2-6mm	7.5YR5/6 yellowish red No mottles or bleaching	Dry Well drained	Fine 1-2mm Few	0.05 / 6.5	0.00-0.10 0.20-0.30
			A2 0.11-0.37 EOBH Hard pan / Rock	Loamy sand	Massive to weak Loose	10-20% coarse fragments 2-6mm	5YR5/8 yellowish red No mottles or bleaching	Dry Well drained	Very fine <1mm Few	0.25 / 6.5	

Landscape



Surface



Soil Profile



Site 30	Soil Profile Class: 1	Location (mE/mS GDA2020 ZONE 54): 740357 7807361	Australian Soil Class: Brown Kandosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 31/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Native Woodland Gently undulating plain Flat Near creek, partial bank	No microrelief Extensive clearing	Hard setting No coarse fragments	A11 0.00-0.17 Abrupt 5-20mm	Loamy sand	Weak Very weak	No inclusions or segregations	10YR3/4 Dark yellowish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm Few	0.10 / 6.0	0.00-0.10 020-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			A12 0.17-0.32 Clear 20-50mm	Loamy sand	Massive Firm	No inclusions or segregations	10YR4/4 Dark yellowish brown No mottles or bleaching	Dry Rapidly drained	Fine 1-2mm	0.23 / 7.0	
			B21 0.32-0.87 Clear 20-50mm	Sandy loam	Massive Weak	No inclusions or segregations	10YR4/3 Brown No mottles or bleaching	Dry Well drained	No roots	0.50 / 7.5	
			B22 0.87-1.00 EOBH	Clayey sand	Weak Weak	No inclusions or segregations	10YR4/3 Brown No mottles or bleaching	Dry Well drained	No roots	0.95 / 8.0	

Landscape



Surface



Soil Profile



Site 31	Soil Profile Class: 9	Location (mE/mS GDA2020 ZONE 54): 747722 7809635	Australian Soil Class: Brown Tenosol / 2TEABGFAIAFMZT	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 31/10/2020

Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Natural Woodland Undulating rises Simple slope 15%	Very sparse woodland of lancewood No microrelief No effective disturbance; natural Gully Erosion	Hard setting >90% coarse fragments 20-60mm	A1 0.00-0.10 Refusal on continuous gravel layer	Loam	Massive, loose	2-10% coarse fragments 2-6mm	10YR4/6 Dark yellowish brown No mottles or bleaching	Dry Well drained	No	0.10 / 6.0	0.00-0.10

Landscape



Surface



Soil Profile



Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C22	739625 7804324	7	Date, 28/10/2020 Native woodland, gently undulating plain, mid slope 1-2% Mixed vegetation including eucalyptus species, No microrelief, No effective disturbance, natural, No erosion Surface soft with nil coarse fragments, loamy sand, massive/loose, No rock outcrop 7.5YR3/3 dark brown, Dry ASC Order, Kandosol	
C23	738185 7804660	7	Date, 28/10/2020 Native woodland, gently undulating plain, lower slope 1.5% Mixed vegetation including eucalyptus species, No microrelief, No effective disturbance, natural, No erosion, No rock outcrop Surface soft with nil coarse fragments, loamy sand, massive/loose 7.5YR3/4 dark brown, Dry, rapidly drained ASC Order, Kandosol	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C24	737622 7804646	7	Date, 28/10/2020 Native woodland, gently undulating plain, mid slope 1-2% Mixed vegetation including eucalyptus species No microrelief, No effective disturbance, natural, No erosion, No rock outcrop Surface soft with nil coarse fragments, loamy sand, massive/loose 7.5YR3/4 dark brown ASC Order, Kandosol	
C25	737427 7805178	7	Date, 28/10/2020 Native woodland, gently undulating plain, lower slope Limited clearing, No microrelief, No erosion Surface soft with nil coarse fragments, No rock outcrop ASC Order, Kandosol	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C26	738614 7806272	7	Date, 28/10/2020 Native woodland, gently undulating rises, upper slope 2% Slim Eucalypt species, No microrelief, No effective disturbance, natural, No erosion, No rock outcrop Surface soft with nil coarse fragments, loamy sand, massive/loose 10YR3/4 dark yellowish brown, Dry ASC Order, Kandosol	
C27	738928 7806579	7 / 1	Date, 28/10/2020 Native woodland, gently undulating plain, upper slope No effective disturbance, natural , No microrelief, No erosionSurface soft with nil coarse fragments, No rock outcrop Boundary between SPC MAP UNITs 7 and 1	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C28	741167 7804404	7	Date, 28/10/2020 Native woodland, gently undulating plain, lower slope 1-2% Slim Eucalypt species, No microrelief, No effective disturbance, natural, No erosion, No rock outcrop Surface soft with nil coarse fragments, loamy sand, massive/loose 7.5YR3/3 dark brown, Dry ASC Order, Kandosol	
C46	738790 7805303	7	Date, 29/10/2020 Native woodland, gently undulating plain, mid slope Mixed vegetation including eucalyptus species, no effective disturbance; natural, No microrelief, No erosion Surface soft with nil coarse fragments, No rock outcrop Loamy sand 7.5YR3/4 dark brown ASC Order, Kandosol	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C47	739247 7805862	1 / 7	Date, 29/10/2020 Native woodland, gently undulating plain, mid slope Eucalypt speciesincluding narrow leaved ironbarks , no effective disturbance; natural, No microrelief, No erosion Surface soft with nil coarse fragments, No rock outcrop Loamy sand 7.5YR3/4 dark brown Boundary between SPC 1 and 7	
C48	739239 7805983	1	Date, 29/10/2020 Native woodland, gently undulating plain, mid slope 1-2% Eucalypts species including Ironbarks, no effective disturbance; natural, No microrelief, No erosion Surface soft with nil coarse fragments, No rock outcrop	-
C49	739434 7806195	1	Date, 29/10/2020 Native woodland, gently undulating plain, open depression Eucalypt species including Ironbarks, limited clearing, No microrelief, No erosion Surface soft with nil coarse fragments, No rock outcrop Overbank of creek to the north	-

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C50	739561 7806340	1	Date, 29/10/2020 Native woodland, gently undulating plain, lower slope 1-2% No effective disturbance; natural, No microrelief, No erosion Surface soft with nil coarse fragments, No rock outcrop Loamy sand 10YR3/4 dark yellowish brown	-
C51	739563 7806558	1 / 5	Date, 29/10/2020 Native woodland, gently undulating rises, lower slope Ironbark located to the south, No effective disturbance; natural, No microrelief, No erosion Exposed bedrock observed Boundary between SPCs 1 and 5	-
C52	739864 7806522	5	Date, 29/10/2020 Native woodland, undulating rises, mid to upper slope No effective disturbance; natural, No microrelief, No erosion, No rock outcrop Surface soft with nil coarse fragments Loamy sand 10YR3/4 dark yellowish brown, nil inclusions	-
C53	739984 7806536	9	Date, 29/10/2020 Native woodland, undulating rises, upper slope 18% No effective disturbance; natural, No microrelief, No erosion Exposed bedrock observed 50-90% coverage	-

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C54	739582 7806869	5	Date, 29/10/2020 Native woodland, gently undulating rises, simple slope Ironbark No effective disturbance; natural, No microrelief, No erosion Surface soft with no coarse fragments, loamy sand, No rock outcrop Near to creek	-
C55	739848 7807747	1 / 5	Date, 29/10/2020 Native woodland, gently undulating rises, open depression, 2-5% coarse fragments 6-20mm No effective disturbance; natural, No microrelief, No erosion, No rock outcrop Boundary between SPCs 1 and 5	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C56	739841 7808524	5	Date, 29/10/2020 Native woodland, undulating low hills, lower slope Ironbark, No effective disturbance; natural, No microrelief, No erosion Surface soft with 2-5% coarse fragments 6-20 mm, No rock outcrop Termite mounds observed, brown/olive brown in colour	
C57	740121 7808489	9	Date, 29/10/2020 Tall, very sparse woodland, steep low rolling hills 13%, simple slope No effective disturbance; natural, No microrelief, No erosion Surface with 50-90% coarse fragments 0.6-2.0 m Exposed bedrock	-

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C58	739683 7808456	5	Date, 29/10/2020 Native woodland, undulating rises, lower slope No effective disturbance; natural, No microrelief , No erosion Small rise nearby wth rocky outcrop	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C59	739686 7808729	5	Date, 29/10/2020 Grazing, gently undulating rises, mid slope, gully Ironbark, No effective disturbance; natural, No microrelief, No erosion except cuting Surface with 20-50% coarse fragments, No rock outcrop Soil profile cutting observed	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C60	739740 7808715	5	Date, 29/10/2020 Gently undulating rises, crest Limited clearing, No microrelief, No erosion Surface hard setting with 10-20% coarse fragments 20-60 mm, No rock outcrop Top of crest with exposed bedrock observed approximately 50 m away	
C61	739470 7809017	1 / 5	Date, 29/10/2020 Native woodland, gently undulating plain Ironbark, No effective disturbance; natural, No microrelief, No erosion Surface loamy sand, 2-5% coarse fragments 6-20mm, No rock outcrop Boundary between SPC MAP UNITs 1 and 5	-

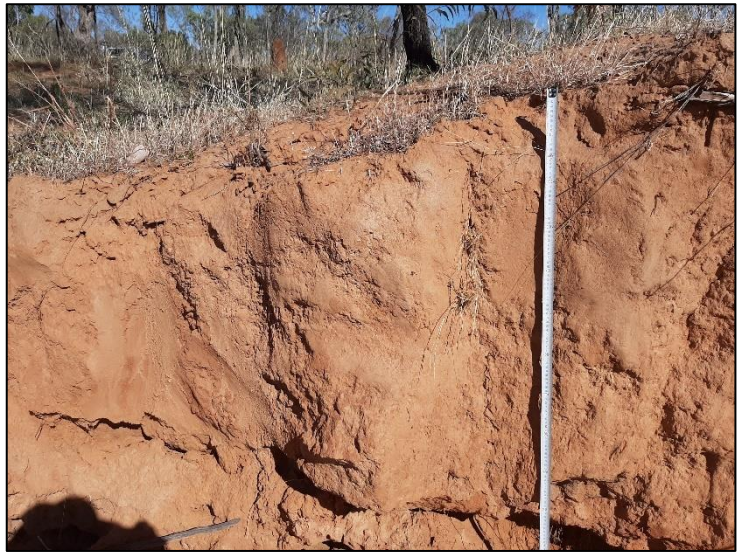
Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C62	739247 7808922	5	Date, 29/10/2020 Native sparse tall woodland consisting of Irongbark, gently undulating plain, open depression, drainage line No effective disturbance; natural, No microrelief, No erosion Surface loose sand, colour 7.5YR3/4 dark brown, <2% coarse fragments 6-20mm, No rock outcrop	
C63	739172 7808966	1	Date, 29/10/2020 Native woodland, gently undulating plain, lower slope Eucalypt species, Ironbark No effective disturbance; natural, No microrelief, No erosion, No rock outcrop Surface loamy sand, loose with nil coarse fragments, Colour 7.5YR 3/3 dark brown, dry Grey soils, near alluvial area	-

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C64	738861 7809162	4	Date, 29/10/2020 Native woodland, gently undulating plain, mid slope 1-2% No effective disturbance; natural, No microrelief, No erosion Surface soft, loamy sand with nil coarse fragments, No rock outcrop	
C65	738404 7808927	4	Date, 29/10/2020 Native woodland, gently undulating plain, upper slope No effective disturbance; natural, No microrelief, No erosion Surface form with nil coarse fragments, No rock outcrop	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C66	73799 7808478	4	Date, 29/10/2020 Native woodland, gently undulating plains, upper slope No effective disturbance; natural, No microrelief, No erosion Surface soft to firm, nil coarse fragments, No rock outcrop, loamy sand	
C67	738382 7808067	1	Date, 29/10/2020 Native woodland, gently undulating plain, open depression Ironbark, No microrelief, Limited clearing, No erosion Surface loose with nil coarse fragments, No rock outcrop, loamy sand to sand Drainage line	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C68	738694 7807733	4	Date, 29/10/2020 Grazing, gently undulating plain, flat Eucalypt species including Red Gum and minor Ironbark, Limited clearing, No microrelief, No erosion Surafce soft with nil coarse fragments, loamy sand, No rock outcrop 10YR4/4 dark yellowish brown	
C69	738877 7807538	1	Date, 29/10/2020 Native woodland, level alluvial plain, flat Pale grey eucalypt specie, no effective disturbance; natural, No microrelief, No erosion Surface soft with nil coarse fragments, loamy sand, No rock outcrop	-
C70	741932 7810308	1	Date, 30/10/2020 Native woodland, gently undulating plain, mid slope 1-2% No effective disturbance; natural, No microrelief , No erosionSurface soft Boundary with loamy sands to the north, minor cracking to the south, <2% coarse fragments 6-20mm, No rock outcrop	-

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C71	741176 7810182	8	Date, 30/10/2020 Native woodland with ironbark, rolling low hills, lower slope Nil microrelief, No effective disturbance; natural, No microrelief, No erosion Surface hard setting with 10-20% coarse fragments 20-60 mm, No rock outcrop	-
C72	741000 7809994	1	Date, 30/10/2020 Native woodland, rolling low hills, flat, gully Mixed vegetation, No effective disturbance; natural, No microrelief, No erosion Surface hard setting, nil coarse fragments, loamy sand, No rock outcrop	-

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C73	740685 7810080	1	Date, 30/10/2020 Native woodland, undulating plain, open depression No microrelief, No effective disturbance; natural, gully erosion Surface soft with nil coarse fragments, No rock outcrop Area appears light coloured in aerial imagery, minor red SCL at depth, unmappable, aggregated within surrounding SPC MAP UNIT • A11 / 0.00-0.20m / Abrupt boundary ○ Loam, massive, loose ○ Nil inclusions or segregations ○ 7.5YR3/3 dark brown, nil mottles ○ Dry, rapidly drained • A12 / 0.20-0.70m / Abrupt boundary ○ Loam, massive, loose ○ Nil inclusions or segregations ○ 7.5YR3/4 dark brown, nil mottles ○ Dry, rapidly drained, fine/few roots • B1 / 0.70-1.00m / EOBH ○ Sandy clay loam, massive, weak ○ Nil inclusions or segregations ○ 2.5YR4/8 red, nil mottles ○ Dry, well drained, nil roots	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C74	740767 7808634	9	Date, 30/10/2020 Native woodland, rolling rises Mixed vegetation, no effective disturbance; natural, No microrelief, No erosion Surface Hard setting with 50-90% coarse fragments 6-20 mm 13%, No rock outcrop Located near a despression between two hills (Site 29)	
C75	740731 7809020	1	Date, 30/10/2020 Native woodland, undulating rises, open depression Narrow leaved Ironbark, no effective disturbance; natural, No microrelief, No erosion, No rock outcrop Surface soft with nil coarse fragments, loamy sand 7.5YR3/4 dark brown	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C76	740700 7809464	1	Date, 30/10/2020 Native woodland, undulating rises, open dperession No effective disturbance; natural, No microrelief, No erosion, No rock outcrop Surface firm with >90% coarse fragments and rocks 0.6-2.0 m inlcuding exposed bedrock	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C77	737594 7807683	1	Date, 30/10/2020 Native woodland, undulating plain, open depression Ironbark, no effective disturbance; natural, No microrelief, No erosion, No rock outcrop Surface firm, cracking, loamy sand, nil coarse fragments 10YR4/3 brown Nil mottles or inclusions 	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C78	738368 7806826	5	Date, 30/10/2020 Native woodland, gently undulating plain, flat to lower slope Ironbark observed Linted clearing, No microrelief, No erosion, <2% coarse fragments 6-20mm, No rock outcrop Surface soft, loamy sand, massive, loose 10YR4/3 brown	
C79	738254 7806888	1 / 5	Date, 30/10/2020 Native woodland, undulating plain, upper slope Ironbark and mixed vegetation No effective disturbance; natural, No microrelief, No erosion Surface soft with 2-10% coarse fragments 6-20 mm, No rock outcrop Boundary between SPC MAP UNITs 1 and 5	-
C80	737629 7806565	7	Date, 30/10/2020 Native woodland, undulating rises, mid slope Mixed vegetation including eucalyptus species, no effective disturbance Surface soft with nil coarse fragments, No rock outcrop	-

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C81	737813 7806694	8	Native woodland, undulating rises, 8% No effective disturbance; natural, No microrelief, No erosion Surface soft with 20-50% coarse fragments 0.6-2.0 m Exposed bedrock on shallow red soils	
C82	737904 7806814	1	Date, 30/10/2020 Native woodland, undulating rises Mixed vegetation with Ironbark No effective disturbance; natural, No microrelief, No erosion Surface soft with nil coarse fragments, loamy sand, No rock outcrop 10YR3/4 dark yellowish brown	-

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C83	738254 7807330	1	Date, 30/10/2020 Grazing, level plain, flat Sparse vegetation No effective disturbance; natural, No microrelief, No erosion Surface cracking with nil coarse fragments, No rock outcrop Light clay 10YR4/2 dark greyish brown	
C84	738744 7808249	5 / 6	Date, 30/10/2020 Native woodland, level plain, flat No effective disturbance; natural, No microrelief, No erosion, No rock outcrop Boundary of clay soils to the north, SPCs 5 and 6	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C85	738804 7808422	5	Native woodland, undulating rises, crest No effective disturbance; natural, No microrelief, No erosion Surface hard setting woth 20-50% coarse fragments 60-200 mm, No rock outcrop Shallow red soils with bedrock exposed	
C86	738945 7808633	6	Date, 30/10/2020 Native woodland including ironbarks, level plain, flat Short grass, Limited clearing, No microrelief, No erosion Surface firm, silty clay loam, <2% coarse fragments 6-20mm, No rock outcrop 7.5YR5/4 brown, nil mottles	-
C87	739090 7808891	6 / 1	Date, 30/10/2020 Native woodland including ironbarks, gently undulating plain, flat Limited clearing, No microrelief, No erosion, No rock outcrop Surface firm with nil coarse fragments, sandy loam 7.5YR3/4 dark brown Near to boundary between surface soils with silty clay loam and sandy loam, SPC MAP UNITs 6 and 1	-

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C91	740728 7805614	1	Date, 31/10/2020 Native woodland, gently undulating rises, mid slope Slim Eucalypt species, No effective disturbance; natural, No microrelief, No erosion, No rock outcrop Surface soft loamy sand with nil coarse fragments 10YR3/4 dark yellowish brown	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C92	740363 7805820	2	Date, 31/10/2020 Native woodland, gently undulating rises No effective disturbance; natural, No microrelief, No erosion, No rock outcrop Narrow leaved ironbark and gilbert river box • A11 / 0.00-0.13m / Abrupt boundary • Loamy sand • 10YR3/2 very dark greyish brown • Nil inclusions • A12 / 0.13-0.30 + / Abrupt boundary • Loamy sand • 10YR3/4 dark yellowish brown • Nil inclusions	

Site No.	Location mE, mN (GDA2020 Zone 54)	Soil Profile Class Map Unit	Comments	Plates
C93	739702 7806139	1	Date, 31/10/2020 Native woodland, level plain, open depression, <2% coarse fragments 6-20mm Red-grey pale eucalypts species , No effective disturbance, natural, No microrelief, Gully erosion, No rock outcrop Surface loose, sand-sandy loam Creek bed No effective disturbance, natural	
C94	739338 7806207	1	Date, 31/10/2020 Native woodland, undulating rises, open depression, lower slope, <2% coarse fragments 6-20mm Limited clearing, No microrelief, Gully erosion, No rock outcrop Boundary of a small, aggregated area of red rocky shallow soils to the north west No effective disturbance, natural	

ESSA Pty Ltd / by EAL NATA (ASPAC certified)

For Info Refer ESSA Pty Ltd
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References: K0695 Sheet 1 of 4

Date Received: 17/11/2020
Date Completed: 08/01/2021

FINAL REPORT

Project:
Project -20WG

All results in this report relate only to the items tested. Results are expressed on an "as received basis".

Client Name: GT Environmental
Contact: Mr Reece Mc Cann
Sample Type: Soil

Number of samples: 40 Tested Report K0695

ESSA /EAL Pty Ltd **(NATA, ASPAC Approved)**

Soil Analysis Report
Batch Numbers:K0695

Client: GTE 20WG- Results Page 1 of 2

ESSA Ref	Field Ref	Soil pH	Soil EC	Soil Cl	Exch.Ca	Exch.Mg	Exch. K	Ech. Na	CEC	ESP	Ca/Mg	Cation
	depth (m)	H20	dS/m	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%Na/CEC	Ratio	Method
K0695/1	**1-0.00-0.10**	6.62	0.024	31	4.3	1.14	1.01	<0.065	6.5	1	3.7	15D3
K0695/2	**1-0.20-0.30**	5.95	0.190	32	5.3	1.24	0.23	0.09	6.8	1	4.3	15D3
K0695/3	**1-0.50-0.60**	6.27	0.057	50	2.0	0.44	<0.12	<0.065	2.6	2	4.5	15D3
K0695/4	**1-0.75-0.85**	6.45	0.041	14	1.5	0.38	<0.12	<0.065	2.0	2	4.0	15D3
K0695/5	**1-0.90-1.00**	6.41	0.026	33	1.5	0.40	<0.12	<0.065	2.0	2	3.7	15D3
K0695/6	**2-0.00-0.10**	6.35	0.043	71	3.6	0.63	0.43	0.08	4.8	2	5.8	15D3
K0695/7	**2-0.20-0.30**	8.52	0.099	102	1.0	0.51	0.16	0.44	2.1	20	2.0	15C1
K0695/8	**2-0.50-0.60**	10.19	0.509	79	0.5	0.24	0.04	2.50	3.2	77	1.9	15C1
K0695/9	**2-0.70-0.80**	10.12	0.393	101	0.3	0.17	0.04	2.39	2.9	83	1.6	15C1
K0695/10	**2-0.90-1.00**	10.08	0.378	132	0.2	0.14	0.06	2.62	3.0	88	1.1	15C1
K0695/11	**3-0.00-0.10**	5.20	0.047	20	0.5	0.24	0.14	<0.065	1.3	1	1.9	15D3
K0695/12	**5-0.00-0.10**	6.26	0.067	11	2.6	0.32	0.19	<0.065	3.1	0	8.1	15D3
K0695/13	**5-0.25-0.30**	7.82	0.013	22	1.3	0.24	0.17	0.05	1.8	3	5.4	15C1
K0695/14	**5-0.50-0.60**	8.11	0.015	42	1.2	0.31	0.13	0.01	1.6	1	3.8	15C1
K0695/15	**5-0.70-0.80**	8.06	0.017	13	1.5	0.47	0.23	0.02	2.2	1	3.3	15C1
K0695/16	**5-0.90-1.00**	7.99	0.021	11	2.0	0.63	0.33	0.02	2.9	1	3.1	15C1
K0695/17	**6-0.00-0.10**	6.64	0.014	17	2.1	0.56	0.27	<0.065	2.9	0	3.8	15D3
K0695/18	**6-0.10-0.20**	6.77	0.015	8	1.1	1.34	0.16	0.31	2.9	11	0.8	15D3
K0695/19	**6-0.30-0.40**	6.18	0.010	11	0.7	0.81	0.19	0.09	1.8	5	0.9	15D3
K0695/20	**7-0.00-0.10**	8.14	0.084	94	6.9	4.36	0.48	1.24	13.0	10	1.6	15C1
K0695/21	**7-0.20-0.30**	7.88	4.092	3793	7.4	5.65	0.24	3.98	17.3	23	1.3	15C1
K0695/22	**7-0.50-0.60**	8.16	4.843	3222	5.9	4.90	0.21	4.89	15.9	31	1.2	15C1
K0695/23	**7-0.70-0.80**	8.51	2.980	2160	3.9	3.47	0.16	3.67	11.2	33	1.1	15C1
K0695/24	**7-0.90-1.00**	8.74	1.464	1211	1.8	2.20	0.14	2.68	6.8	39	0.8	15C1
K0695/25	**18-0.00-0.10**	5.97	0.024	25	1.3	0.23	<0.12	<0.065	1.6	0	5.5	15D3
K0695/26	**18-0.20-0.30**	6.37	0.009	29	0.6	0.26	<0.12	0.12	1.0	11	2.3	15D3
K0695/27	**18-0.50-0.60**	5.89	0.004	27	0.2	0.20	<0.12	<0.065	0.5	3	1.2	15D3
K0695/28	**18-0.80-0.90**	5.84	0.003	23	0.3	0.26	<0.12	<0.065	0.6	2	1.0	15D3
K0695/29	**18-1.10-1.20**	5.83	0.002	22	0.2	0.49	<0.12	<0.065	0.8	1	0.5	15D3
K0695/30	**18-1.40-1.50**	5.80	0.002	10	0.1	0.69	<0.12	<0.065	0.9	1	0.2	15D3
K0695/31	**22-0.00-0.10**	5.04	0.014	70	0.3	0.14	<0.12	<0.065	1.2	0	2.3	15D3
K0695/32	**22-0.20-0.30**	4.58	0.015	8	<0.05	0.03	<0.12	<0.065	0.1	6	1.2	15D3
K0695/33	**22-0.50-0.60**	4.68	0.011	8	<0.05	0.05	<0.12	<0.065	0.1	5	0.9	15D3
K0695/34	**22-0.70-0.80**	4.99	0.005	9	<0.05	0.16	<0.12	<0.065	0.2	6	0.1	15D3
K0695/35	**24-0.00-0.10**	7.62	0.132	24	8.1	1.52	0.36	0.04	10.0	0	5.3	15C1
K0695/36	**24-0.20-0.30**	7.36	0.025	13	1.7	0.58	0.21	0.04	2.6	2	3.0	15C1
K0695/37	**24-0.40-0.50**	7.39	0.013	16	1.6	0.95	0.33	0.02	2.9	1	1.7	15C1
K0695/38	**29-0.00-0.10**	6.76	0.011	11	2.7	0.95	0.25	<0.065	3.9	0	2.9	15D3
K0695/39	**29-0.20-0.30**	6.67	0.011	9	3.5	1.93	0.19	<0.065	5.6	1	1.8	15D3
K0695/40	**31-0.00-0.10**	5.55	0.069	34	0.1	1.30	<0.12	0.39	2.5	16	0.1	15D3

ESSA Ref	field ref	Zinc	Mn	Iron	Copper	Boron	Si	Tot C	Org Matter	P Col.	NO3	NH4
	depth (m)	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	mg/kg	mg/kg	mg/kg
K0695/1	**1-0.00-0.10**	2.4	42	29	0.40	0.21	40	1.3	1.3	27	2.1	4.2
K0695/6	**2-0.00-0.10**	2.4	20	93	0.3	0.33	37	2.21	2.21	16	7.8	4.0
K0695/11	**3-0.00-0.10**	<0.5	6	75	0.1	0.11	6	1.11	1.11	17	15.2	10.4
K0695/12	**5-0.00-0.10**	1.1	12	14	0.3	0.23	19	0.59	0.70	17	28.2	6.3
K0695/17	**6-0.00-0.10**	0.8	11	22	0.2	0.25	13	0.97	0.97	14	0.8	1.2
K0695/20	**7-0.00-0.10**	0.6	8	9	1.3	0.42	63	0.44	0.44	17	2.2	0.2
K0695/25	**18-0.00-0.10**	<0.5	12	36	0.2	<0.1	12	0.69	0.77	12	5.8	2.0
K0695/31	**22-0.00-0.10**	<0.5	2	82	<0.1	0.10	4	1.07	1.14	11	3.9	0.2
K0695/35	**24-0.00-0.10**	2.0	8	16	0.3	0.46	30	3.87	3.87	19	33.1	1.1
K0695/38	**29-0.00-0.10**	<0.5	11	5	<0.1	<0.1	17	0.43	11 (OC)	4.5	0.6	2.6
K0695/40	**31-0.00-0.10**	<0.5	6	28	0.2	<0.1	14	0.39	0.39	13	1.4	4.2

Cu = Copper, Si = Silicon, P Col. = P by Colwell, NO3 = Nitrate N , NH4 = Ammonium N

ESSA /EAL Pty Ltd **(NATA, ASPAC Approved)**

Soil Analysis Report
Batch Numbers:K0695

Client: GTE 20WG- Results Page 2 of 2

ESSA Ref	field ref	Tot Sulfur	Soil pH CaCl2	Soil pH H2O	Tot N	SO4S	C/N
	depth (m)	mg/kg	0.01M		%	mg/kg	Rat.
K0695/1	1-0.00-0.10	<50	5.4	6.6	0.04	1.4	29
K0695/6	2-0.00-0.10	103	5.5	6.4	0.14	2.6	16
K0695/11	3-0.00-0.10	<50	4.6	5.2	0.04	3.0	27
K0695/12	5-0.00-0.10	<50	5.6	6.3	0.04	1.1	18
K0695/17	6-0.00-0.10	<50	5.8	6.6	0.06	1.1	18
K0695/20	7-0.00-0.10	<50	7.0	8.1	0.03	10.8	16
K0695/25	18-0.00-0.10	<50	5.1	6.0	0.02	3.8	34
K0695/31	22-0.00-0.10	<50	4.4	5.0	0.04	1.3	28
K0695/35	24-0.00-0.10	154	7.1	7.6	0.23	4.8	17
K0695/38	29-0.00-0.10	3	5.6	6.76	0.03	3.1	14
K0695/40	31-0.00-0.10	<50	4.5	5.6	<0.02	2.6	21

Lab No	Sample No	Moisture	Gravel	Sand	Sand	Silt	Silt	Clay	Texture	R1	Emerson
	Depth (m)	Content	> 2 mm	> 50 µm	> 20 µm	2−50 µm	2−20 µm	< 2 µm	Class	Disp.	Class no.
		%		<2mm	<2mm	<2mm	<2mm	<2mm		Rat.	
K0695/1	1-0.00-0.10	1	0	60	71	25	14	15	Loam	0.53	5
K0695/2	1-0.20-0.30	1	0	65	71	20	14	15	Loam	0.58	5
K0695/3	1-0.50-0.60	0	0	81	86	9	4	11	S Loam	0.39	5
K0695/4	1-0.75-0.85	0	0	85	87	7	4	9	S Loam	0.37	8
K0695/5	1-0.90-1.00	0	0	85	87	8	5	7	LSand	0.32	8
K0695/6	2-0.00-0.10	0	0	84	87	7	4	9	S Loam	0.32	8
K0695/7	2-0.20-0.30	0	0	82	87	11	6	7	Loamy Sand	0.40	1
K0695/8	2-0.50-0.60	1	0	69	76	12	5	19	S Loam	0.62	1
K0695/9	2-0.70-0.80	0	0	71	76	10	5	19	S Loam	0.60	1
K0695/10	2-0.90-1.00	0	0	73	77	8	3	20	Sandy Clay Lo	0.62	1
K0695/11	3-0.00-0.10	0	0	92	92	0	0	8	S Loam	0.04	8
K0695/12	5-0.00-0.10	0	0	83	89	11	5	6	LSand	0.34	8
K0695/13	5-0.25-0.30	0	0	85	93	9	0	7	Sand	0.36	8
K0695/14	5-0.50-0.60	0	0	86	91	6	1	8	Sand	0.49	8
K0695/15	5-0.70-0.80	0	0	79	84	8	2	13	S Loam	0.50	8
K0695/16	5-0.90-1.00	0	0	71	77	9	3	20	SC Loam	0.52	8
K0695/17	6-0.00-0.10	0	0	87	91	6	2	7	Sand	0.36	8
K0695/18	6-0.10-0.20	1	0	66	73	14	7	20	SC Loam	0.53	2
K0695/19	6-0.30-0.40	0	0	76	81	12	7	12	S Loam	0.53	8
K0695/20	7-0.00-0.10	2	0	42	51	28	20	29	Clay Loam	0.52	2
K0695/21	7-0.20-0.30	2	0	23	33	40	29	38	SC Loam	0.34	1
K0695/22	7-0.50-0.60	2	0	17	29	41	29	42	Silty Clay	0.43	1
K0695/23	7-0.70-0.80	1	0	30	42	37	25	33	Clay Loam	0.63	1
K0695/24	7-0.90-1.00	1	0	57	66	17	8	26	Clay Loam	0.54	1
K0695/25	18-0.00-0.10	0	0	91	90	0	1	9	S Loam	0.26	8
K0695/26	18-0.20-0.30	0	0	87	89	2	1	10	S Loam	0.68	8
K0695/27	18-0.50-0.60	0	0	83	87	5	1	12	S Loam	0.36	8
K0695/28	18-0.80-0.90	0	0	81	82	2	1	17	S Loam	0.37	8
K0695/29	18-1.10-1.20	0	0	79	80	2	1	19	SC Loam	0.19	8
K0695/30	18-1.40-1.50	0	0	75	77	2	1	22	SC Loam	0.14	8
K0695/31	22-0.00-0.10	0	0	87	87	1	1	12	S Loam	0.41	8
K0695/32	22-0.20-0.30	0	0	74	73	4	4	23	SC Loam	0.47	8
K0695/33	22-0.50-0.60	0	0	65	67	5	4	29	SC Loam	0.39	8
K0695/34	22-0.70-0.80	0	0	64	67	11	8	25	Clay Loam	0.38	8
K0695/35	24-0.00-0.10	1	0	78	82	7	4	14	S Loam	0.23	5
K0695/36	24-0.20-0.30	0	0	83	89	7	0	10	S Loam	0.21	8
K0695/37	24-0.40-0.50	0	0	83	85	6	3	12	S Loam	0.26	8
K0695/38	29-0.00-0.10	1	0	81	86	10	5	9	S Loam	0.39	8
K0695/39	29-0.20-0.30	1	0	72	79	11	4	17	S Loam	0.46	8
K0695/40	31-0.00-0.10	0	0	62	69	15	9	22	SC Loam	0.53	8

Texture Codes S = Sandy, L= Loamy, C = Clay

ESSA / EAL Pty Ltd (Nata ASPAC Approved)

METHOD DESCRIPTIONS

Soil

Methods used to Analyse Samples

Analyte	ALHS*	Uncertainty %	LOQ	Unit	Name	Method Description
pH	4A1	1.1	0.1	pH	pH	1:5 water extr, pH meter
EC	3A1	5.4	0.01	dS/m	Electrical conductivity	1:5 water extr, EC meter
Cl	5A2	10.0	10.0	mg/kg	Chloride	1:5 water extr, (AA) colorimetric
NO3-N	7C2	6.7	1.0	mg/kg	Nitrate-nitrogen	1:5 water extr, (AA) colorimetric
NH4-N	7C2	7.8	0.6	mg/kg	Ammonium-nitrogen	1M KCl extr, (AA) colorimetric
Bicarb.P	9B2	16.8	1.0	mg/kg	Bicarb.ext.phosphorus	0.5M NaHCO3 @ pH 8.5, (AA) colorimetric
Exch.Ca	15B/C1	7.2	0.18	meq/100g	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.Mg	15B/C1	4.7	0.31	meq/100g	Exchangeable magnesium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.Na	15B/C1	9.6	0.09	meq/100g	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.K	15B/C1	4.8	0.02	meq/100g	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Org Matter	NA				Leco Furnace	Trimac Furnacew
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity	KNO3 + Ca(NO3)2 extr, (AA) colorimetric
ADMC	2A1	11.9	0.4	%	Air Dried Moisture Content	Gravimetric oven dry @ 105C
R1	NA	20.2	NA		Dispersion Ratio	Ratio [Aqueous dispersible (Silt + Clay):Total (Silt + Clay)]
SO4-S	10B3	11.5	0.6	mg/kg	Sulfate sulfur	Ca(H2PO4)2 @ pH 4.0 extractable sulfate-sulfur, ICPOES
Sand	no ref	22.1	1.0	%	Particle size, sand	Hydrometer, gravimetric & Sieve
Silt	no ref	16.6	1.0	%	Particle size, silt	Hydrometer, gravimetric
Clay	no ref	12.7	1.0	%	Particle size, clay	Hydrometer, gravimetric
PBI	Moody			Index	P Buffer Index	PBI Cirrected for Colwell P

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

For Manager Analytical Services: **D E Baker BSc MASSSI**

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.

Soluble Salts included in Exchangeable Cations - Except PRE-WASHED (if EC>0.3dS/m).

ESSA / EAL Pty Ltd(NATA ASPAC Approved)

QUALITY CONTROL DATA

Soil

Reference: K0695

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

Test Method	Units		Actual Value	Acceptance Criteria [Range]
pH	pH	B		5.0 - 5.3
EC	dS/m	B		0.27 - 0.32
Cl	mg/kg	B		10 - 35
NO3-N	mg/kg	B		10 - 16
NH4-N	mg/kg	NA		NA
Bicarb.P	mg/kg	B		51 -75
Total Kjeldahl N	%	ASPAC 34	0.110	.100 - .120
Total P	%	ASPAC 34	0.02	.019 - .021
Organic Carbon	%	B		1.82 - 2.3
Ca (Exch. cations)pH7	meq/100g	B		6.96 - 8.04
Mg (Exch. cations)pH7	meq/100g	B		1.88 - 2.22
Na (Exch. cations)pH7	meq/100g	B		.057 - .182
K (Exch. cations)pH7	meq/100g	B		1.209 - 1.411
Exch. Acidity	meq/100g			NA
ECEC	meq/100g	A		NA
CEC	meq/100g	S12		58 - 73
ESP	%	A		NA
Coarse sand	%	B	17.0	17.3 - 22.4
Fine Sand	%	B	22.0	20.0 - 25.7
Silt	%	B	16.0	10.5 - 19.8
Clay	%	B	44.0	37.9 - 48.9
R1		B		0.23 - 0.38

Test Method	Units	Test Soil	Actual Value	Acceptance Criteria [Range]
DTPA-Cu	mg/kg	SB		2.37 - 3.25
DTPA-Zn	mg/kg	SB		3.15 - 3.81
DTPA-Mn	mg/kg	SB		97.7 - 149.0
DTPA-Fe	mg/kg	SB		24.3 - 32.6
0.33 Bar	%	G		32 - 51
15 Bar	%	G		23 - 30
Ca (Exch. cations)pH8.5	meq/100g	S12		27.7 - 35.4
Mg (Exch. cations)pH8.5	meq/100g	S12		22.88 - 24.5
Na (Exch. cations)pH8.5	meq/100g	S12		2.0 - 2.28
K (Exch. cations)pH8.5	meq/100g	S12		1.64 - 2.09

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APPENDIX E

Central WRD Conceptual Design Report

STRATEGIC MINERALS CORPORATION

REPORT

STRATEGIC MINERALS CORP

BIG VEIN SOUTH

Revised Integrated Waste Landform Concept Study

261273 R01
July 2026



TAILINGS.WATER.WASTE.

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TAILINGS.WATER.WASTE.

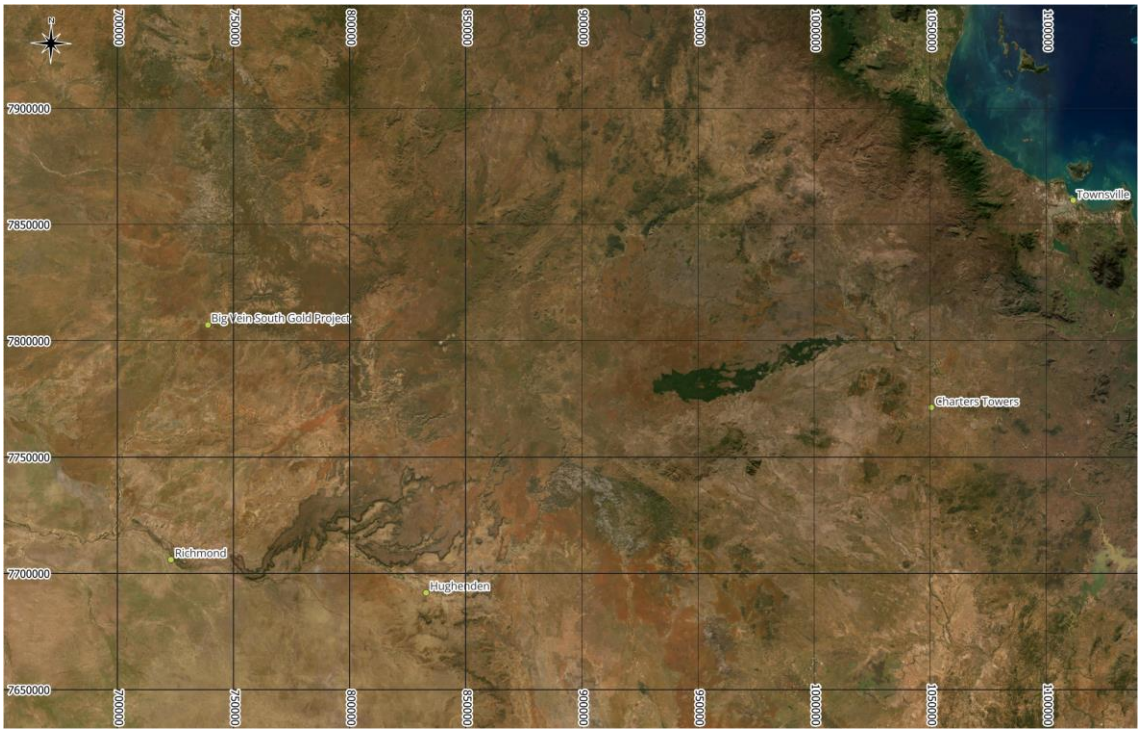
1 INTRODUCTION

1.1 Background

Strategic Minerals Corporation Pty Limited (**SMC**) is developing the Big Vein South Gold Project (**BVS**), located 130 km north of Richmond and 380 km west of Townsville in north-west Queensland. A location plan for the Site is shown in **FIGURE 1**.

The proposed development includes an open-cut mining operation that would extract up to 1.95 MT of gold bearing ore per annum, over an 11-year Life-Of-Mine (**LOM**). Oxide ores extracted during the first two (2) years of operations would be treated by heap leaching. Transition and primary ores would be treated in a Carbon-In-Leach (**CIL**) circuit from year three (3) through to the end of LOM.

FIGURE 1: LOCATION PLAN



1.2 Purpose and Technical Requirements

1.2.1 Previous Studies

In developing the BVS project, SMC has engaged specialist service providers to complete various investigations, studies and assessments. Studies used to inform this Assessment include:

- Hansen Environmental Consulting (Dec 2024): Environmental Assessment Report (**EAR**),
- SMC (Undated): Mine Materials Management Plan (**MMMP**), and
- RGS (Nov 2025): Geochemistry Report for the Big Vein South Gold Project (**RGS 2025**).

SMC engaged ATC Williams Pty Limited (**ATCW**) to define and assess the Integrated Waste Landform Concept in 2025. The Study was documented as:

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- ATCW (April 2025): Big Vein South, Integrated Waste Landform Concept Study (**IWL Concept Study**).

The IWL Concept Study was submitted to the Queensland Department of Environment, Tourism, Science and Innovation (**DETSI**) for assessment pursuant to the Queensland Environmental Protection Act (1994) and Regulation (2019). DETSI issued a Request For Information (**RFI**) dated 20 June 2025 that included items related to the IWL Concept Study.

This Revised IWL Concept Study has been prepared in response to the RFI.

1.2.2 Technical Requirements

Technical requirements and frameworks applicable to this Study include:

- International Network for Acid Prevention (2009): Global Acid Rock Drainage Guide (**GARD**),
- Australian Government (Sept 2016): Tailings Management, Leading Practice Sustainable Development Program for the Mining Industry (**DFAT 2016**),
- M. Hawley and J. Cunning (2017): Guidelines for Mine Waste Dump and Stockpile Design (**CSIRO 2017**), and
- Australian National Committee on Large Dams (2020): Guidelines on Tailings Dams (Planning, Design, Construction, Operation and Closure) (**ANCOLD 2019).**

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2 BVS DEVELOPMENT CONCEPT

2.1 Climate

The climatic conditions at the Site were reported by Hansen 2024. Average annual rainfall is reported as 688.9 mm and average annual net evaporation as 1,338 mm.

The nearest Bureau of Meteorology Data weather station with significant rainfall data is Gilberton Station (030019) which is located 84.6 km from the Site. The Köppen Geiger classification system describes the Site as Grassland (B_{SH}, hot, winter drought) and Subtropical (C_{SB}, distinctly dry winter).

2.2 Geology

2.2.1 Regional Geology

The regional geology of the Site was reported by Hansen 2024 and RGS 2025.

The BVS is located in the northern sector of the Eromanga Basin which overlies the Proterozoic basement rocks of the North Australian Craton. Key stratigraphic units proximal to the Site include (in descending order):

- Alluvial units (Quaternary to recent, associated with erosion of Mesozoic sandstone cap rocks),
- Eromanga sediments (Mesozoic era, weathering up to 40 m),
- Basement rocks (Proterozoic era, weathering up to 40m).

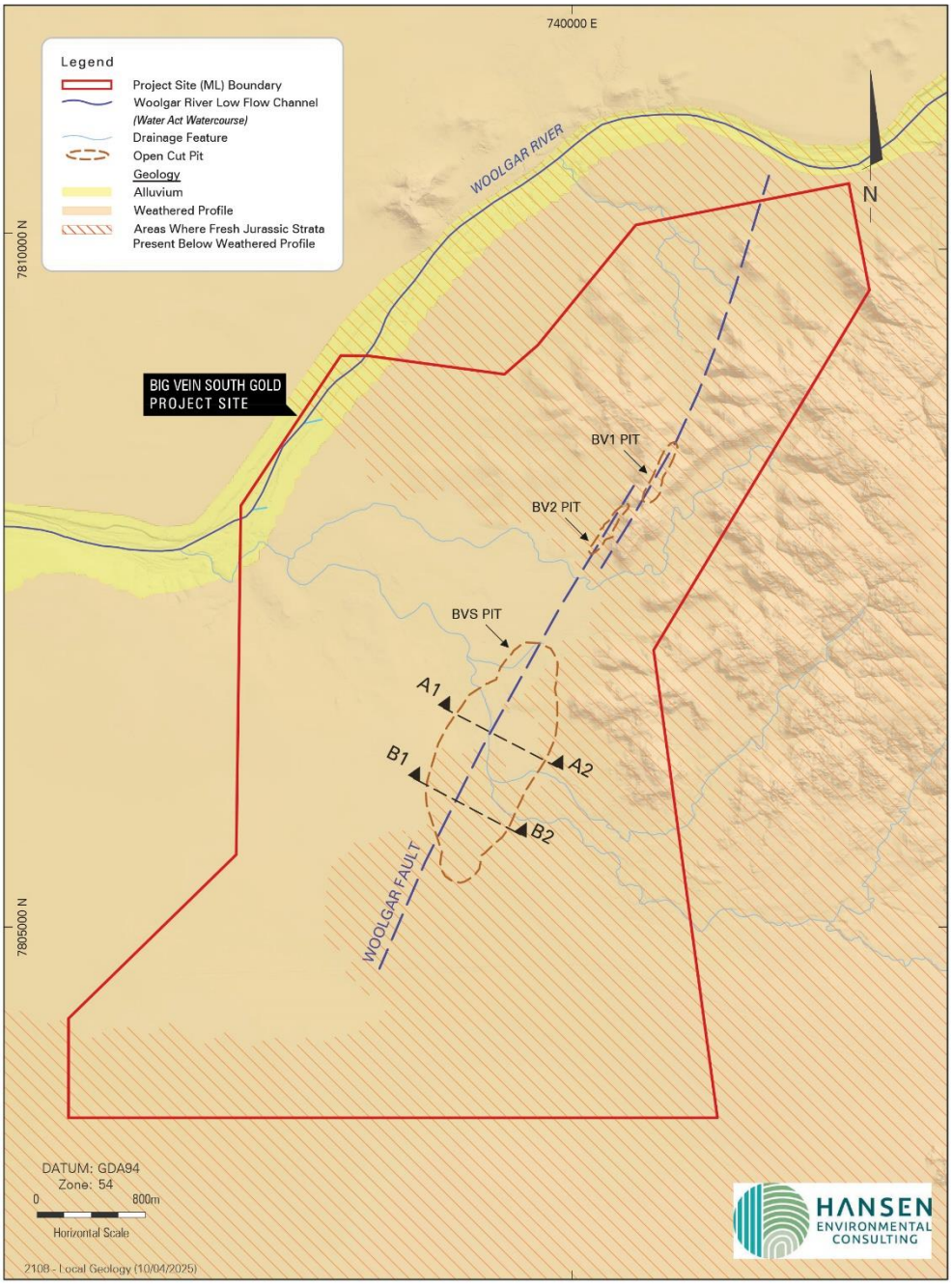
The Eromanga sediments include sandstones, shales and mudstones which were deposited during the Mesozoic era. The Proterozoic basement rocks are predominantly the Einasleigh metamorphics which comprise a package of granites, gneiss, granofels and amphibolite.

2.2.2 Mine Geology

Outcrop geology of the Site at 1 : 50,000 scale was prepared by SMC and is presented as **FIGURE 2**. The Site is dominated by the Woolgar Fault which is a major, long-lived fault system trending north-northeast to the south-southwest.

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FIGURE 2: OUTCROP GEOLOGY



Mineralisation at the Site is a shear-hosted, mesothermal style gold deposit that formed within the Proterozoic rocks along the Woolgar Fault.

The mineralisation-related veining at BVS consists of irregular, sheared, syn-mineral, euhedral bucky white quartz variably overprinted by a later more brittle event, bringing new quartz, and sulphides. The best mineralisation is hosted in the overprinted quartz, displaying vein textures including comb and stylo-breccia. Sulphide is dominated by a pyrite-galena-sphalerite assemblage, with minor chalcopyrite and very weak pyrrhotite. In essence, the gold mineralisation and introduction of sulphides are contemporaneous, and hence sulphides are constrained to the major minable ore zones. The ore zone is considerably broader in the central to northern portion of the deposit (**FIGURE 3)**. Mesozoic sedimentary cover increases to the south and the overall ore zone thins and steepens (**FIGURE 4**).

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A small (less than 5m thick) discontinuous dolerite dyke is observed on some drill sections (A1-A2). The dyke is sometimes referred to as the “Hanging Wall Dolerite” but is not mineralised. On occasion the dolerite has sheared clayey margins and carries minor pyrite.

The proposed BV1 and BV2 satellite open pits encapsulate small shallow identified mesothermal quartz vein gold resources hosted in the Basement metamorphics along the Woolgar Fault. The mode of mineralisation is similar to the BVS deposit, but less volumetrically significant due to diminished fracturing of the host rocks. The local terrain at BV1 and BV2 is more topographically incised than that at BVS.

Carbonaceous or black shales (Toolebuc formation) are not encountered at the Site.

FIGURE 3: BVS GEOLOGICAL SECTION A

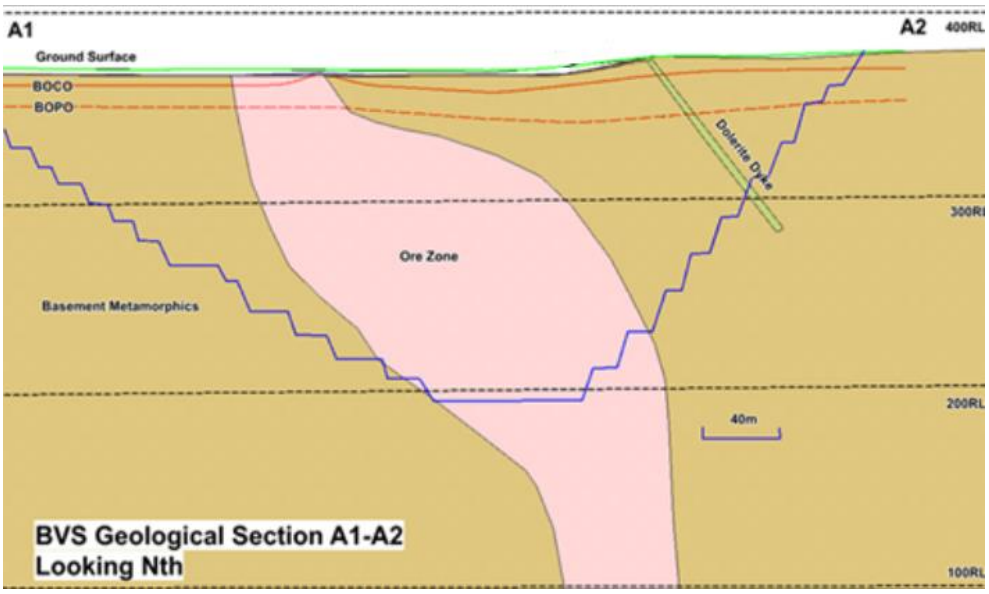
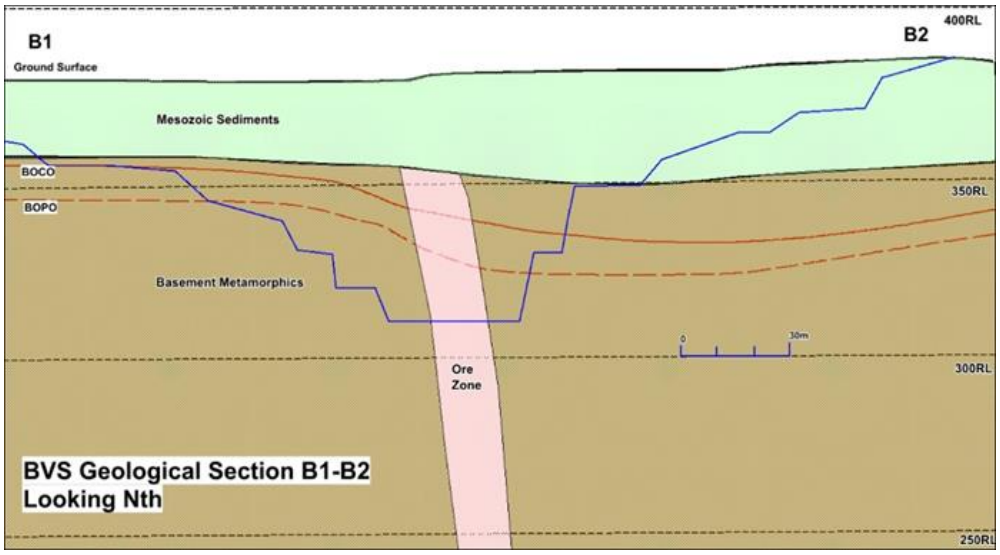


FIGURE 4: BVS GEOLOGICAL SECTION B



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2.3 Development Program

2.3.1 Mining Operations

Mining operations at the Site would include development of up to three (3) open pits using conventional drill and blast, load and haul methods. The proposed pits are:

- Big Vein 1,
- Big Vein 2, and
- Big Vein South.

Life of Mine (**LOM**) production of ore and waste rock was provided by SMC and is summarised in **TABLE 1**. Geochemical risk (reactive capacity) is interpreted from RGS 2025. Assessment of the waste rock inventory has identified that the stream would comprise predominantly Non-Acid Forming (**NAF**) waste rock with minor quantities Potentially Acid Forming (**PAF**) rock units. Gold bearing ore extracted during the initial years of operation would be dominated by Oxide. Ore extracted in later years would be predominantly Transition/Fresh.

TABLE 1: LIFE OF MINE WASTE ROCK INVENTORY

Mining Unit		Code	Quantity**	Reactive Capacity
Ore Zone	Oxide Ore	OO	2 MT	NAF
	Transition/Fresh Ore	OF	18 MT	PAF (Nil to moderate)
Waste – Ore Zone	Ore Zone Waste	WOZ	2 MT	PAF (Nil to moderate)
Waste - Bulk Zone	Basement Metamorphics	WBM	40 MT	NAF
	Mesozoic Sediments	WMS	90 MT	NAF
	Hanging Wall Dolerites	WHD	< 1 MT	PAF (Nil to low)

** Strategic Minerals Corporation

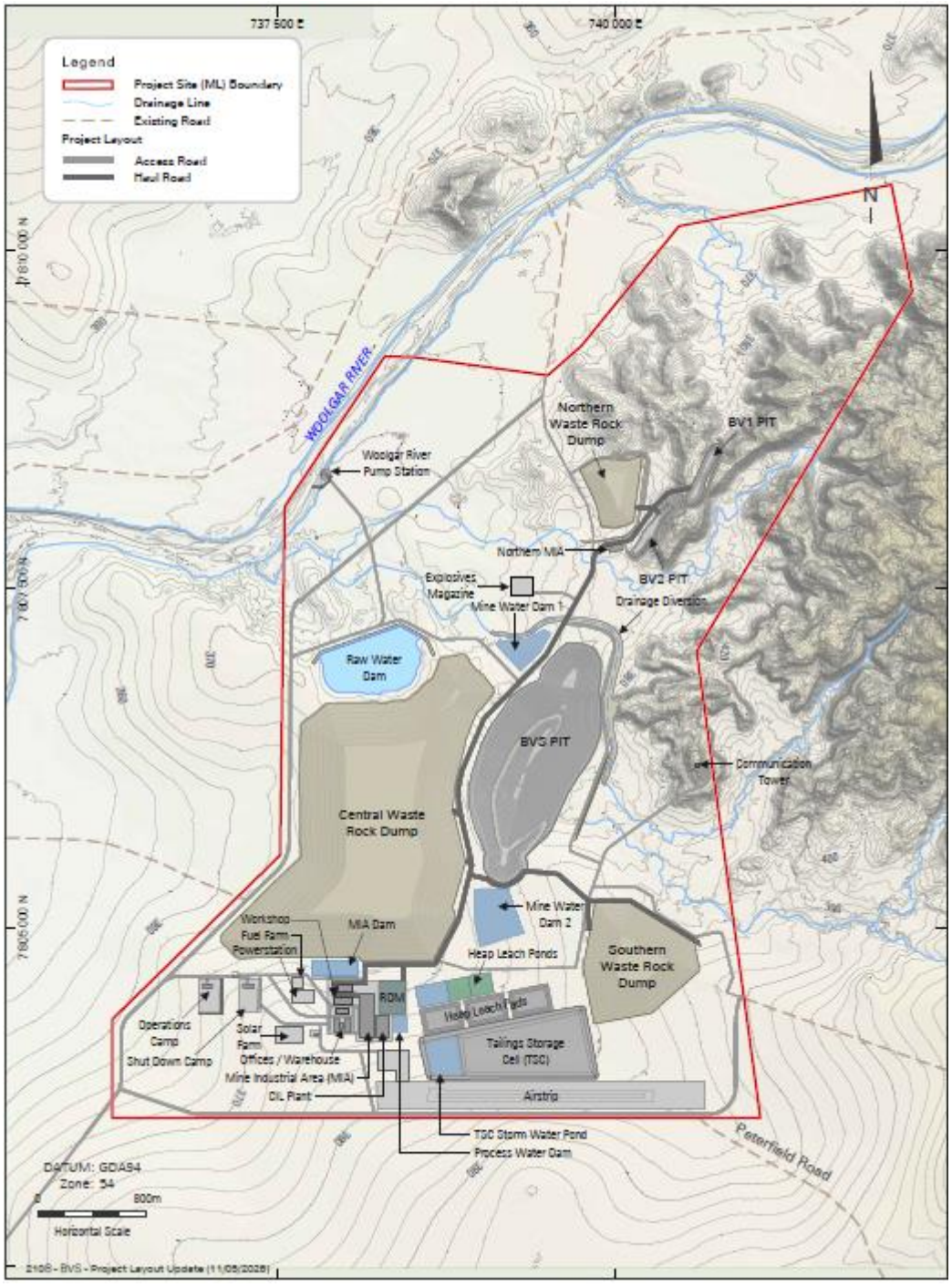
BVS is expected to generate over 130 MT of waste rock over the LOM that would be emplaced in one of three (3) Waste Rock Dumps (**WRD's**) known as:

- Northern WRD (**NWRD**),
- Central WRD (**CWRD**), and
- Southern WRDs (**SWRD**).

SMC proposes to emplace approximately 110 MT of the waste rock inventory at the CWRD with the remainder emplaced at the NWRD and SWRD. Development of the Site would occur over an 11-year LOM. The final landform at the end of project Year 11 is presented in **FIGURE 5**.

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FIGURE 5: PROJECT LAYOUT YEAR 11



2.3.2 Processing Operations

2.3.2.1 Years 1 - 3

Gold bearing ores extracted during the first two (2) to three (3) years of operations would be dominated by Oxide and would be treated by heap leaching. This would include crushing and stockpiling on low permeability pads before being irrigated with a solution of dilute sodium cyanide. Cyanide soluble gold extracted by the heap leach operation would then be collected and recovered at the gold circuit.

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Gold bearing ores extracted during the later stages of the LOM would be predominantly Transition/Fresh and would be treated in a CIL plant that would be commissioned in Year 3. Process tailings generated by the CIL plant would be thickened using a conventional thickener and treated to destroy residual cyanide.

The BVS LOM plan includes development of a paddock style Tailings Storage Facility (**TSF**). Process tailings generated by the CIL plant during Years 3 and 4 would be pumped to the TSF for slurry discharge and solids settlement. Tailings bleed water along with any rainfall runoff would report to a decant pond before being pumped back to the processing operation for reuse.

2.3.2.2 Years 4 - 11

The BVS LOM plan also includes commissioning of a tailings filtration plant in Year 4 that would dewater the CIL tailings to yield a spadeable cake. Gold bearing ores would continue to be treated at the CIL plant but the tailings management strategy would largely transition to a filtered tailings approach.

The dewatered tailings cake would drop into one or more bunkers located beneath the filter frames and loaded into haul trucks with front end loaders. The dewatered tailings would then be hauled to the Integrated Waste Landform (**IWL**) for Co-placement with the PAF waste rock stream. Process tailings would be managed using this strategy for the remainder of the LOM.

The BVS LOM plan anticipates that during Years 4 to 11, at least 80% of the process tailings streams would deport from the processing plant as filtered tailings. The plan includes provision for the remaining (up to) 20% to deport as thickened slurry to the TSF.

The LOM plan also includes reprocessing of the heap leach residue during years 6 – 11. This material would likely be blended with new ore being extracted by the mining operations.

2.3.2.3 Tailings Management Strategies

SMC proposes to implement two (2) tailings management strategies which would operate in parallel. LOM production for each tailings management strategy is presented in **TABLE 2**.

TABLE 2: LIFE OF MINE TAILINGS MANAGEMENT STRATEGIES

Strategy	LOM Production	LOM Quantity
Slurry Deposition at TSF	20 % of Oxide ore tailings (0.4 MT) 20 % of Transition/Fresh tailings (3.6 MT)	4 MT
Tailings Filtration and Emplacement at IWL	80 % of Oxide tailings (1.6 MT) 80 % of Transition/Fresh tailings (14.4 MT)	16 MT

3 INTEGRATED WASTE LANDFORM

3.1 Integrated Waste Landform Concept

SMC proposes that the PAF waste rock inventory as well as the filtered tailings inventory (which is also PAF), would be contained by an Integrated Waste Landform (**IWL**) developed within the CWRD that would be formed by a significant inventory of NAF waste rock.

The overall concept for the IWL is that the NAF waste rock inventory would be strategically placed to form a Co-Placement Cell (**CPC**). PAF waste rock and filtered tailings would be transported to the CPC in trucks for co-placement in nominal 1 m (vertical) lifts.

The IWL would not be used to contain unfiltered tailings or tailings with a moisture content that exceeded the Liquid Limit (**LL**). The proposed IWL Concept is not new or innovative and is consistent with the containment strategies anticipated in leading technical guidelines including:

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- ANCOLD 2019: Section 3.4.3.2 (Voids in Waste Dumps),
- GARD: Section 6,
- DFAT 2016: Section 4.2.3 (Dry Stacking), and
- DFAT 2016: Section 4.2.5 (Integrated Disposal).

3.2 Functional Requirements

The primary objective of the IWL would be to provide for permanent and safe containment of the PAF waste rock and filtered tailings inventories. Prior to progression to a detailed design, a project specific suite of functional requirements would need to be defined via a Basis of Design memorandum. For the purposes of this Study, functional objectives are presented in **TABLE 3** and reflect industry norms and technical guidelines including ANCOLD, CSIRO and GARD. It should be noted that a Post Mining Land Use (**PMLU**) of native vegetation with low intensity cattle grazing has been proposed for the CWRD.

Detailed design of the IWL would require a degree of trade-off between the various objectives. A formal Bais of Design would be prepared to inform the detailed design.

TABLE 3: FUNCTIONAL OBJECTIVES

Aspect	Function	Objective
Capacity	CPC provides sufficient capacity to contain LOM inventory of PAF waste rock and filtered tailings	Geometric design demonstrates conformance with capacity criteria
Physically Stable	Landform stable under static and cyclic (earthquake) loading	Geometric design demonstrates conformance with suitable criteria
	Landform resistant to erosion	Highly textured surface with substantial water storage capacity that generates limited surface runoff
Chemically Stable	Substantially limits the rate of infiltration and water flux through the CPC	Downward flux insufficient degrade the environmental values of the receiving environment
	Does not expose materials contained within CPC to cyclic wetting and drying	Upward flux insufficient to cause problematic salt accumulations
Sustain the PMLU	Vegetation cover consistent with the PMLU	Vegetation meets minimum requirements

3.3 IWL Development

Implementation of the IWL Concept would adopt the following design principles:

- Segregation of the higher-risk, PAF waste streams to facilitate effective management and avoid contamination of low-risk streams,
- Minimise the lateral extent (footprint) of any cell used to contain PAF waste inventories,
- Facilitate capture and management of PAF waste rock and filtered tailings drainage during the operational and post operational phases, and
- Significantly limit the flux of meteoric water through the contained PAF waste during the post operational phase.

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These principles are entirely consistent with respected technical guidelines such as the GARD, ANCOLD and CSIRO and are consistent with what would be considered sound operating practice in the Queensland metalliferous mining sector.

All PAF waste rock and filtered tailings generated by the project would be contained by co-placement within the CPC which would be formed by strategic emplacement of NAF waste rock at the CWRD. Drawings representing the Revised IWL Concept are presented for illustrative purposes as **APPENDIX A**.

Implementation of the IWL Concept would include six (6) key elements which are:

- Site characterisation,
- Detailed design and specification,
- Foundation preparation,
- IWL Construction including:
  - Strategic placement of NAF waste rock,
  - Emplacement of PAF waste rock and filtered tailings in the CPC,
  - Collection and management of CPC contact waters including runoff and seepage,
- Decommissioning and rehabilitation, and
- Post construction maintenance and monitoring.

These are discussed in the following sections.

For the purposes of this Study, the materials available to develop the IWL are presented as **TABLE 4**.

TABLE 4: IWL MATERIALS

Material Type	State of Weathering	Description
NAF Waste Rock	Oxide/Transition	Silt-SAND-GRAVEL-Cobbles
	Fresh	Silt-Sand-GRAVEL-COBBLES-Boulders
PAF Waste Rock	Oxide/Transition/Fresh	Silt-Sand-GRAVEL-COBBLES-Boulders
Filtered Tailings	Fresh	SILT-SAND

3.4 Program and Schedule

Development of the IWL would occur in three (3) phases which are:

- Foundation preparation phase,
- IWL construction phase, and
- Decommissioning and rehabilitation phase.

Foundation preparation works would commence at the same time as pre-stripping of the BVS open-pit (Year 0 – 1). Emplacement of PAF waste rock could not commence prior to the commissioning of the CPC. Commissioning of the CPC could not occur prior to completion of foundation preparation works (see **Section 3.7**) and placement of sufficient NAF waste rock to form the lateral extents of the CPC.

Construction of the IWL would occur as a continuous build over the full LOM (Year 1 – 11).

The decommissioning and rehabilitation phase would be concerned with installing an Infiltration Barrier over the full extents of the CPC in order to significantly reduce the flux of meteoric water through the waste contained within the CPC. Installation of the Infiltration Barrier could not

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commence until filling of the CPC was completed. This is currently scheduled to occur in Year 12.

3.5 Site Characterisation

Characterisation of the conditions at the Site would include:

- Geotechnical and hydrogeological assessment of the foundations,
- Geotechnical and geochemical assessment of the materials proposed to be used in construction of the IWL including investigation of filtered tailings liquefaction potential and insitu densities required to mitigate monotonic or seismic-induced liquefaction
- Revision of the LOM production plan,
- Preparation of Basis of Design memorandum.

3.6 Detailed Design

Development of the proposed IWL would be informed by a detailed design prepared by a suitably qualified and experienced engineer and completed in a manner consistent with contemporary frameworks such as GARD and CSIRO 2017. The detailed design of the IWL would include:

- Geometric assessment including:
  - LOM storage, materials balance and staging,
  - Material placement specifications (layer thicknesses and compaction requirements),
  - Slope stability (static, seismic and post-liquefaction as appropriate),
- Seepage and infiltration assessment including:
  - Seepage containment system (during operations),
  - Optimisation of Store and Release (**SAR**) Cover geometry (net flux and capillary action),
  - Provision of Plant Available Moisture (**PAM**),
- Landform evolution assessment including:
  - Surface water drainage,
  - Long-term erosion,
- Design and specification of monitoring systems,
- Specification for construction including:
  - Technical specification,
  - Issue For Construction drawings,
  - Inspection and test plan.

3.7 Foundation Preparation

3.7.1 Foundation Clearing and Surface Water Control

Construction of the CWRD and IWL would commence by clearing and grubbing all surface vegetation from the footprint area. Topsoil and subsoil horizons would be managed in accordance with the Progressive Rehabilitation and Closure Plan (**PRCP**).

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Suitable drainage and catchment delimitations would then be developed to ensure that any runoff from the area was contained and managed via the water management system

3.7.2 Seepage Collection Pad

A key requirement for the IWL would be that any waters coming into contact with the PAF waste contained within the CPC are collected and transferred to the mine water management system for containment. This would require the CPC to include basal containment to stop seepage waters entering the groundwater environment. Arrangement of the basal containment system must be informed by detailed characterisation of the foundation conditions at the Site.

For the purposes of this Study, foundation preparation works would also include construction of a Seepage Collection Pad (**SCP**) that would form the foundation of the CPC. The extents of the SCP would exceed the lateral extents of the CPC to ensure that any drainage from the cell was suitably contained. The SCP would comprise by a low permeability platform constructed with moisture conditioned NAF waste rock, placed in controlled layers and compacted to achieve the required permeability. Geometric design of the SCP including overall thickness, gradient and arrangement of perimeter bund walls would be completed as a component of the detailed design.

The waste rock inventories extracted during the early years of mining operations are expected to yield significant inventories of material that is well graded, NAF and oxide/transition in nature. It is expected that this material would be suitable for reuse in SCP construction works.

The SCP would also include a network of seepage collector drains that would be used collect seepage waters draining from the CPC. The collector drains would be located on the upper surface of the SCP and would comprise slotted pipe surrounded by free-draining media. The collector drains would report to one or more transfer drains that would convey water from the CPC to the water management system. The transfer drains would comprise solid pipe that would provide for controlled collection and transfer of seepage waters from the facility.

Specification of the construction requirements for the SCP would be prepared as a component of the detailed design and would be informed by the geotechnical investigation and integration with the site water management system. It is reasonable to expect that the SCP and drainage system would remain operable for several decades following decommissioning and rehabilitation of the CPC. Development of the SCP would also include quality control checks to demonstrate that key design requirements are met.

3.7.3 As-Constructed Reporting

Construction of the SCP would need to be completed prior to first emplacement of PAF material at the CPC and would be documented by way of an As-Constructed Report.

3.8 IWL Construction

3.8.1 Strategic Emplacement of NAF Waste

Emplacement of the NAF waste rock inventory at the IWL would occur by end tipping from dump trucks in nominal 10 m (vertical) lifts to develop a central void within which the CPC would be formed. The extents of the CPC would be managed to remain within the limits of the SCP that forms the foundation of the cell.

Placement of the NAF waste rock would be managed so that a minimum offset (or buffer) was maintained around the entirety of the CPC. The purpose of the minimum offset would be to:

- Provide lateral containment to the waste contained within the CPC, and
- Facilitate installation of an Infiltration Barrier that extends over the full extents of the CPC as well as a substantial buffer zone.

For the purposes of this Study, a minimum offset of 20 m has been adopted but this would be confirmed during the detailed design.

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In addition to the above, it should be noted that the NAF waste rock inventory includes a surplus of acid neutralising capacity. Whilst not a requirement of the IWL Concept, this additional alkalinity would add an additional layer of protection against acidification.

Development of the external slopes of the final landform would commence by end tipping from dump trucks in nominal 10 m (vertical) lifts with berms between subsequent lifts. The external slopes would then be recontoured to an overall slope of 5 H : 1 V and rehabilitated. Decommissioning and rehabilitation of the external slopes of the CWRD is beyond the scope of this Study.

3.8.2 Emplacement of PAF Waste Inventory

The PAF waste rock and filtered tailings inventories would be emplaced within the CPC as they are generated by the mining and processing operations. Both streams would be transported to the CPC in dump trucks that would co-place the streams by end tipping in nominal 1 m (vertical) lifts (to be confirmed by detailed site characterisation and design studies, as described in **Sections 3.5** and **3.6**).

The LOM inventories of PAF waste rock and filtered tailings that would be emplaced at the CPC are presented in **TABLE 1** and **TABLE 2**. For the purposes of this Study**,** the CPC would be conservatively sized to contain up to 28 MT of PAF waste rock and filtered tailings.

Production of the PAF waste rock stream would be an outcome of mine sequencing and is expected to be highly variable with periods of weeks and/or months with no PAF waste rock generation expected.

Under the current LOM, filtered tailings would not be produced until the filtration sub-process was commissioned in project year four (4). Following this, production of the filtered tailings stream is expected to be relatively consistent and would reflect processing operations.

Emplacement at the CPC would reflect production of the filtered tailings and PAF waste rock streams. During periods of low PAF waste rock production, material being emplaced at the CPC would be dominated by filtered tailings. Implementation of the IWL/CPC Concept places no reliance on the relative proportion of each stream or whether the streams are mixed or layered.

Track dozers or dedicated compaction equipment (to be confirmed by detailed site characterisation and design studies, as described in **Sections 3.5** and **3.6**) would be used to maintain the tip head as it moves across the cell and to compact material placed into the CPC to a density of at least 95 % standard dry density. The purpose of mechanical compaction would be to:

- Increase the insitu density of the filtered tailings to reduce contractive behaviour and pore pressure generation. This in turn shifts the material response away from conditions that enable static or cyclic liquefaction;
- Minimise long-term or creep settlement; and
- Reduce infiltration of rainfall into the co-placed waste during the construction phase.

Even at 100 % filtered tailings, the material emplaced at the CPC would provide sufficient shear strength to support effective operation of the mobile equipment fleet operating within the CPC.

3.8.3 Construction Management and Monitoring

Construction of the IWL would be supported by a Construction Management and Monitoring Plan (**CMMP**) which would be prepared by the design engineer. The CMMP would include:

- Overview of the design intent and requirements (particularly in relation to material placement and compaction),
- Reconciliation of the life of mine production plan with the design,
- Requirements for monitoring including:
  - Geochemical characteristics of the materials being used to construct the IWL,
  - Quantity and quality of seepage reporting from the SCP,

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- Surface and groundwater monitoring down gradient of the IWL,
- Requirements for routine inspection.

The requirements for monitoring and maintenance of the IWL during the construction phase would be defined by a suitably qualified and experienced engineer but are expected to reflect the requirements defined in **TABLE 5**. In addition to the above, construction of the IWL and CPC would be supported by periodic reporting of the as-constructed status of the facility. As-constructed reports would be prepared:

- At the completion of foundation preparation works (i.e. following completion of the SCP and before first placement of PAF waste rock or filtered tailings at the CPC),
- Every three (3) years following CPC commissioning, and
- At the completion of construction.

TABLE 5: IWL MONITORING PLAN - CONSTRUCTION

Aspect	Monitoring Approach	Frequency
CPC Extents	Periodic survey of the extents of the CPC to confirm that it remains within the extents of the SCP	Quarterly
CPC Seepage Generation	Measurement of the quantity and quality of seepage water draining from the CPC	Monthly
CPC Rainfall Runoff Generation	Measurement of the quantity and quality of surface water runoff transferred from the CPC	Monthly
Chemical Containment	Monitoring of surface and groundwaters outside of the CWRD to demonstrate effective containment Walk-over (visual) inspection for salt scalds and vegetation impacts	Monthly

3.9 Water Management

3.9.1 Water Management Overview

As discussed in the earlier sections, the primary objective of the Revised IWL Concept is to eliminate or significantly reduce the flux of water through any PAF waste contained within the CPC. Features of the IWL Concept that facilitate this objective include:

- Limiting the extents of the CPC,
- Exclusion of surface runoff from other areas of the IWL,
- Management of rainfall runoff and seepage during both the operational and post operational phases,
- Emplacement of the PAF waste using compaction, and
- Installation of a SAR Cover during the decommissioning and rehabilitation phase.

Formation of the CPC would occur as a series of ‘lifts’ that would be stacked one on top of the other. This approach limits the extents of the CPC and facilitates exclusion of surface runoff from other catchments by maintenance of perimeter bunds.

Rainfall runoff and seepage generated by the remainder of the IWL (ie. outside of the CPC) would report to catch dams located around the perimeter of the facility. RGS 2025 reported that the NAF waste rock inventory represents negligible geochemical risk.

3.9.2 Management of CPC Runoff

During the IWL construction phase, the CPC would remain open and incident rainfall would accumulate within the cell. Effective management of CPC runoff would be required to facilitate emplacement during the wet season and to minimise infiltration into the CPC cell.

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Emplacement of the PAF waste within the CPC would be completed in a manner so that that a runoff collection sump was maintained within the emplacement area at all times. Skid mounted pumps would be used to transfer water from the sump to the site water management system for containment and reuse.

3.9.3 Seepage Water Management

It is reasonable to expect that the CPC would develop some seepage during the IWL construction phase. The quantum of seepage generated would be a function of pore water being expelled from the filtered tailings as it consolidates within the CPC as well as infiltration of rainfall. The rate of seepage generation is expected to be minor.

Notwithstanding this, the IWL Concept includes a seepage containment system formed by the SCP including collector drains and transfer pipes. Any seepage waters generated by the CPC would drain to the SCP where it would be collected in slotted pipes before exiting the facility via the transfer pipes and integrating with the site water management system.

The SCP would operate for the entirety of the construction phase and would continue to operate during and following the decommissioning and rehabilitation phase. It is reasonable to expect that installation of the SAR Cover would significantly reduce rainfall infiltration into the CPC and eventually result in negligible seepage reporting to the SCP. Any seepage reporting to the SCP following installation of the SAR Cover would need to be collected and managed via the site water management system. It is expected that complete drawdown (seepage discharge) would occur within 12 months of placement of the SAR Cover. The SCP would remain operational for several decades following the placement of the SAR Cover.

3.10 Decommissioning and Rehabilitation

3.10.1 Infiltration Barrier

RGS's assessment the overall reactivity of the waste rock and tailings inventories included kinetic testing and concluded that all waste classes had oxidation rates in the low range (ie. less than 5 x 10^{-8} kg $O_2/m^3/s$). These data indicate that percolation of meteoric water into the waste inventories (NAF waste rock, PAF waste rock, and filtered tailings) is unlikely to result in acidified or significantly contaminated drainage.

Notwithstanding this, percolation of meteoric water into the PAF waste inventory stored within the CPC would increase the risk of mobilisation of oxidation products stored within the waste inventory. To mitigate this risk, the IWL Concept includes an Infiltration Barrier that would significantly limit water flux through the CPC under the closure condition.

The IWL Concept includes a Store And Release (**SAR**) Cover over the full extents of the CPC which are consistent with the climatic conditions at the Site and the GARD. Background information regarding the proposed SAR Cover is presented in **Section 4.3.5**.

The geometric arrangement of the SAR Cover would be informed by vadose zone water balance modelling completed as a component of the detailed design. For the purposes of this Study, the SAR Cover would include a Reduced Permeability Layer (**RPL**) overlain by an Infiltration Storage Layer (**ISL**) as presented in **TABLE 6**.

TABLE 6: SAR COVER CONFIGURATION

SAR Cover Layer	Layer Thickness	Formation
Infiltration Storage Layer	1200 – 1800 mm	Select NAF waste rock (oxide/transition) Placed loosely to form hummocked landscape Vegetated with endemic trees consistent with the PMLU
Reduced Permeability Layer	300 - 600 mm	Select NAF waste rock (oxide/transition) Moisture conditioned, placed in layers and compacted in accordance with design requirements

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Application of the SAR Cover would also include installation of monitoring stations by which the performance of the cover would be assessed during the post construction phase. Details of the monitoring system would be developed as a component of the detailed design.

3.11 Post Construction Maintenance and Monitoring

The requirements for inspection, monitoring and maintenance of the IWL during the post construction phase would be defined by a suitably qualified and experienced engineer but are expected to reflect the requirements defined in **TABLE 7**. The objective of the post construction monitoring program would be to capture data suitable to demonstrate that rehabilitation success objectives had been achieved.

TABLE 7: IWL MONITORING PLAN - POST CONSTRUCTION

Aspect	Monitoring Approach	Frequency##
Physical Stability	Periodic photogrammetric survey to confirm settlements and erosion is consistent with design	Every 3 – 5 years
CPC Seepage Generation	Measurement of seepage (quality and quantity) discharging from CPC via transfer drain	Annual
Chemical Containment	Monitoring of surface and groundwaters outside of the CWRD to demonstrate effective containment Walk-over (visual) inspection for salt scalds and vegetation impacts	Annual

Monitoring requirements would apply only until PMLU milestones had been achieved

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4 RISKS AND MITIGATION MEASURES

4.1 Tailings Management Strategies

4.1.1 Overview

The strategies used to manage process tailings generated by metalliferous mining operations can be broadly classified into the following classes:

- Slurry deposition,
- Tailings filtration, and
- Special purpose strategies.

Special purpose strategies are generally concerned with harvesting/redirecting a portion of the tailings stream to a specific beneficial purpose such as sand extraction or paste backfill in underground operations and are not proposed at BVS. Tailings management strategies that adopt slurry deposition and filtered tailings are discussed in the following sections.

4.1.2 Slurry Deposition

Under a slurry disposal strategy, tailings are thickened at the plant before being pumped to the TSF and discharge as slurry. The solids are allowed to settle and any bleed water along with rainfall runoff directed to a decant pond for removal. Hydraulicly placed tailings typically exhibit limited shear strength so containment areas must be suitably designed and constructed to resist lateral flow. Storage areas suitable for slurry deposition are often formed within existing voids (repurposed mine pits), by dams, or by various combinations.

Slurry deposition schemes are suitable for most types of process tailings and present a relatively low operating cost base. Capital development costs can vary widely and reflect site specific variables.

ANCOLD 2019 provides a comprehensive framework to support effective design, construction and operation of the TSF over the full lifecycle including decommissioning and rehabilitation.

4.1.3 Tailings Filtration

Tailings management strategies that include tailings filtration typically include:

- Tailings thickening using a high-rate or paste thickener,
- Tailings filtration using either centrifuges, vacuum filters or mechanical pressure filters,
- Transportation of the filtered tailings from the plant to the TSF using dump trucks or conveyor systems, and
- Emplacement of the filtered tailings at the TSF.

The objective of the filtration step is to dewater the tailings to a moisture content that is less than the Liquid Limit (**LL**) at which point the tailings would exhibit the properties of a solid (sometimes described as a spadeable cake). Tailings filtration schemes have been deployed on most classes of mineral commodities including coal fines and metalliferous tailings. In general, tailings that include significant concentrations of clay size particles are more difficult to filter than those comprised of silt and sand sized particles. Filtration steps can be specified to achieve any moisture content within +10 % and -7 % of the LL. The capital and operating costs for filtered tailings strategies can vary widely and are influenced by the tailings characteristics, the target product moisture content, and distance to the final containment area.

Filtration strategies offer two primary benefits. The first is that process water and reagents extracted during filtration are immediately returned to the processing circuit for reuse, promoting resource efficiency and sustainability. The second is that filtered tailings behave more like a solid and are less likely to become flowable or unstable. Consequently, the required

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containment structures are typically smaller and more manageable with a resultant reduction in development cost.

Operating and maintenance costs for filtration schemes are significant and reflect the considerable fixed plant and transportation efforts required.

Selection and specification of the filtration sub-process has not been completed but would include geotechnical and rheological characterisation of the feed slurry as well as specialist testing. For the purposes of this Study, it is reasonable to assume that the BVS tailings would be classified as low plasticity (silty-sand, negligible cohesion) with a LL of between 20 and 35 % moisture (w/w). The general objective of any filtration step would be to produce a tailings with a moisture content 3 – 5 % drier than the LL.

Plate and frame filters are more than capable of producing cakes with a moisture of between 12 and 20 % so the prospects of BVS securing a technical solution are excellent. Selection of the filtration sub-process should be informed by assessments completed by suitably qualified and experienced engineers. **PLATE 1** and **PLATE 2** show typical configurations for plate and frame, and horizontal belt filters respectively. **PLATE 3** shows a close-up view of tailings that have been filtered to approximately 4 % below the LL.

PLATE 1: PLATE AND FRAME TAILINGS FILTER



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PLATE 2: HORIZONTAL BELT TAILINGS FILTER



PLATE 3: FILTERED TAILINGS



4.2 Physical Stability Risks

4.2.1 Capacity

Detailed design and construction of the CPC should ensure that sufficient capacity is available to contain the LOM inventory of PAF waste rock and filtered tailings.

The Revised IWL Concept includes a CPC arranged as rectangular prism with dimensions of 800 m (long), 400 m (wide), and 55 m (high) for a total containment volume of 17,600,000 m^3.

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Assuming an emplaced density of 1.6 T/m^3, the CPC would have a capacity of 28 MT which would be more than sufficient to contain the LOM production of PAF waste rock (2 MT) and the planned inventory filtered tailings (up to 16 MT) for a total inventory of up to 18 MT.

The purpose of the surplus capacity (up to 10 MT) is to provide suitable contingency/flexibility to deal with upside and downside risks should they occur. Such contingencies might include:

- Project scope change to dispense with the Slurry Deposition strategy and manage all process tailings via the Filtered Tailings strategy,
- Underestimation of PAF waste rock inventory (downside risk),
- Resource extension resulting in additional inventories of PAF waste rock and/or process tailings,

Any unused capacity within the CPC would be filled by emplacement of NAF waste rock.

4.2.2 Containment

A key requirement for any IWL is that it provides for physical containment of the mineralised waste streams over the life of facility which for the purposes of this Study, would be 10,000 years. Uncontrolled placement or migration of the mineralised waste inventory could result in contamination of the surrounding NAF waste rock inventory and potentially the receiving environment.

Design and construction of the CPC should ensure that lateral containment is established before PAF waste rock and filtered tailings are placed into the CPC. In addition, it is important that placement of NAF waste rock provides a suitable buffer between the CPC and the receiving environment. Specification of the minimum buffer or “rind” width should be provided in the detailed design.

Significant (more than 1 – 2 m) migration of the tailings into the NAF waste rock inventory is not a credible mode of failure as the filtered tailings are not flowable.

4.2.3 Tailings Liquefaction

Liquefaction of the filtered tailings stream is unlikely to be a credible mode of failure. Process tailings may be at risk of seismic liquefaction under certain conditions, but this would require that the tailings exhibit low cohesion, are loose, and fully saturated. Tailings emplaced within the CPC would be characterised as low cohesion, but they would not be loose because they would be emplaced with machine compaction. Of most significance is that re-saturation of the filtered tailings by infiltration of rainfall which is also expected to be non-credible.

Assessment of the material properties of the filtered tailings would be completed as a component of the characterisation studies (**Section 3.5**) that would inform the detailed design (**Section 3.6**). A key outcome of the detailed design would be the level of compaction required to maintain the filtered tailings in a non-liquefiable state.

4.2.4 Slope Stability

Inadequate design and/or deficient construction of the IWL may give rise to modes of failure related to slope instability including slumping failure. Significant slope instabilities may result in loss of containment from the CPC and should be a key consideration for the design.

Development of the IWL would include a significant zone of NAF waste rock that would form the bulk of the landform including the outer batters which would be at greatest risk of slope instability. Design of the batter slopes forming the IWL should be consistent with contemporary design frameworks including the GARD and CSIRO 2017.

It should be noted that it is not only practicable, but common practice to develop stable structures using filtered tailings only. A well designed and constructed tailings filter stack (or dry stacks as they are sometimes called) should be entirely self-supporting and would not require lateral containment to achieve slope stability. Tailings that have been dewatered to a moisture content lower than the LL will exhibit sufficient shear strength to be self-supporting. Some examples of self-supporting structures developed with filtered tailings are provided in **TABLE 8.**

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TABLE 8: EXAMPLES OF SELF-SUPPORTING TAILINGS STACKS

Mine	Climatic Conditions (Koppen Geiger Classification)	Placement Specifications	Location
Hermosa, USA Copper	B_{SH} – Hot semi-arid <350 mm / annum Hot summer, mild winter	Truck delivery, spread & compact HDPE liner and underdrainage Batter slopes 3 H : 1 V • Waste rock armour berms, • Machine compaction	31°27'22.02"N 110°42'35.46"W
Media Luna, Mexico Gold	A_{SW} – Tropical 500-700 mm / annum Savanna, dry winter	Conveyor delivery, spread & compact Batter slopes 3 H : 1 V • Waste rock armour berms, • Machine compaction	18°00'32.07"N 99°45'00.04"W
Zawar, India Zinc-Lead-Silver	B_{WH} – Hot desert <250 mm / annum Semi-arid desert	Truck delivery, spread & compact Batter slopes 3 H : 1 V Compacted to 95% MDD	24°20'43.58"N 73°42'29.94"E
Karara, WA Magnetite	B_{WH} – Hot desert <250 mm / annum Semi-arid desert	Conveyor delivery, spread & compact Batter slopes 2 H : 1 V Compacted to 85% MDD	29°11'12.02"S 116°47'1.60"E
LaRonde, Canada Gold-Copper-Zinc	D_{FC} – Sub-arctic <450 mm / annum Cold winter, mild summer	Stack developed over existing slurry TSF Truck delivery, spread & compact Batter slopes 5 H : 1 V Compacted to 95% MDD	48°14'54.46"N 78°26'29.86"W
La Coipa, Chile Copper	B_{WH} – Hot desert <100 mm / annum Hot summer, mild winter	Conveyor delivery, spread & compact Batter slopes 2-3 H : 1 V Compacted to 85% MDD	26°48'49.44"S 69°16'11.89"W

4.2.5 Erosion

Surface runoff that becomes concentrated in drains or unintended flow paths almost universally results in incised erosion of mine disturbed soils and meta-soils. Erosion over the long term can result in damage to engineered barriers and potentially, loss of containment.

SMC proposes to develop the revised IWL concept as a sub-component of the CWRD. The CPC would be constructed through the strategic emplacement of NAF waste rock, forming a series of stacked, ring-dyke-style bunds to create a central void whilst simultaneously establishing a perimeter bund (or rind) to provide lateral containment.

The detailed design of the IWL would specify the minimum width of NAF waste rock required to ensure adequate lateral containment of the CPC. For the purposes of this study, a minimum containment width of 20 m has been adopted.

Loss of containment from the CPC as a result of erosion would require substantial degradation of the CWRD final landform. Accordingly, a loss of containment scenario would be contingent upon catastrophic erosion of the CWRD final landform and is therefore considered non-credible.

Assessment and detailed design of the CWRD final landform including landform evolution modelling was beyond the scope of this Study, but erosion of the CWRD final landform would be managed in accordance with the requirements defined in the PRCP.

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4.3 Geochemical Risks

4.3.1 Oxidation of Reduced Sulphur Forms

A key objective of the IWL would be to contain the LOM inventories of PAF waste rock and filtered tailings. Assessment of the geochemical risks presented by the PAF waste rock and filtered tailings inventories was documented in RGS 2025.

RGS reported that some components of the waste rock inventory included reduced sulphur forms that are liable to react with water and oxygen to form sulphuric acid which could in turn, mobilise salts and heavy metals. RGS also reported limited testing of the high-grade ore (n = 1) which returned a PAF classification and low-grade ore (n = 1) stream which returned a classification of NAF. These results were in accord with the tailings testing (n = 3) that classified the tailings as PAF. While significant acid generation is not expected, the results from kinetic testing did indicate that neutral/saline drainage may be encountered during operations and placement of the cover system.

As stated in the earlier section, RGS's assessment of the overall reactivity of the waste rock and tailings inventories included kinetic testing and concluded that all waste classes had oxidation rates in the low range and are unlikely to result in acidified or significantly contaminated drainage.

Emplacement of the PAF waste rock and filtered tailings inventory within the CPC would maintain the materials in a relatively dry state, and as such it should be expected that any reduced sulphur forms (pyrite) would eventually oxidise to form acid, most of which would be consumed by acid neutralising minerals. The data presented by RGS indicates that the Net Acid Production Potential (**NAPP**) of the PAF streams was less than 100 Kg H_2SO_4 for all reported data and generally less than 50 Kg H_2SO_4 indicating that the proposed wastes would not be considered high capacity.

The data however does not demonstrate that seepage generated by the CPC would be suitable for direct release to the receiving environment. Formation of acidic drainage is less likely but formation of neutral of saline drainage is possible.

As a result, it is essential the detailed design of the IWL and CPC includes suitable seepage containment and transfer to the water management system. For the purposes of this Study, a SCP is proposed but it is likely that investigation of the residual soils that would form the foundation of the SCP demonstrates that they exhibit suitably low permeability to form basal containment.

In either event, development of the SCP should be informed by detailed design completed by a suitably qualified and experienced engineer. The design should include construction specification and quality control / quality assurance requirements.

4.3.2 Co-Disposal, Co-Mingling and Co-Placement

The term Co-disposal is commonly used to describe schemes where two (2) or more waste streams are emplaced at the same location. Co-disposal is a somewhat ambiguous term, and schemes are better described as:

- Co-mingling,
- Co-deposition, and
- Co-placement.

The term Co-mingling applies to schemes where two or more waste streams are combined to form a homogeneous mixture. Co-mingling schemes that are implemented to control acid formation are generally concerned with combining a coarse waste stream (such as waste rock or coarse washery rejects) within a low permeability matrix that forms a seal around the pyrite minerals. Co-mingling strategies have been implemented at various coal operations in Queensland and seek to entrain coarse washery rejects within coal tailings that are typically rich in clay and hydrophilic minerals.

A Co-mingling approach would not be effective at BVS because:

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- Effective mixing of the filtered tailings and PAF waste rock would be impracticable,
- The filtered tailings are comprised of silt and sand sized particles with insufficient clay to maintain any effective seal against oxygen flux, and
- The IWL would be maintained in a drained state.

Co-deposition schemes are concerned with deposition of two or more slurry streams and are not applicable in this instance.

The IWL Concept proposes that the PAF waste rock and filtered tailings streams are emplaced concurrently within the CPC as a Co-placement strategy. The objective of the CPC is to store the potentially problematic waste streams (segregation) at a location where contaminated seepage could be effectively contained during and following the construction phase. At the conclusion of the construction phase, the CPC would be capped with a SAR Cover that would effectively eliminate water flux through the system, and after a short drawdown period, would result in negligible seepage being generated.

The Co-placement approach affords superior operational flexibility because emplacement of the filtered tailings stream does not rely on the availability of the PAF waste rock stream to maintain physical stability. In addition, the PAF waste rock and filtered tailings streams present an equivalent geochemical risk profile that would require similar management strategies. Co-placement at the CPC presents an operationally robust approach with appropriate levels of risk mitigation.

Detailed design of the CPC should be consistent with the requirements defined in the GARD.

4.3.3 Water Flux – Capillary Action

Rainfall that infiltrates into the system would remain in storage until it is lost either to evapotranspiration (direct evaporation to air and/or uptake by plants and photosynthesis) or seepage. The climatic conditions at the Site include a short but generally intense wet season followed by a long dry season between April and November where upward flux would generally be much more significant than percolation (downward flux).

Water stored within the CPC of the IWL may become contaminated with acid, dissolved metals and salts if they are available for dissolution. In cases where upward flux is significant, there is a risk that oxidation products are transported upwards through the system. This phenomenon (upwards migration of salts) is an essential component of nutrient cycling and is not intrinsically problematic. However, if the rate of upward flux is significant and causes appreciable concentration of salts in the soil horizon, vegetation growth may be impacted.

In the case of BVS, the risks presented by capillary action are unlikely to be significant due to the relatively low capacity of the PAF waste rock and filtered tailings inventories.

Assessment of the risks presented by capillary action should include numerical modelling and would be completed during detailed design of the Infiltration Barrier. Where mitigation is required, suitable approaches are available and would typically include one of:

- Inclusion of a gap-graded layer within the cover system, or
- Inclusion of a low permeability layer that would limit the cyclic wetting and drying of the contained waste.

4.3.4 Water Flux – Net Percolation

4.3.4.1 Overview

For BVS, the most effective means to manage the risks presented by containment of mineralised waste is to reduce the flux of water through the waste and thereby reduce or eliminate the mode of contaminant transport into the receiving environment.

Section 6 of the GARD recommends the various approaches for the management of PAF wastes including segregation and engineered barriers.

Low water flux covers have been successfully implemented at several sites across northern Australia. A number of these applications have included the installation of instrumentation to

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support performance monitoring. Data reported in the technical literature indicates that a well designed and constructed Infiltration Barrier should be expected to restrict infiltration to significantly less than 10% of annual rainfall.

Detailed design of an Infiltration Barrier should be informed by an understanding of soil-moisture characteristics of the proposed materials and numerical analysis using suitable software.

4.3.4.2 Co-Placement Cell Extents

SMC proposes to develop the CWRD final landform as presented in **FIGURE 5**. NAF waste rock would be emplaced by end tipping in nominal 10 m (vertical) lifts and the outer slopes reprofiled to a slope of 5 H : 1V leaving a central plateau approximately 1300 m long and 500 m wide.

Adoption of the geometric extents of the CPC was based on a trade-off between:

- A project requirement to provide containment capacity for at least 25 MT of material,
- An operational requirement to support emplacement of filtered tailings through to the end of LOM,
- A design objective to maintain a 20 m buffer of NAF waste rock around the entirety of the CPC, and
- A design objective to minimise the CPC footprint.

For the purposes of this Study, footprints of 800 m * 400 m and 840 m * 440 m were adopted for the CPC and SCP respectively with a CPC height of 55 m. This configuration provides an overall capacity of 28 MT which exceeds the design requirement by a suitable margin.

4.3.5 Store and Release Covers

The objective of the SAR Cover is to capture and store moisture from precipitation and then release that moisture by evaporation before it can percolate into the underlying substrate. SAR Covers can be configured as either mono or duplex covers. Mono-covers are arranged so that a single layer provides both the ‘storage’ and the ‘release’ functionality. One drawback of the mono-cover approach is that stored moisture can be lost to drainage through the base of the layer. This can be overcome to some extent by increasing the layer thickness and therefore storage capacity, but moisture moving deeper into the landform is a greater risk of moving into the underlying waste and therefore contributing to net flux.

Duplex covers include two layers known as the Infiltration Storage Layer (**ISL**) and the Reduced Permeability Layer (**RPL**). The ISL acts as both growth media and moisture storage. The RPL acts to retard drainage from the ISL and thereby improve the storage capacity of the system. A key advantage of the duplex cover is that it limits cyclic wetting / drying of the underlying waste.

Detailed design of the SAR Cover should include assessment of water flux to develop a detailed understanding of the soil moisture water balance including net infiltration and the risk of capillary action. The assessments should be informed by sound understanding of the soil-moisture characteristics and numerical modelling in a suitable software package. Construction programs should include specific requirements for material selection and placement to ensure that key design requirements are achieved.

SAR Covers that have been developed in accordance with a strong design should be expected to achieve the functional objectives with relative certainty. Examples from northern Australia where SAR Covers have been deployed with good success are provided in **TABLE 9**.

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TABLE 9: EXAMPLE SAR COVERS IN NORTHERN AUSTRALIA

Location	Climatic Conditions (Koppen Geiger Classification)	Cover Material Characteristics	Location
Mt Whaleback WA	B_{SH} - Hot Semi-arid 320 mm / annum Intense monsoonal wet season	Well graded, run-of-mine, siltstone/mudstone/shale waste rock	23°20'17.73"S 119°39'42.84"E
Kidston Mine Qld	B_{SH} - Hot Semi-arid 550 mm / annum Intense monsoonal wet season	Well graded, run-of-mine oxide waste rock	18°51'56.29"S 144° 8'41.61"E
Century Mine Qld	B_{SH} - Hot Semi-arid 560 mm / annum Intense monsoonal wet season	Well graded, run-of-mine, limestone/dolostone waste rock	18°44'44.19"S 138°36'29.26"E
Frances Creek NT	A_W – Tropical savanna 1200 mm / annum Intense monsoonal wet season	Well graded, run-of-mine, siltstone/mudstone/shale waste rock	13°35'22.50"S 131°51'13.79"E

One factor common to each of the successful deployment of SAR Covers is that they were placed in a manner that provided for a highly textured landscape that increases the retention and infiltration of rainfall. These textured landscapes are typically developed by paddock dumping of well graded NAF waste rock over a low slope surface (less than 50 H : 1 V). The “hummocked” surface remains in a loose state which facilitates infiltration that also provides additional storage in the valleys between the individual heaps. SAR Covers developed in this manner result in near zero surface runoff and are therefore well suited to final landforms at risk of erosion.

Deployment of SAR Covers in northern Australia has been reported widely in the technical literature including:

- Williams D, Mulligan D, and Currey N (2006): "A Reflection and Analysis of the Waste Rock Dump Closure Strategies at Kidston Gold Mine". First International Seminar on Mine Closure (Australian Centre for Geomechanics pp. 463–472).
- Rohde T, Defferrard P, and Lord M (2016): "Store and Release Cover Water Balance for the South Waste Rock Dump at Century Mine". Eleventh International Conference on Mine Closure (Australian Centre for Geomechanics pp. 47–59).
- Defferrard P, Rohde T and Lang J (2024): “Ten Years of Cover Performance Data and Capillary Break Investigation for Leding Practice Store and Release Cover at Century Mine” ". Seventeenth International Conference on Mine Closure (Australian Centre for Geomechanics pp. 681-694).

An example of an ISL developed using ‘Rock Mulch’ derived from shales, mudstones and siltstones (materials similar to those encountered at BVS) is presented in **PLATE 4**.

In this case, rock mulch discharged from 90 t class haul trucks would form a mound approximately 2.0 m high and 6.0 m in diameter. Additional piles were then tipped in a ‘tight’ pattern which caused the piles to overlap. Sufficient fill was placed over a given area to achieve the required ISL thickness through controlled placement. Settlement of the individual piles was approximately 300 mm over the first 24 months. In this case, vegetation establishment was achieved by direct seeding from a helicopter.

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PLATE 4: EVOLUTION OF HUMMOCKED ISL IN NORTHERN AUSTRALIA







4.4 Post-Mining Land Use Risks

4.4.1 Soil Nutrition and Plant Available Moisture

The construction materials proposed to be used to develop the SAR Covers at the IWL would be comprised of rocky soils and meta-soils derived from mine development. They are likely to be characterised by poor soil structure, very low levels of soil organic matter and nutrients, and poor moisture holding capacity. As a result, establishment of a vegetation community on landforms comprised of waste rock can be challenging.

Low levels of soil nutrition are unlikely to be a limiting factor because vegetation species endemic to northern Australia are generally well adapted to tolerate poor nutrition. Plant Available Moisture (**PAM**) is generally a much more significant factor. Plants can only grow when the moisture content of a soil matrix exceeds the Permanent Wilting Point (**PWP**). Species endemic to the Site are expected to be well suited to survive through the dry summers that occur each year, but a good growing season is essential if the community is to maintain suitable vigour. Vigorous growth is essential if processes such as nutrient recruitment (eg dropping leaf litter) and reproduction are to be effective.

If the decommissioning and rehabilitation program is to be successful, the system must provide sufficient PAM to support establishment of a viable vegetation community.

4.4.2 Revegetation

The Site is located in the Gulf Plains Bioregion (2) and Land Zones that include quaternary alluvial deposits (3) and sandstone ridges (10). Vegetation types are dominated by woodlands.

A viable and self-sustaining vegetation cover is integral to the SAR Cover functionality and supporting the PMLU. Incorrect specification of the revegetation to be established as a component of the cover system could result in a number of undesired outcomes that result in a failure to establish. Such conditions could then give rise to destabilising factors such as wind and water erosion and or infestation by weeds.

The climate and soils of the Site are such that the most viable means of establishing a self-sustaining vegetation cover in the SAR Cover would be to revegetate using species endemic to the local area.

4.4.3 Tree Root Penetration

Decommissioning and rehabilitation of the IWL would include establishment of vegetation including tree species on the SAR Cover. The primary purpose of revegetation would be to support implementation of the PMLU, but a secondary purpose would be to increase evaporative losses from the ISL by photo-transpiration and thereby reduce the hydraulic gradient applied to the RPL. It should be noted that detailed design of the RPL and ISL that form the proposed SAR Cover would ignore the effects of transpiration.

Detailed design of the SAR Cover has not been completed but the Revised IWL Concept adopts a duplex cover that includes a low permeability zone (RPL) overlain by a water storage zone (ISL). The purpose of the RPL is to resist infiltration so it will not hold significant inventories of water. The ISL however would be configured to store as much moisture as practicable so tree root development would preferentially occur in that zone. It is expected that an ISL thickness of at least 1 m would be required to provide sufficient storage for the climatic conditions at the site.

Establishment of tree species in the ISL would require that 600 mm of ‘growth media’ was available to provide for development of a root structure that provided for nutritional and moisture needs as well as stability. The Revised IWL Concept includes an ISL thickness of 1,500 mm that exceeds this requirement.

Successful development of the revegetation would eventually result in improved soil characteristics including structure development and increased inventories of organic matter and macronutrients. These improved characteristics would significantly improve the moisture holding capacity of the cover and would act to accentuate the installed Infiltration Barrier.

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4.5 Life of Facility and Execution Risks

4.5.1 LOM Inventory

Effective implementation of the IWL Concept would require that:

- The CPC provides sufficient capacity for the LOM PAF waste rock and filtered tailings inventories, and
- That sufficient NAF waste rock is available to form the SCP and CPC.

Detailed design of the IWL should demonstrate that sufficient inventories are available to provide for effective containment at all times, including during the IWL construction and decommissioning and rehabilitation phases. This would typically include geometric modelling to develop bills of quantity for key material types and potentially a process for material reservation.

In the BVS case, these risks are not considered significant because the NAF waste rock inventory (130 MT) significantly exceeds the PAF waste rock and filtered tailings inventories (20 MT) at a ratio of 7 : 1. Effective mine planning and sequencing would ensure that suitable inventories of NAF waste rock were reserved for implementation of the IWL Concept.

It should be noted that development of additional CPC capacity would be relatively straightforward by merely extending the extents of the void. Unused capacity could easily be taken up by Co-placement of NAF waste rock. Unnecessary extension of the CPC however should be avoided as the increased CPC catchment area adds an unnecessary burden to the SCP and site water management system.

4.5.2 Construction Management

Effective development of the IWL would require that the as-constructed status of the facility remains consistent with the design intent.

Management of these classes of risk should include periodic inspection of the works by a suitably qualified and experienced engineer who is familiar with the design and the design intent. The inspections should be documented and completed in a manner similar to Section 8 of ANCOLD 2019.

4.5.3 Post Closure Drain-down

Under the Revised IWL Concept, the CPC would remain open during the IWL construction phase and would not close until installation of the SAR Cover. It should be expected that meteoric water entering the CPC during the construction phase would be lost either to evaporation or as drainage to the SCP where it would be recovered and directed to the water management system. Water would not be ‘held-over’ from year to year.

Installation of the SAR Cover would effectively close off the CPC and ingress of additional water would be limited to net flux through the Infiltration Barrier.

It should be noted that the SCP and underdrainage system would continue to operate following completion of the decommissioning and rehabilitation phase.

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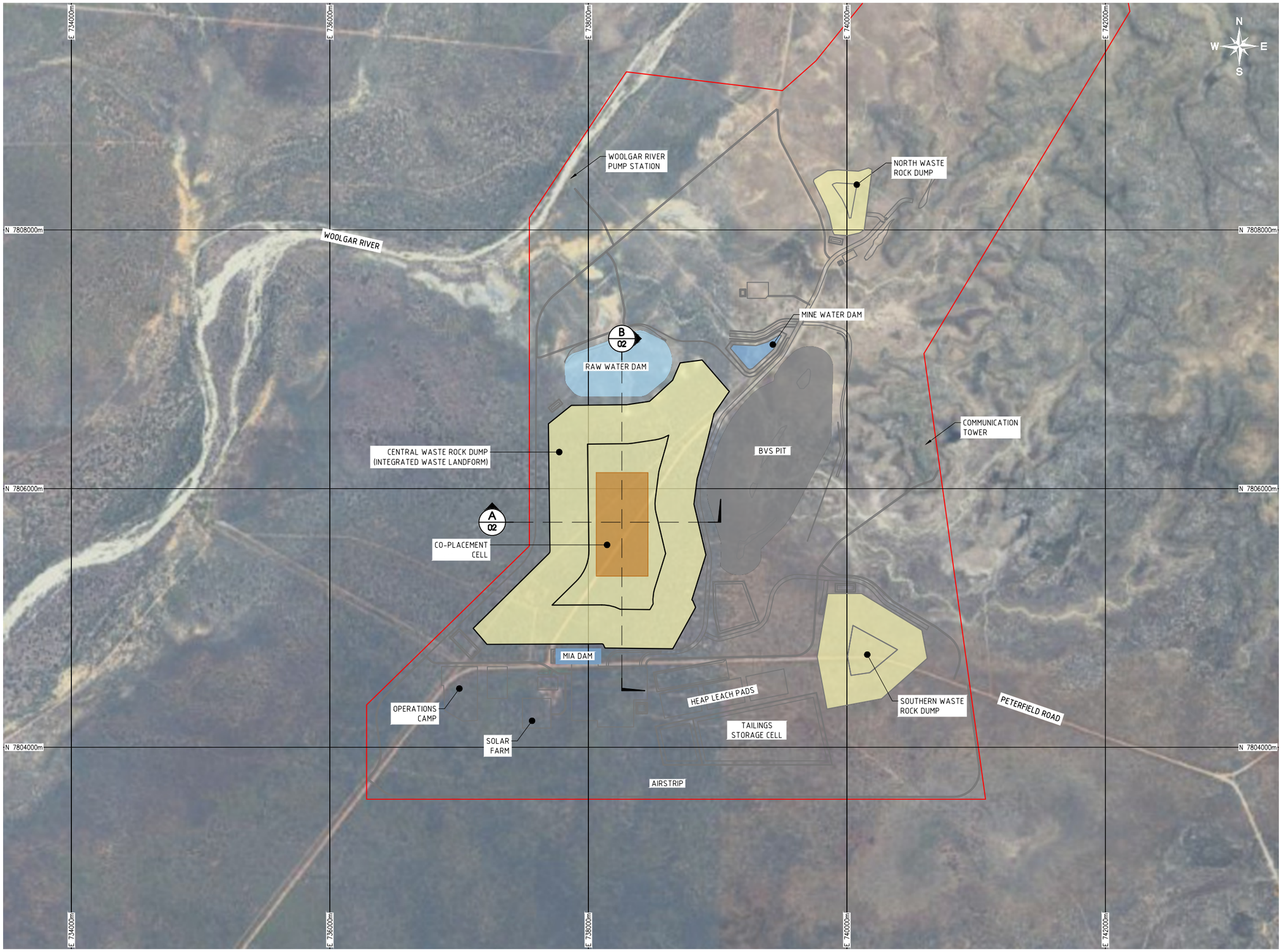
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APPENDIX A – IWL CONCEPT DRAWINGS



LEGEND

- PROJECT SITE (ML) BOUNDARY)
- WASTE ROCK DUMP
- CO-PLACEMENT CELL

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SCALE OF METRES 1:30,000 @ A3

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LAYOUT PLAN

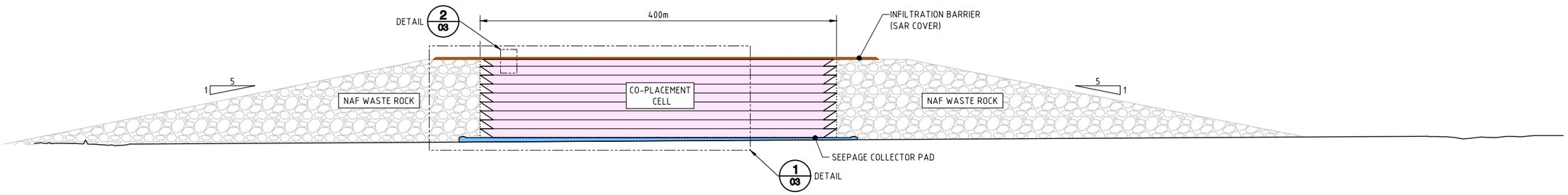
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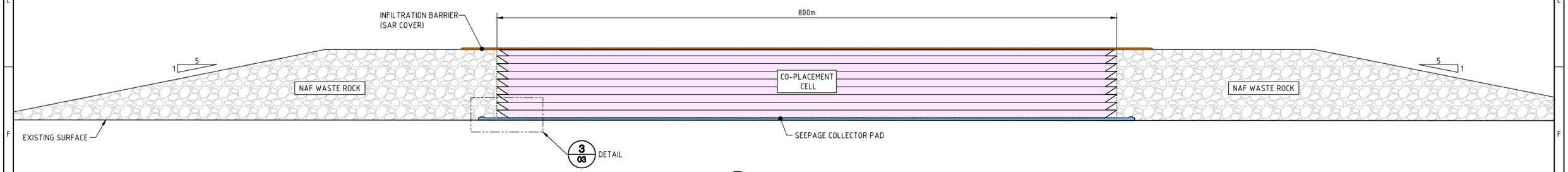
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SECTION B — SCALE 1:5,000 — 01

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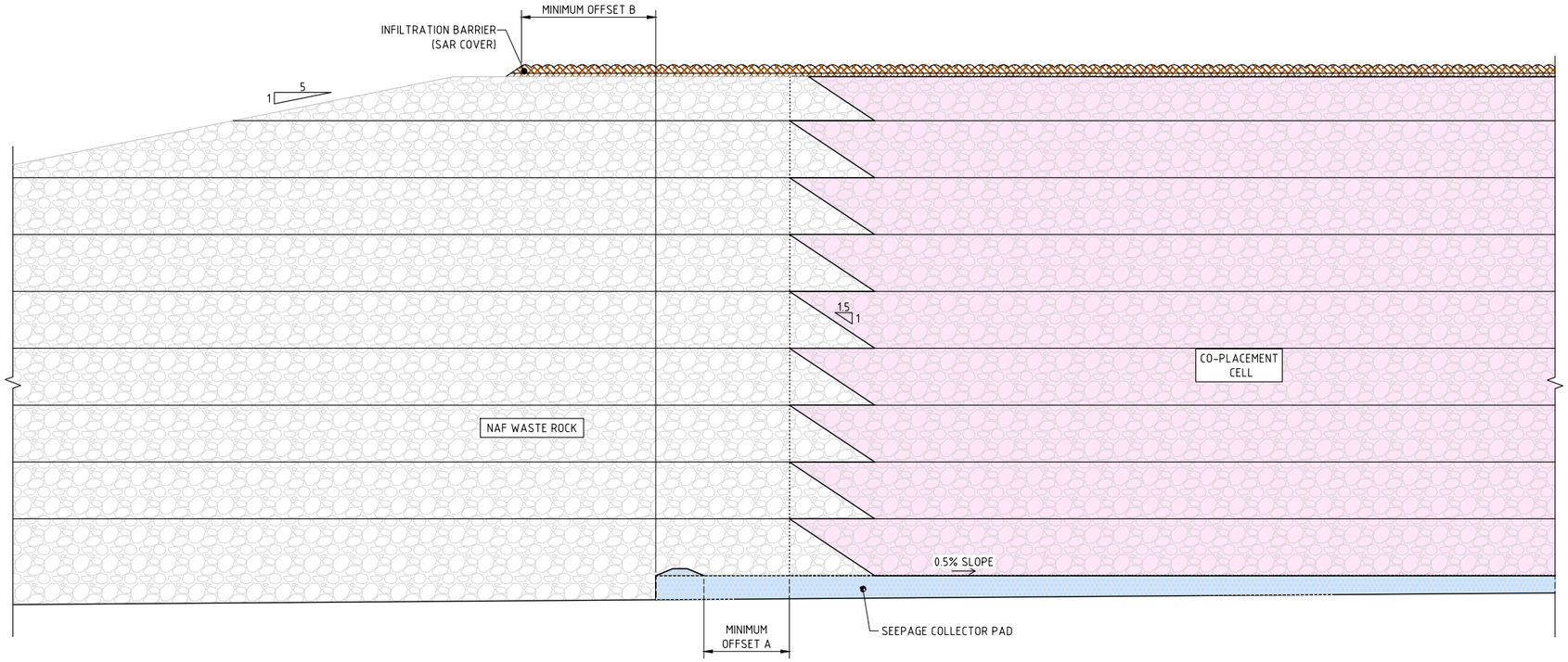
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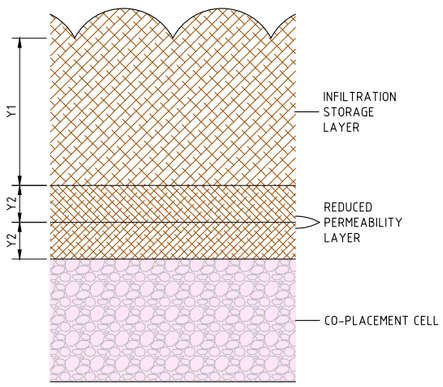
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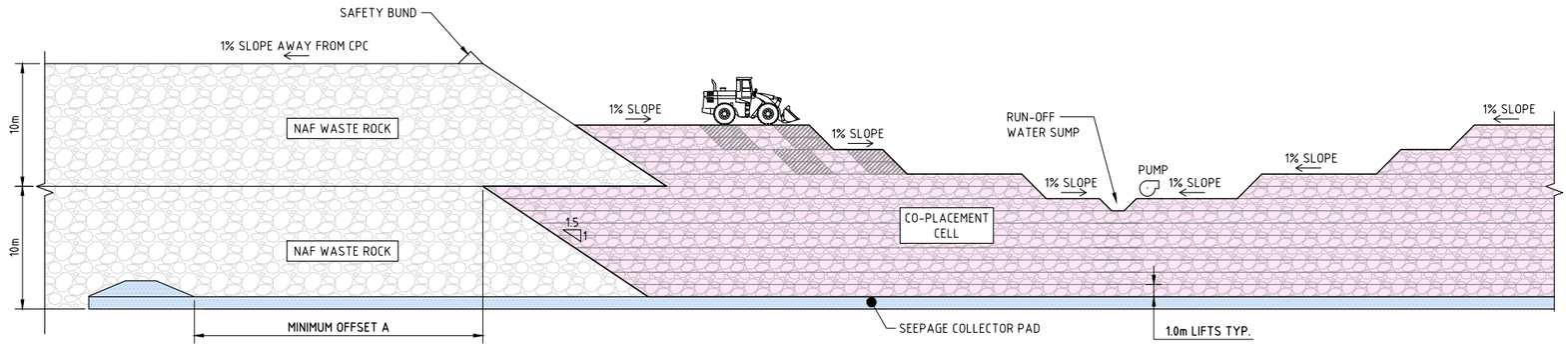
1. NAF WASTE ROCK PLACED BY END-TIPPING IN 10m (VERTICAL) LIFTS.
2. CO-PLACEMENT WASTE PLACED IN 1m (VERTICAL) LIFTS BY END-TIPPING WITH NO MIXING OF WASTE TYPES AND COMPACTION TO ENGINEERS SPECIFICATION.
3. RUNOFF WATER SUMP TO BE MAINTAINED AT ALL TIMES. WATER ACCUMULATING IN SUMP TO BE PUMPED TO SITE WATER MANAGEMENT SYSTEM.
4. REDUCED PERMEABILITY LAYER PLACED TO ENGINEERS SPECIFICATION (IN LAYERS, WITH MOISTURE CONDITIONING AND COMPACTION).
5. INFILTRATION STORAGE LAYER PLACED TO ENGINEERS SPECIFICATION (PADDOCK DUMPED TO FORM HIGHLY TEXTURED AND 'LOOSE' SOIL).



DETAIL 1 SCALE 1:1000 02 CO-PLACEMENT CELL CONFIGURATION



DETAIL 2 SCALE 1:50 02 SAR COVER



DETAIL 3 SCALE 1:500 02 CO-PLACEMENT CELL DETAIL

0.5 0 0.5 1.0 1.5 2.0 2.5
SCALE OF METRES 1:50 @ A3

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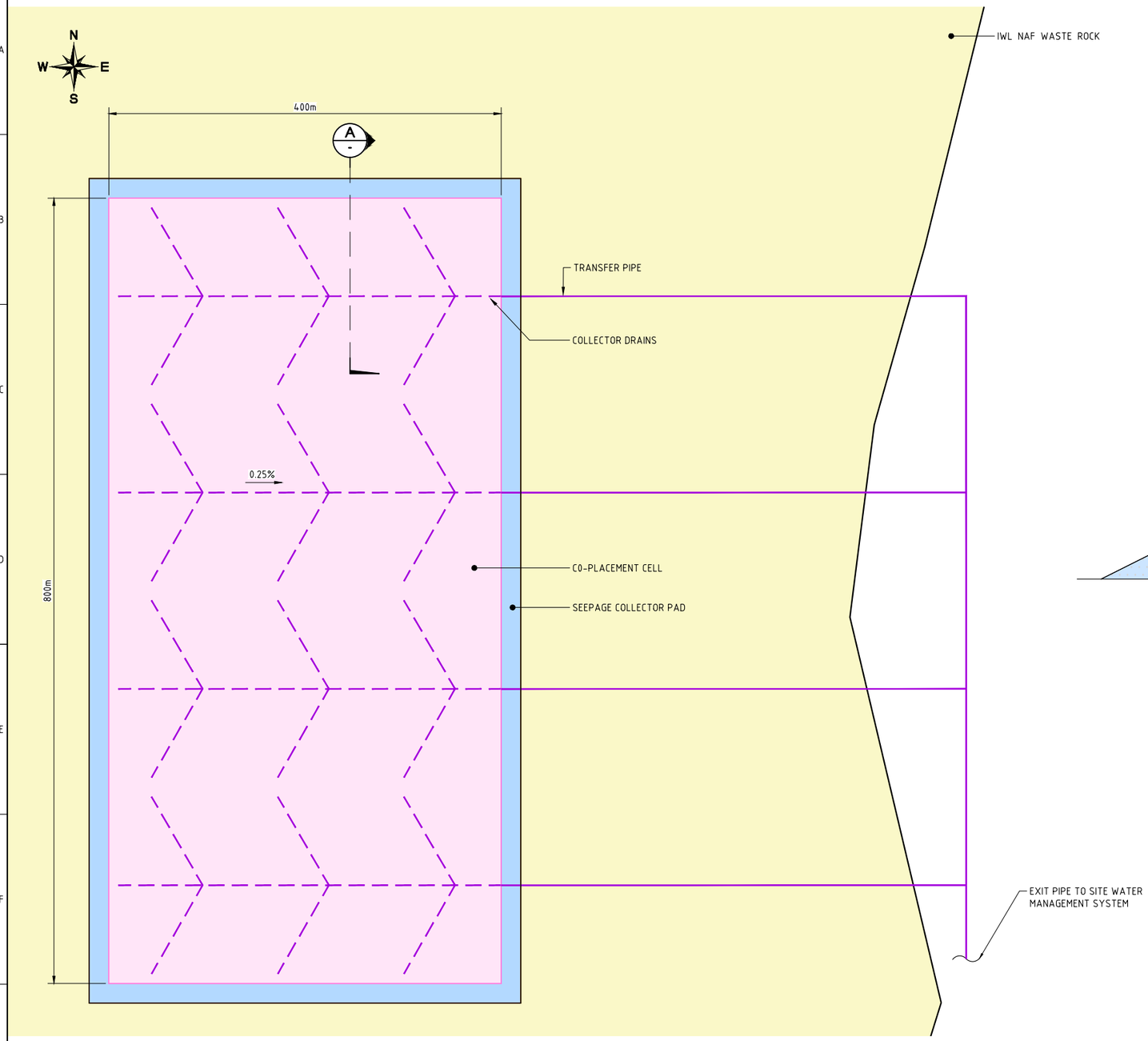
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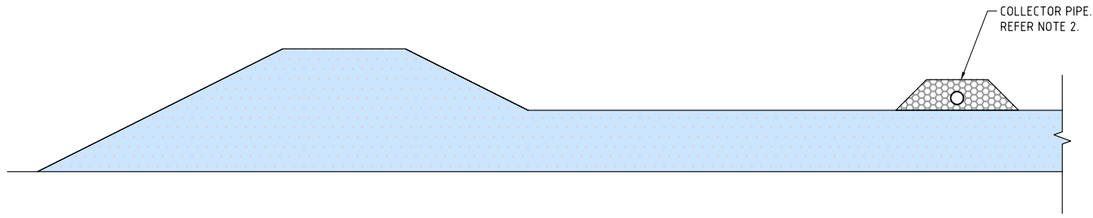
SHEET 3 OF 4



CO-PLACEMENT CELL PLAN
SCALE 1:5,000

NOTE - SEEPAGE COLLECTOR PAD:

1. SEEPAGE COLLECTOR PAD DEVELOPED TO ENGINEERS SPECIFICATION TO ACHIEVE LOW PERMEABILITY AND GRADIENT.
2. COLLECTOR DRAIN FORMED BY SLOTTED PIPE WITH AGGREGATE FILTER
3. TRANSFER DRAIN FORMED WITH SOLID HDPE



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APPENDIX F

Geochemistry Report

STRATEGIC MINERALS
CORPORATION

TECHNICAL REPORT

Geochemistry Report for the Big Vein South Gold Project

Prepared for: Strategic Minerals Corporation Pty Ltd

Prepared by: RGS Environmental Consultants Pty Ltd

9 September 2026

RGS

MINE WASTE AND WATER MANAGEMENT

TECHNICAL REPORT

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Glossary of terms and abbreviations

ABA	Acid Base Account, an evaluation of the balance between acid generation and acid neutralisation processes. Generally, determines the MPA and the inherent ANC, as defined below, and is commonly used in assessing the potential for AMD associated with mining.
ABCC	Acid Base Characteristic Curves
Acidity	A measure of hydrogen ion (H+) concentration and certain dissolved metals in a solution when titrated to a set pH value; generally expressed as mg/L $CaCO_3$ equivalent.
Alkalinity	A measure of the capacity of a water to neutralise acids.
ALS	Australian Laboratory Services.
AMD	Acid and metalliferous drainage from mine waste materials characterised by low pH, elevated metal concentrations, high sulfate concentrations and high salinity.
ANC	Acid Neutralising Capacity expressed as kg H_2SO_4 per tonne of sample. A measure of a sample's maximum potential ability to neutralise acid.
ANC:MPA	The ratio of the acid neutralising capacity to the maximum potential acidity of a sample. Used to assess the risk of a sample generating acid conditions.
AS	Australian Standards
BVS	Big Vein South
CIL	Carbon-In-Leach gold processing plant using activated carbon.
EC	Electrical Conductivity, expressed as µS/cm.
eCEC	Effective cation exchange capacity provides a measure of the mass of exchangeable cations (Ca, Mg, Na and K) in a sample.
Eh	Redox potential. A measure of the tendency of a chemical species to acquire or lose electrons to an electrode. Used to measure oxidising (+ve) or reducing (-ve) conditions in a saturated column.
EAR	Environmental Assessment Report.
ESP	Exchangeable sodium percentage provides a measure of the sodicity of a material and propensity to erode.
FIMS	Flow Injection Mercury System.
GAI	Geochemical Abundance Index.
HEC	Hansen Environmental Consulting.
H_2SO_4	Sulfuric Acid.
HIL	Health Investigation Levels under the NEPM. The HILs are scientific, risk-based guidance levels (or Tier 1 criteria) designed to be used in the first stage of an assessment of potential risks to human health from chronic exposure to contaminants.
ICP-MS	Inductively Coupled Plasma Mass Spectrometry.
ICP-AES	Inductively Coupled Plasma Atomic Emission Spectrometry.
INAP	International Network on Acid Prevention.
KLC	Kinetic Leach Column. Leaching setup that generates time-dependent data on the kinetics and rate of acid generation and acid neutralising reactions under laboratory controlled (or onsite conditions).

LOR	Limit of Reporting. Laboratory detection limit for the reporting of results for a particular geochemical test.
MPA	Maximum Potential Acidity calculated by multiplying the total sulfur content of a sample by 30.625 (stoichiometric factor) and expressed as kg H_2SO_4 per tonne.
NAF	Non-Acid Forming. Geochemical classification criterion for a sample that will not generate acid conditions.
NAG test	Net acid generation test. Hydrogen peroxide solution is used to oxidise sulfides in a sample, then any acid generated through oxidation may be consumed by neutralising components in the sample. Any remaining acidity is expressed as kg H_2SO_4 per tonne.
NAPP	Nett Acid Producing Potential, expressed as kg H_2SO_4 per tonne. Calculated by subtracting the ANC from the MPA.
NEPC	National Environment Protection Council. The NEPC makes the National Environment Protection Measures (NEPMs) and reports on the implementation and effectiveness of NEPMs in participating jurisdictions.
PAF	Potentially Acid Forming. Geochemical classification criterion for a sample that has the potential to generate acid conditions.
PC Titrator	Potentiometric Compact Titrator. PC Titrators are specially designed for routine applications and simple operation, allowing basic titration analysis from a single device.
pH	A measure of hydrogen ion (H^+) concentration; generally expressed as pH.
PSD	Particle size distribution.
Scr	Chromium reducible sulfur test measures the sulfide sulfur content of a sample material.
SD	Saline Drainage. Water that is elevated in dissolved salts (e.g., Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, and SO_4^{2-}), but may have acidic, neutral, or alkaline pH.
SMC	Strategic Minerals Corporation.
SO_4^{2-}	Sulfate.
Spent heap leach residue	Material left over following heap leaching (i.e. once the leaching process is complete and no further gold can be recovered the spent ore and residual cyanide solution becomes waste). Typically the waste load is rinsed with water until the cyanide concentration in the effluent is below the adopted environmental criteria.
Static test	Procedure for characterising the geochemical nature of a sample at a single point in time. Static tests may include measurements of mineral and chemical composition of a sample and the Acid Base Account.
SWP	Strategic Woolgar Project.
Total Sulfur	Total sulfur content of a sample measured using a 'Leco' analyser expressed as % S.
Tailings	Material left over after the process of separating the economic fraction (ore) from the uneconomic fraction.
w:v	Weight to volume ratio.
Waste Rock	Material that surrounds an ore body and must be removed to mine the ore.
WAD cyanide	Weak Acid Dissociable cyanide.
WRD	Waste Rock Dump. A facility used to store waste rock.
XRD	X-ray diffraction is a rapid analytical technique providing elemental data for samples.

1 Introduction

RGS Environmental (RGS) was commissioned by Strategic Minerals Corporation (SMC) to complete a geochemistry assessment as part of the Environmental Assessment Report (EAR) for the Big Vein South Gold Project (the project).

1.1 Project description

The project involves the construction and operation of an open cut gold mine on a greenfield site in North Queensland. The project site covers an area of approximately 2,281 ha and is located approximately 100 km north of Richmond and 380 km west of Townsville (**Map 1**).

Open cut mining will be conducted using excavators and trucks. Gold ore will be processed on site to produce gold dore (solid bars containing gold alloy). The mine's peak production rate will be up to 1.95 million tonnes per annum (Mtpa) of run of mine (ROM) gold ore, yielding up to approximately 100,000 ounces of gold dore per annum. The mine life will be approximately 11 years.

The following mining and ore processing activities will be undertaken as part of the project:

- Developing three open cut pits, as follows:
  - The main Big Vein South Pit (BVS Pit) located in the centre of the project site (**Map 2**). Waste rock from this pit will be hauled by truck and stored in the Central and Southern Waste Rock Dumps (WRDs).
  - Two small satellite pits, BV1 Pit and BV2 Pit, located in the northern part of the project site (**Map 2**). Waste rock from these pits will be stored in the Northern WRD.
- Transporting mined ore in haul trucks from the open cut pits to the ROM area ore stockpiles located near the mine processing facilities at the southern end of the project site (**Map 2**).
- Processing ore from the BV1 and BV2 Pits in the first 2 years of mining using Heap Leach Pads and gold elution. Processing ore mined from the BVS Pit in an on-site Carbon In-Leach (CIL) Plant from Year 3 onwards. The heap leaching process will generate spent heap leach residues. These residues will be reprocessed in the CIL Plant over the life of the mine. The CIL Plant will generate wet tailings and dewatered tailings. Wet tailings will be pumped to a Tailings Storage Cell. Dewatered tailings will be stored with waste rock in the Central and Southern WRDs.
- Transporting dore bars from the site via plane to a refinery.

The majority of the mine infrastructure will be located at the southern end of the project site (**Map 2**). Key mine infrastructure will include ore processing facilities, workshop, warehouse, administration buildings, haul roads and access roads, vehicle servicing, refuelling and wash down facilities, fuel storage facilities, diesel and solar power station, water supply and water management infrastructure. Workforce accommodation and a private airstrip will also be located at the southern end of the project site.

1.2 Mine materials generated by the project

The project will generate the following distinct mine materials:

- Waste rock from BVS Pit;
- Waste rock from the two smaller satellite pits (BV1 Pit and BV2 Pit);
- High grade ore;
- Low grade ore;
- Wet tailings;
- Dewatered tailings; and

- Spent heap leach residues.

These materials will be stored and handled as follows:

- Waste rock from BVS Pit will be stored the southern and central WRDs, along with the dewatered tailings.
- Waste rock from BV1 Pit and BV2 Pit will be stored the northern WRD.
- High grade ore will be stockpiled in the mine industrial area or the heap leach pads for processing during mining operations. No high grade ore will be present at mine closure.
- Low grade ore will be stockpiled on dedicated pads prior to processing during mining operations. No low grade ore will be present at mine closure.
- Wet tailings will be stored in a dedicated Tailings Storage Cell during mining operations and post closure.
- Spent heap leach residues will be stockpiled on dedicated Heap Leach Pads prior to processing during mining operations. No spent heap leach residues will be present at mine closure.

1.3 Report scope and structure

The key objectives of the geochemistry assessment are to:

- Investigate the geochemical and physical characteristics of the materials listed in **Section 1.2**.
- For each of these materials, assess the risk of acid generation, the presence of soluble metals and salts and the potential risks of leachate from these materials; and
- Identify any rehabilitation and environmental management issues related to the geochemical and physical properties of these materials and propose appropriate management measures.

This report is structured as follows:

- **Section 1** provides an overview of the project, a description of the materials that will be generated by the project and describes the scope of work and report structure.
- **Section 2** provides a description of the project site geology.
- **Section 3** provides a detailed description of the geochemistry assessment methodology, including the geochemistry sampling and testing program.
- **Sections 4 to 9** present the geochemical results for each of the mine materials that will be generated by the project (i.e. as listed in **Section 1.2**).
- **Section 10** describes the management measures to be adopted for the storage and handling of mine materials based on the geochemistry results.
- **Section 11** provides a complete list of references relied upon to complete this report, as well as the figures referred to in text.

Attachment A provides an overview of the geochemical testing methodology. Laboratory test data are provided in **Attachments B** to **E**. The plan view and vertical section images of the BV1 and BV2 drill holes are provided in **Attachment F**.

2 Local Geology Overview

The project site and its surrounds have a long history of geological exploration. Exploration activities commenced in the 1950s and have continued at intervals until the present day. On this basis, the geology of the project site and its surrounds is well understood.

The project site is located at the northern margin of the Eromanga Basin, a sedimentary basin that was deposited in the Mesozoic era. Locally, the Eromanga Basin overlies a Proterozoic basement. The Proterozoic basement is part of the North Australian Craton, one of Australia's major mineral provinces.

The Eromanga Basin and Proterozoic basement have been extensively modified by weathering and erosion. The weathered profile extends to depths of up to 40 m below ground level in the project site.

The surface geology in the project site and its surrounds is shown in **Map 3**. The project site stratigraphy includes the following (from youngest to oldest):

- Alluvium associated with the Woolgar River and its floodplain;
- The weathered in-situ rocks of the Eromanga Basin and Proterozoic basement (herein called the 'weathered profile');
- Fresh (i.e. unweathered) Jurassic strata of the Eromanga Basin; and
- Fresh Proterozoic basement rocks, including the target gold ore.

The Woolgar River alluvium is a sand and gravel deposit that forms the Woolgar River floodplain. The floodplain alluvium is confined within a narrow valley. The floodplain alluvium thickness typically ranges from a few centimetres at the edge of the floodplain up to approximately 10 m on the riverbanks. The river channel is typically incised approximately 4 m into the floodplain alluvium. The base of the alluvium is located approximately 6 m below the riverbed.

The weathered profile comprises poorly consolidated, fine-grained, clay-bound sands and silts. It is present across the entire project site and is typically located at the ground surface, except where it is overlain by the alluvium. The weathered profile is up to approximately 40 m thick in the lower lying areas and is typically thinner in the elevated parts of the project site (approximately 0.5 m thick). The weathered profile is between 4 m and 25 m thick in the open cut mining areas.

Historical bore logs show that the fresh Jurassic strata forms a single, undifferentiated sedimentary rock formation, comprising mainly sandstone, with minor conglomerate, siltstone and claystone. Where present within the project site, the fresh Jurassic strata underlies the weathered profile (**Map 3**) and ranges in thickness up to approximately 70 m. The fresh Jurassic sediments are between 0 m and 30 m thick in the open cut mining areas.

Exploration data from the project site shows that the Proterozoic basement comprises folded metamorphic rocks (e.g. amphibolite), granite and intrusive (dolerite and rhyolite) dykes. The Proterozoic basement typically underlies the weathered profile and the fresh Jurassic sediments (where present) (**Map 3**). Within the open cut mining areas, the top of the Proterozoic basement is located at depths of between 10 m and 40 m below the ground surface. The Proterozoic basement is estimated to be several kilometres thick in the open cut mining areas.

The gold ore has been deposited in a deformation (or shear) zone within the Proterozoic basement. The shear zone is orientated along a south-southwest to north-northeast axis and extends across the project site. Exploration data from the project site shows that the shear zone has been completely mineralised.

3 Methodology

Contemporary best practice geochemical sampling and characterisation was undertaken in accordance with the Australian Government's handbook *Preventing Acid and Metalliferous Drainage* (the PAMD Handbook). The PAMD Handbook was published in 2016 and established the current overarching national framework for the assessment and management of acid and metalliferous drainage (AMD) across the mining industry. The PAMD Handbook is regarded as leading practice for AMD in Australia.

Dr Alan Robertson, Principal Geochemist at RGS was a member of the PAMD Handbook development panel and was engaged by the Australian Government to peer review the PAMD Handbook. Dr Robertson was also the expert peer reviewer for the 2024 South Australian guidelines *Assessment and Management of Acid and Metalliferous Drainage* and is chairperson of the NT Government's *McArthur River Independent Expert Panel on the Prevention and Management of Potential AMD from Large Waste Rock and Tailings Storage Facilities*.

The project geochemical sampling and characterisation program has been undertaken in accordance with the PAMD Handbook. Section 4.2 of the PAMD Handbook requires that a risk-based, site-specific material characterisation program is undertaken prior to mining, based primarily on the geological and geochemical variability of the in-situ rock and the consequences of misclassifying materials. Section 4.2 of the PAMD Handbook specifically recommends that the program should be designed to be representative rather than achieve a specific minimum sampling frequency or density.

For projects at this stage of development, the PAMD Handbook methodology involves:

- An initial desktop assessment to establish the geological variability and any known AMD risks;
- An initial screen of the in-situ rock for potential AMD risks; and
- A targeted sampling of the in-situ rock and/or mine materials to confirm the screening results and confirm the potential AMD risks.

The following sections describe the site-specific geochemistry sampling and characterisation program that has been undertaken for the project, in accordance with the risk-based approach required by the PAMD Handbook.

3.1 Desktop Assessment of Geological Variability and AMD Risks

The desktop review considered published geology mapping and SMC's geological exploration database, comprising approximately 40,000 m of logged drill core collected from 90 drill holes within the BVS Pit, 39 holes within the BV1 Pit and 27 holes within the BV2 Pit (refer to **Map 4**). Based on this review, it was concluded that:

- The waste rock in all three pits is dominated by weathered sediments overlying unmineralised Proterozoic rock (mainly dolerite, granite and metamorphic schist/gneiss) accounting for more than 90% of the total rock in each pit).
- All three pits contain a narrow band of mineralised rock that hosts the target gold ore.

The in-situ geology is relatively uniform across the gold resource and the geology within in each pit is similar. Hence, the waste rock and ore from each pit is expected to be consistent and predictable. Based on these geological conditions, it is highly probable that the only potential AMD risks would be associated with the mineralised rock rather than the weathered sediments or unmineralised Proterozoic rock.

3.2 Screening Assessment

A screening assessment was undertaken to confirm the geological interpretation presented in Section 3.1.

In total, the screening assessment considered :

- 10,003 geochemistry assay samples collected from the BVS Pit (i.e. an average of one result for approximately every 3.6 m of drilling in BVS Pit); and

- 1,208 additional geochemistry assay samples collected from the BV1 and BV2 Pit waste rock profiles.

Each geochemical assay sample was tested for a multi-element analysis for a broad suite of parameters (35 elements) including total/speciated sulfur and a range of metals and metalloids. These results span the entire waste rock profile in BVS Pit, BV1 Pit and BV2 Pit and represent all relevant rock types present in all three pits. These results were evaluated to assess AMD potential. 196 samples which contained over 1% Ca and Mg were analysed for ANC (Acid Neutralising Capacity). The measured ANC values were used with measured Ca and Mg data to derive correlations for inferred ANC values for the entire database. The maximum potential acidity (MPA) was calculated from total sulfur results in the assay database, which were then balanced against the inferred ANC values to determine the net acid producing potential (NAPP) of all assay datapoints in the assay database.

The findings of the initial screening assessment are consistent with the geological interpretation and confirm that:

- The waste rock in BVS Pit is overwhelmingly (98%) non-acid forming (NAF) rock with significant buffering capacity and is likely to be acid consuming.
- The waste rock in the satellite pits is NAF with significant buffering capacity and is likely to be acid consuming.
- Potentially acid-forming (PAF) material within the waste rock is mineralised rock that is very closely associated with the orebody (typically within a few metres). PAF material is not correlated to any specific lithology and is not widely distributed throughout the waste rock profile away from the mineralised zone.

3.3 Targeted sampling and testing program

3.3.1 Overview

A targeted geochemical sampling and assessment program was undertaken to confirm the screening results for waste rock, to provide additional detail on the characteristics of ore and other mine materials derived from the processing of ore (i.e. tailings and spent heap leach residues) and to confirm the potential AMD risks from the storage and handling of these materials. In summary, this included:

- The collection of a representative subset of 228 waste rock samples; and
- The preparation of seven ore, tailings and spent heap leach samples by processing of bulk ore samples in a laboratory-scale plant. As explained in Section 4 of the PAMD Handbook, processed waste samples are considered to be more representative than in-situ ore testing and are typically undertaken later in the project development process due to the significant time and cost involved in preparing these samples.

The test results from the targeted geochemical sampling confirmed the findings of the waste rock screening assessment and AMD risks, and the geochemical characteristics of the ore and process wastes produced from ore.

Based on the consistent and predictable geology and the significant number of representative geochemical datapoints (>11,000), there is a high level of confidence in the conclusions of the geochemical characterisation program and a low risk of materials being misclassified.

Sections 3.3.2 to 3.3.5 provide details of the geochemistry field investigation strategy, sampling effort and targeted geochemical analysis undertaken.

3.3.2 Waste Rock Samples

Between 2010 and 2021, SMC drilled several hundred exploration drill holes within the extent of the proposed BVS, BV1 and BV2 Pits. SMC's exploration geologists logged, sampled and assayed the exploration holes and provided RGS with the exploration database to identify exploration samples representative of the waste rock material from the three pits that will be stored in the relevant WRDs.

The following waste rock samples and selected assay results were selected for use in this assessment:

- For BVS Pit, a total of 10,213 samples comprising:
  - 10,003 geochemistry assay samples (exploration samples) collected from a total of 90 exploration drill holes.
    - This includes a subset of 196 representative exploration drill chip samples (Sample 1 to Sample 196) that were selected from 60 (of the 90) exploration drill holes selected by RGS for targeted geochemical testing.
  - 14 drill core samples (Sample 197 to Sample 210); and
- For BV1 and BV2 pits, a total of 1,226 samples comprising:
  - 1,208 geochemistry assay samples (exploration samples) collected from a total of 66 exploration drill holes.
  - 18 drill core samples from a total of 4 exploration drill holes (Sample 211 to Sample 228).
  - 2 composite samples representing waste rock from BV1 Pit (sample IDs 2021057_C003 and 2021057_C004, herein shortened to waste rock samples C003 and C004).
  - 2 composite samples representing waste rock from BV2 Pit (sample IDs 2021057_C005 and 2021057_C006, herein shortened to waste rock samples C005 and C006)

Map 4 shows the locations of the drill holes that provided the waste rock samples from BVS, BV1 and BV2 Pits. The samples and corresponding drill holes and lithologies are listed in the upper portion of **Table B1 (Attachment B)**. All drill chip and drill core materials were logged and sampled by a suitably qualified SMC geologist as directed by RGS to ensure the collection of representative samples. The drill chip and drill core waste rock samples were placed in individual plastic bags and transferred to ALS Environmental Laboratory (ALS Stafford) for testing.

3.3.3 Ore and Mine Waste Samples

A total of seven (7) ore and mine waste samples were prepared by SMC for use in the geochemical assessment as follows:

- 3 tailings samples (called Tailings Sample 1 to 3);
- 2 spent heap leach residue samples (Spent Heap Leach Residue Sample 1 and 2);
- 1 low-grade ore sample; and
- 1 high-grade ore sample.

The samples are listed in the lower portion of **Table B1 (Attachment B)**. All ore and tailings/spent heap leach residue samples were placed in individual plastic bags and transferred to ALS Environmental (ALS) and/or Trilab Laboratories for testing and certificates of analyses are provided in **Attachment C**.

3.3.4 Geochemistry analysis program

3.3.4.1 *Overview of Analysis*

Prior to testing, the samples were prepared by ALS Stafford. Drill core representing waste rock and ore was crushed to pass 20 mm sieve size and a 300 g subsample taken and pulverised to pass 0.075 mm sieve size for subsequent static Acid Base Account testing. Drill chip and “as received” sample material representing ore, waste rock, tailings and spent heap leach residue materials did not require initial crushing and a 300 g subsample was taken and pulverised to pass 0.075 mm sieve size for subsequent static Acid Base Account testing. For kinetic tests, crushed drill core samples and “as received” samples were utilised, as required. The sample preparation method was determined by the testing requirements and is described in the testing sections below.

The geochemical test program involved:

- Acid Base Account testing of the solid materials to determine the acid generation (and neutralisation) potential of the materials.
- Multi-element testing of the solid materials to characterise the typical elemental profile of each material.
- Testing of water extracts from the solid materials. Water extracts were collected using 'static' water extract tests and kinetic leach column tests. Static and kinetic leachate tests are highly idealised laboratory tests and the results of these tests do not represent field seepage water quality. Static tests measure the maximum solubility of each component of the mine materials under idealised laboratory conditions designed to maximise oxidation and dissolution from pulverised sample materials (<75 µm) with a very high surface area. Kinetic tests measure the timing, rate and duration of oxidation and acidity/alkalinity generation processes generally under highly concentrated, freely-oxidising conditions. The data collected from these tests show the quality parameters that are theoretically leachable from the solid materials under artificially enhanced laboratory conditions. The data can be used to identify the quality parameters that should be monitored in the project groundwater and/or surface water monitoring programs.

Table 3-1 summarises the total testing numbers used in this assessment. A summary of the parameters involved in geochemical assessment of the samples is provided in **Attachment A**. A detailed breakdown of each component of the testing work is provided in Sections **3.3.2 to 3.3.5**. **Table 3-2** Summarises the waste rock geochemistry sampling program at BVS, BV1 and BV2 pits.

Table 3-1: Summary of samples tested in this assessment

Sample Material	Waste Rock		High Grade Ore	Low Grade Ore	Tailings	Spent Heap Leach Residue
	BVS	BV1/BV2				
Geochemical Assay testing	10,003	1,208	Not applicable			
Acid Base Account testing	196 exploration drill chip samples and 14 drill core samples	18 drill core samples	1	1	3	2
Multi Element Solids	196 exploration samples and 2 composite samples	2 composite samples	1	1	3	2
Static Water Extracts	0	0	1	1	2	0
Kinetic Leach Column Water Extracts	9	2	1	1	1	2

Table 3-2: Summary of waste rock geochemistry sampling program

Mining Pits	No. of Geochemical Assay Samples	No. of Targeted Geochemical Samples	Total No. of Geochemical Samples
BVS Pit Waste Rock	10,003	210	10,213
- *Unmineralised/weathered rock*	*7,740*	*208*	*7,948*
- *Partially mineralised waste rock associated with the orebody*	*2,263*	*2*	*2,265*
Satellite Pits Waste Rock	1,208	18	1,226
TOTAL	**11,211**	**228**	**11,439**

3.3.4.2 *Acid Base Account Testing*

Acid Base Account testing was used as a standard procedure whereby the static acid-neutralising and acid-generating characteristics of a material were assessed (AMIRA, 2002; COA, 2016; and INAP, 2026). This standard laboratory procedure provides a homogenous sample but also generates a large 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.

Acid Base Account testing was undertaken on the following samples:

- A total of 210 waste rock samples from BVS Pit, comprising:
  - 196 waste rock exploration samples from BVS Pit (i.e. Samples 1 to 196). These samples are a representative subset of the 10,003 exploration drill chip samples from BVS Pit that had existing total sulfur, calcium and magnesium assay data available (as well as a range of other metals and metalloids). RGS analysed the available exploration dataset to identify 196 representative waste rock samples from this dataset for further calibration using the Acid Neutralising Capacity test described below.
  - 14 additional drill core samples representing waste rock from BVS Pit (i.e. Samples 197 to 210).
- All 18 waste rock drill core samples from the BV1 and BV2 satellite pits (i.e. Sample 211 to Sample 228).
- All seven (7) ore, tailings and spent heap leach residue samples.

The testing included:

- Testing each sample for the following parameters:
  - Total sulfur [Leco method]; and
  - pH and Electrical Conductivity (EC) (1:5 sample:deionised water [w:v]) (drill core samples only);
  - Acid Neutralising Capacity (ANC) [AMIRA, 2002 method].
- For any samples with a concentration of ≥ 0.1% total sulfur (i.e. 20 samples in total), additional testing for the following parameters:
  - Chromium reducible sulfur (Scr) testing was undertaken to determine the sulfide sulfur content of the samples (Australian Standard AS 4969.7, 2008 method). The Scr test provides a more accurate representation of the MPA that could be generated from a sample material, as acid generation primarily forms from the reactive sulfide content measured by this method.
  - Net Acid Generation (NAG) testing was also completed on the 20 samples, as this provides additional information on the geochemical characteristics of sample materials and is typically used to compliment Acid Base Account test data at metalliferous mines (AMIRA, 2002; COA; 2016).
- Calculating the Maximum Potential Acidity (MPA) and Net Acid Producing Potential (NAPP) values of each sample from the total sulfur (or Scr data, where available) and these values were balanced against the ANC values to calculate the NAPP **(Table B1, Attachment B)**.

In addition, Acid Buffering Characteristic Curves (ABCC) tests were completed at the RGS in-house laboratory to investigate the acid buffering capacity of the sample materials at higher pH values than are used in the standard ANC tests. This method provides an indication of the potential for acid buffering at near neutral pH. A total of 50 ABCC tests were undertaken on the following samples:

- 40 waste rock samples from BVS Pit;
- 4 composite waste rock samples from BV1 and BV2 Pits (waste rock samples C003 to C006);
- 3 tailings samples (Tailings Samples 1 to 3);
- 1 spent heap leach residue sample (Spent Heap Leach Residue Sample 1); and

- 1 low grade ore sample and 1 high grade ore sample.

The ABCC test was completed by slowly acidifying a sample with dilute sulfuric acid to around pH 2.5 over a 16 to 24-hour period. The method is a less aggressive treatment of a sample than that applied in the ANC method, and typically only accounts for the more readily available carbonates (e.g., calcite and dolomite). When present in sufficient quantity, reactive carbonate minerals will typically buffer mine waste materials at near-neutral pH, subsequently maintaining low metal/metalloid solubilities.

The ABCC tests were completed using 1 g of sample (< 0.075 mm fraction contained in 25 mL of deionised water) and 0.05 M sulfuric acid (H_2SO_4) applied at a flow rate of 3.75 mL/hour using a Springfusor® pump. 0.05 M H_2SO_4 was selected as the appropriate acid concentration to generate accurate ABCC test curves following review of the ANC results for each sample. For this test, the pH probe was calibrated to pH 4.0 and pH 6.88 prior to testing each sample. The pH meter was set to log every five minutes until the solution pH reached 2.5.

3.3.4.3 *Multi-element tests on solid materials*

Multi-element testing was undertaken on the following samples:

- All 196 BVS Pit waste rock samples in the subset identified from the exploration samples (this testing was undertaken by SMC geologists as part of the exploration program).
- 2 composite samples representing waste rock from BV2 Pit (waste rock samples C003 and C004).
- 2 composite samples representing waste rock from BV1 Pit (waste rock samples C005 and C006).
- All seven (7) ore and mine waste samples (Tailings Samples 1 to 3, Spent Heap Leach Residue Samples 1 and 2, the high grade ore sample and the low grade ore sample).

The composite waste rock samples from BV1 and BV2 Pits were prepared based on the static Acid Base Account test results, sample lithology and sample weathering as detailed in **Table B2 (Attachment B).**

The multi-element testing suite was as follows:

For the 196 waste rock exploration samples:

- metals/metalloids in whole rock (4 acid digestion followed analysis of aluminium (Al), antimony (Sb), arsenic (As), boron (B), cadmium (Cd), calcium (Ca), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), iron (Fe), magnesium (Mg), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), potassium (K), selenium (Se), sodium (Na), thorium (Th), uranium (U), vanadium (V), and zinc (Zn) in whole rock) [ICP-AES and FIMS]).

For all other samples:

- metals/metalloids in whole rock (2 acid digestion followed analysis of Al, Sb, As, B, Cd, Ca, Cr, Co, Cu, Pb, Fe, Mg, Mn, Hg, Mo, Ni, K, Se, Na, Th, U, V and Zn in whole rock) [ICP-AES and FIMS]).

It is important to note that total metals/metalloids assay dataset supplied to RGS by SMC geologists for the initial 196 waste rock samples (i.e., from the SMC assay database) was generated using a 4 acid digest (hydrofluoric [HF], nitric [HNO_3], perchloric [$HClO_4$] acid digestion and hydrochloric [HCl] acid leach followed by FIMS and/or ICP-AES/MS). This is a sample digestion method used by exploration geologists and is a more aggressive sample digestion method than the standard 2-acid ('environmental') digestion method used by RGS and the mining industry in general for geochemical and environmental assay (COA, 2016). While data generated by a 4 acid digest are generally not appropriate for use in an environmental assessment, these data are useful in this instance as they provide multi-element data from a broad range of waste rock materials at the project.

To provide some context, RGS compared the metal/metalloid concentration in the relevant samples with HIL(C) levels for soils in public open spaces (NEPC, 2013).

3.3.4.4 *Testing of static water extracts*

Static water extracts were undertaken on the following samples:

- Wet and dewatered tailings samples (Tailings Samples 2 and 3)

The water extract tests involved artificially agitating pulverised tailings samples (≤ 75 µm) at a ratio of 1:5 (w:v) in deionised water. The use of pulverised tailings samples with a large surface area in contact with the leaching solution, thereby providing greater potential for dissolution and reaction that would occur under real-world field conditions. Agitating the samples further encourages dissolution and reaction. Finally the use of a 1:5 (w:v) ratio is significantly more concentrated (4 times) than alternative static testing methods that involve ratios of 1:20. The data collected from these tests show the quality parameters that are theoretically leachable from the solid materials under artificially enhanced laboratory conditions, and do not reflect tailings water released within the Tailings Storage Cell.

The tailings samples underwent the following tests on the soluble fractions of 1:5 (w:v) water extracts, a sample to volume ratio that is routinely used in the mining industry for such analyses (COA, 2016) :

- pH and EC;
- soluble metals/metalloids (Al, As, B, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Sb, Se, Th, U, V, and Zn) [ICP-AES/MS and FIMS].
- Weak acid dissociable (WAD) cyanide (the tailings samples only). WAD cyanide, refluxed under weakly acidic conditions (pH 4.5), includes all free cyanide species plus all Ag, Cu, Hg and Ni cyanides.

3.3.4.5 *Kinetic Leach Column (KLC) tests*

Following receipt and interpretation of the static geochemical test results, 16 KLC tests were established at the RGS in-house laboratory using the following samples as detailed in **Table B3** (**Attachment B**):

- 8 individual samples representing waste rock from BVS Pit (KLC 1 to KLC 8);
- 2 composite samples representing waste rock from BV1 and BV2 Pits (KLC 13 and KLC14);
- 1 individual sample representing tailings (KLC 9);
- 2 individual samples representing spent heap leach residue (KLC 11 and KLC 12);
- 1 individual sample representing low grade ore (KLC 10);
- 1 individual sample representing high grade ore (KLC 15); and
- 1 composite sample representing waste rock from BVS Pit (KLC 16).

3.3.4.5.1 Unsaturated Kinetic Leach Column tests

All but one of the KLC tests were operated under free-leach conditions based upon standard mining industry guidelines for such tests (AMIRA, 2002). These tests provide an indication of any dynamic changes in the chemistry of pore water derived from sample materials and can provide input into the development of a water quality monitoring program for any seepage derived from relevant storage facilities.

Most of the KLC tests were operated at a larger scale than ‘standard’ AMIRA style KLC tests although the actual size of the KLC tests was dependent on the volume of sample material available to complete the test program. Larger scale KLC tests typically allow the use of greater range of particle sizes, creating more flow paths through the material in the column and avoiding preferential flow paths for the leaching fluid that can occur using smaller AMIRA style columns. A larger range of particle sizes and wider distribution of flow paths helps to ensure intimate contact between the leaching fluid.

In the KLC tests, leachate was applied monthly and collected for laboratory assay. KLC sample materials were typically allowed to dry out during the interim period between leaching events to allow oxidation to freely occur and any oxidation products to be generated prior to the next leaching event. In some cases at a waste storage facility, stored bulk materials may retain moisture and/or remain saturated, although this is more likely with fine materials such as tailings or spent heap leach process residues. For one of the KLC tests on spent

heap leach residue materials (KLC 12), the column was intentionally kept saturated between leach events and compared against a free leaching KLC test (KLC 11), to investigate any effects on water quality under saturated anoxic conditions such as could be experienced by bulk materials in the field.

KLC tests were operated under a monthly and/or quarterly watering and leaching cycle for a period of approximately 12 months.

The free leaching KLC test methodology essentially represents the worst case or maximum potential for sulfide oxidation and potential acid/metal/metalloid/salt generation in pore water. An example of the typical KLC column set up used in this project is provided in **Attachment A** (**Figure A1**).

The specification for the KLC tests for this project included the following.

- Medium or large acrylic columns depending on the volume of sample material available.
  - Medium column (19 cm diameter x 34 cm height and a volume of 9.64 L) for KLC 10 to KLC 12 and KLC 15 to KLC 16.
  - Large column (19 cm diameter x 65 cm height and a volume of 18.4 L) for KLC 1 to KLC 9 and KLC 13 to KLC 14.
- A tap was fitted at the base of the column. The base was lined with 800 cm^3 of glass beads. Filter mesh was installed on top of the glass beads to prevent the material fines moving through the glass beads and blocking the tap.
- The mass and volume of material placed into the column was recorded.
- KLC 1 to KLC 11 and KLC 13 to KLC 16 were operated under oxic conditions (unsaturated, **free-leach**) and KLC 12 (0.86 L pore volume) was operated under anoxic conditions (**saturated**). For the oxic columns, 1.5 L of deionised water was generally added to each sample for each leach event. Based on the internal diameter of the column, this equates to an approximate depth of 50 mm of water for each leach event and a typical sample:water ratio of greater than 6:1.
- The leach cycle included turning off the taps at the bottom of the KLC before adding water to the column over a period of 10 minutes. The water was left to percolate through the sample and was then retained in the sample for 24 hours.
- After 24 hours the tap was opened, and the water collected. The volume, pH and EC were measured after eight hours in the free-leach columns.
- The volume of water utilised was sufficient to recover a sample for the required ALS laboratory analyses.

3.3.4.5.2 Saturated Kinetic Leach Column test

The **saturated** column (KLC 12) included material that was fully saturated to the top of the column under anoxic conditions.

- An Eh probe (to measure redox potential) was placed in the water column. Rather than within the spent heap leach residue material.
- The Eh cable passing through the access port in the column lid was sealed with silicon. A tap was fitted into the lid to allow water to recharge the column as samples were removed over time.
- The lid was then fixed to the top of the column providing a water and air-tight seal to ensure that no oxygen could interact with the column sample media.
- The process to recharge and drain samples from the saturated KLC column included the following steps:
  - Each month 1,000 mL of deionised water was put into a 1 L bottle fitted with a plastic tap.
  - The bottle was inverted and then fitted onto the column lid tap.
  - The column lid tap was opened to force air up into the bottle tap orifice.
  - The bottle tap was opened slowly to expel air from the column tap into the inverted bottle.

- The column drainage tap was then opened to release approximately 1.25 mL of leachate per minute.

3.3.4.5.3 KLC water extract testing

The leachate from each column sample was measured for pH and EC shortly after collection of the samples at the RGS in-house laboratory. The leachate samples were then submitted to ALS for the following analyses:

- pH and EC;
- Ionic balance;
- Acidity and alkalinity [Automatic titrator];
- Dissolved metals/metalloids (Al, As, B, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Sb, Se, Th, U, V, and Zn [ICP-AES/MS and FIMS];
- Dissolved major cations (Ca, Mg, Na and K) [ICP-AES]; and
- Dissolved major anions (Cl, F and SO_4) [ICP-AES].

Summary results tables and trends for the kinetic geochemical test program are provided in **Attachment D** and discussed in **Sections 4.3**, **5.3**, **6.3**, **7.3**, **8.3** and **9.3**. The certificates of analyses for the ALS results from the kinetic geochemical test program are provided in **Attachment E**.

The KLC leachate concentrations are presented alongside applied water quality guideline values (ANZECC & ARMCANZ (2000); ANZG (2018)). These guidelines are provided for context only and are not intended to be interpreted as “maximum permissible levels” for site water storage or discharge. It should be noted that the ratio of sample to water in the KLC tests is typically in the range 3:1 to 10:1 (w/v) (i.e., concentrated), whereas the ratio of sample to water generally used in tests where results can (arbitrarily) be compared against guideline concentrations to provide relevant context is more than an order of magnitude more dilute at 1:5 (w/v). Whilst arbitrary comparisons against guideline concentrations can be useful in some situations and help to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the project site.

4 BVS Waste Rock Geochemistry

4.1 Acid Base Account and NAG test results

The Acid Base Account and NAG test results for waste rock samples from BVS Pit are presented in **Table B1 (Attachment B)** and summarised below.

- **pH:** The pH(1:5) values for sample numbers 197 to 210 are shown in **Figure 4-1**. The pH ranges from 8.8 to 9.6 (median 9.4) and is typically alkaline. The results show that waste rock materials represented by the samples tested are not acidic under initial 'worst case' laboratory conditions.

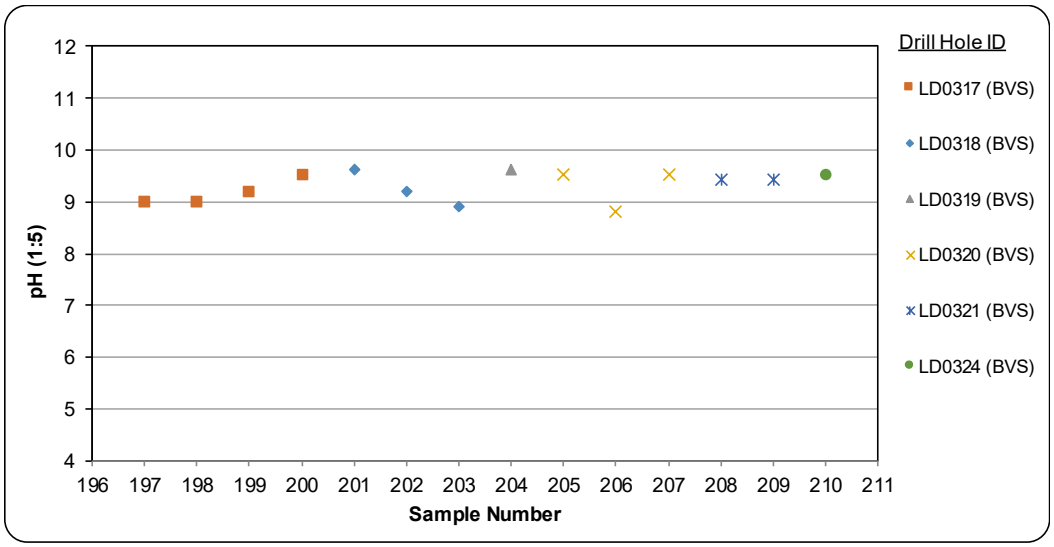


Figure 4-1: Waste rock pH values

- **EC**: The $EC_{(1:5)}$ values for sample numbers 197 to 210 are presented in **Figure 4-2**. The EC ranges from 154 to 593 µS/cm and has a low median value of 212 µS/cm. According to DME Guidelines (DME, 1995), the EC values are typically in the 'very low' to 'low' range. These results demonstrate that waste rock materials represented by the samples tested generate low concentrations of salts under initial 'worst case' laboratory conditions.

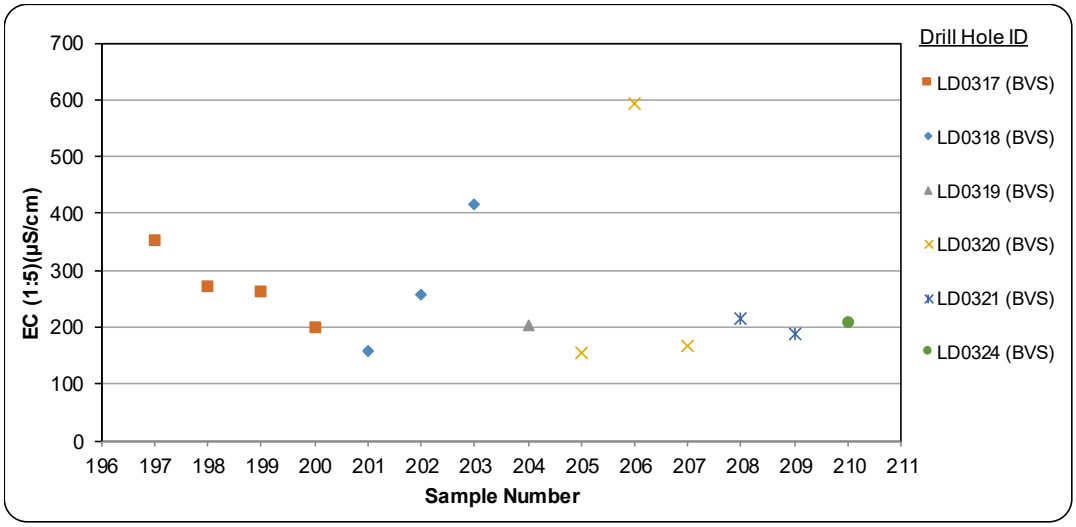


Figure 4-2: Waste rock EC values

- **Total sulfur**: The total sulfur values for the BVS Pit waste rock samples are presented in **Figure 4-3**. The total sulfur values range from less than 0.02 to 3.83 %S and has a low median sulfur content of 0.39 %S).

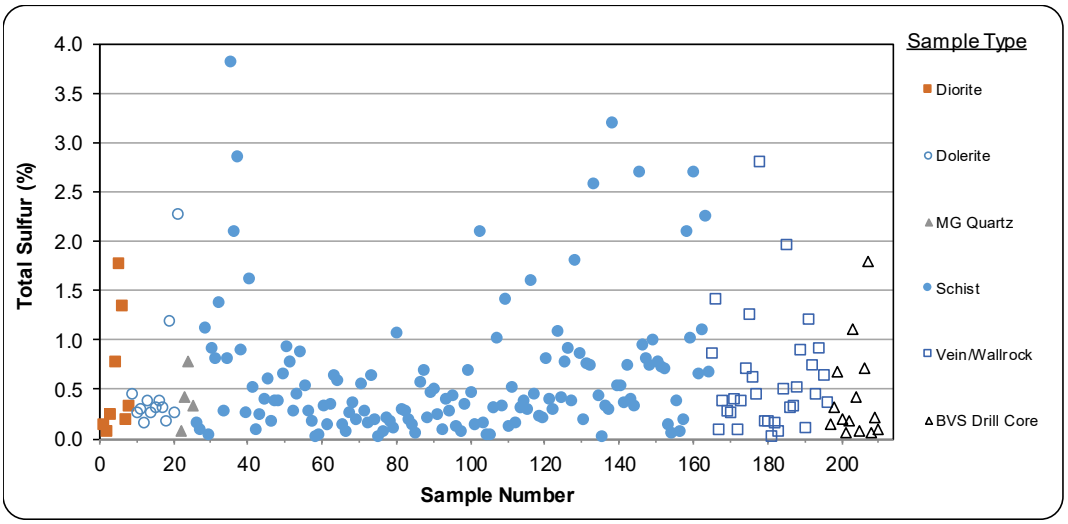


Figure 4-3: Waste rock total sulfur content

- **Chromium Reducible Sulfur (Scr)**: The Scr values, for the eight waste rock samples where Scr data are available, are presented in **Figure 4-4**. The Scr method measures the sulfide sulfur content or unoxidised portion of sulfur (e.g., pyrite; FeS_2) and provides a clearer indication of the MPA that a sample could generate if exposed to oxidising conditions over time. The results demonstrate that most of the total sulfur content in the waste rock samples is likely to be present as sulfide. A relatively strong correlation between total sulfur and sulfide sulfur is evident, although higher total sulfur numbers appear to have at least some other forms of sulfur present such as sulfate which in fresh materials would not be expected to contribute significantly to the overall MPA.

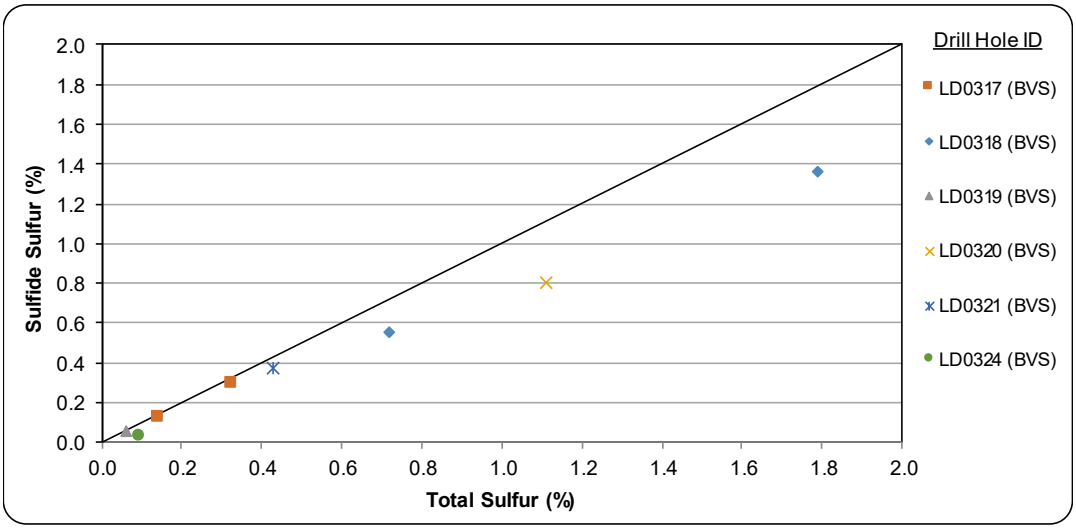


Figure 4-4: Waste rock total sulfur versus sulfide sulfur

- **MPA**: The MPA that could be generated through the oxidation of sulfur in all of the BVS Pit waste rock samples ranges from 0.6 to 117.3 kg H_2SO_4/t (median 11.8 kg H_2SO_4/t). The MPA value is calculated from the total sulfur content or sulfide sulfur content (where available).

- **ANC**: The ANC of all of the BVS Pit waste rock samples ranges from 15.5 to 181.0 kg H_2SO_4/t (median 55.6 kg H_2SO_4/t). The median ANC is approximately five times greater than the median MPA.
- **Acid Buffering Characterisation Curve (ABCC) tests**: ABCC test results for 40 waste rock samples from BVS Pit are presented in **Figures B1** to **B3** (**Attachment B)**. The ABCC test results show that the dolerite and schist materials that comprise the vast majority of the BVS Pit waste rock have available acid buffering capacity even at higher pH values. While the magnitude and availability of acid buffering in some minor lithologies is less (e.g. micro-granodiorite, granite, quartzite, and vein-hosted lithologies) this does not affect the overall ability of the bulk waste rock material to buffer acidity at a range of pH values.
- **ANC:MPA ratio**: The ANC:MPA ratio for all of the BVS Pit waste rock samples ranges from 0.4 to 93.7 and has a median value of 4.6. ANC:MPA ratio lines have been plotted on **Figure 4-5** to illustrate the factor of safety associated with the samples. Generally, those samples with an ANC:MPA ratio greater than 2 have a low to negligible risk of acid generation and a high factor of safety in terms of potential for generating acidic drainage (INAP[1], 2026; COA, 2016). The vast majority of the waste rock samples have an ANC:MPA ratio greater than 2 and therefore a high factor of safety with respect to acid generation. A small proportion of the samples tested (less than 5 %) have an ANC:MPA ratio less than 1 and therefore have a reduced factor of safety with respect to potential acid generation.

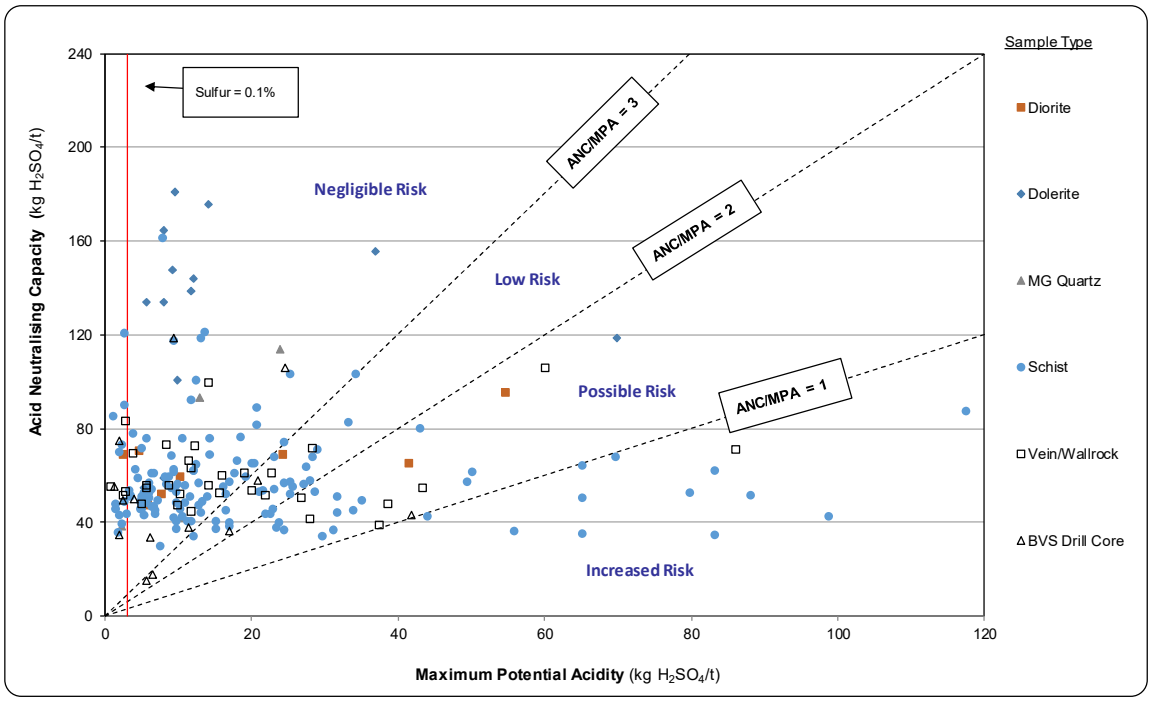


Figure 4-5: Waste rock ANC:MPA ratio

- **Net Acid Producing 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 NAPP for all of the BVS Pit waste rock samples ranges from -171.5 to +55.4 kg H_2SO_4/t (median -42.8 kg H_2SO_4/t) (**Figure 4-6**). The bulk of the waste rock samples tested have a negative NAPP value. A small number of samples (10 or <5 % of samples) have a positive NAPP. Nine of the ten samples with a positive NAPP are derived from the schist lithology.

[1] INAP considers that mine materials with an ANC:MPA ratio greater than 2 are likely to be NAF unless significant preferential exposure of sulfides along fracture planes occurs in combination with insufficiently reactive ANC.

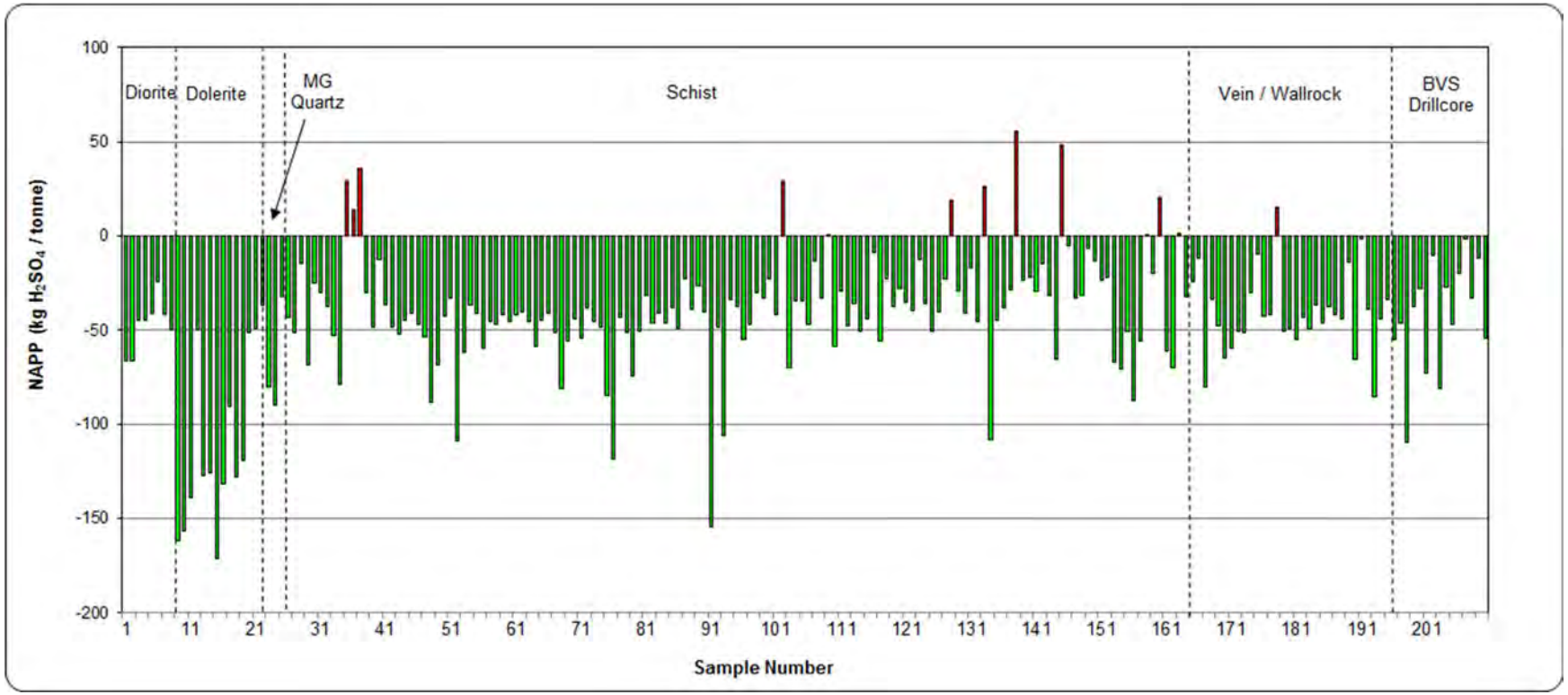


Figure 4-6: Waste rock NAPP values

- **Net Acid Generation (NAG) test**: The NAG test results for eight BVS Pit drill core waste rock samples are presented in **Figure 4-7**. The final NAG_{pH} values are all greater than pH 4.5 and range from pH 8.9 to 10.4. NAG capacity values titrated to pH 4.5 and pH 7.0 are below the laboratory limit of reporting (LoR) (0.1 kg H_2SO_4/t). Hence the combined NAPP and NAG results shown in **Figure 4-7** confirm that the BVS Pit waste rock materials represented by the samples tested are classified as non-acid forming (NAF).

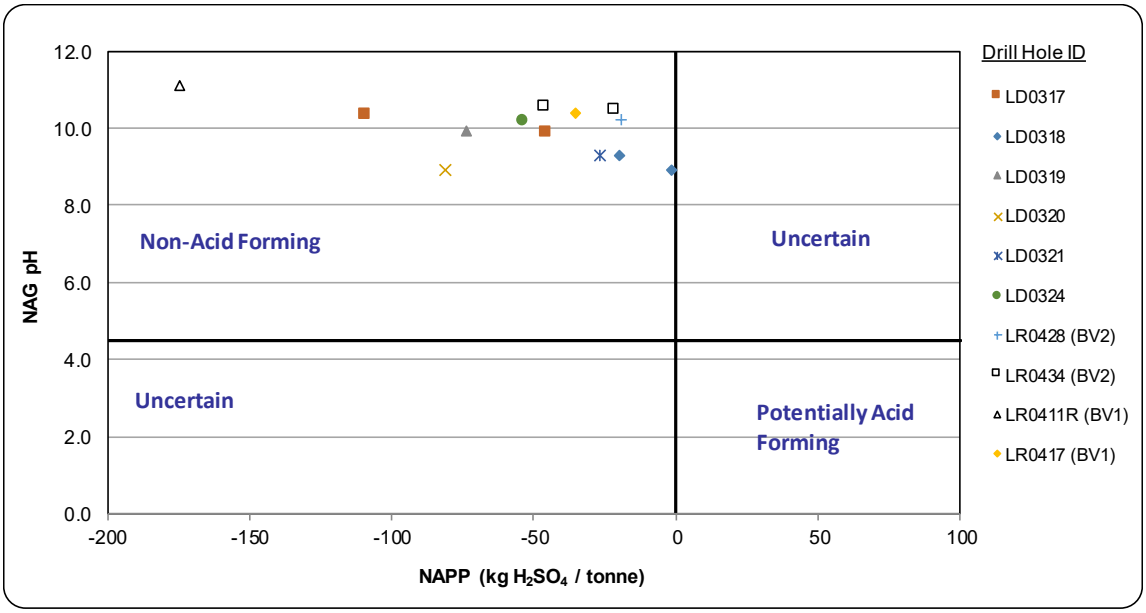


Figure 4-7: Waste rock NAG pH versus NAPP

Table 4-1 provides the geochemical classification criteria used by RGS to classify the acid forming nature of the BVS Pit waste rock materials and gives a breakdown of the number of samples in each classification category.

Table 4-1: Geochemical classification criteria for BVS Pit waste rock samples

Classification	Sulfur (%)	NAPP value (kg H_2SO_4/t)	ANC:MPA Ratio	No. of samples (n=210)
Non-Acid Forming (Barren)	≤ 0.1	-	-	24
Non-Acid Forming	> 0.1	≤ -5	≥ 2	172
Uncertain	> 0.1	> -5 to ≤ +5	< 2	4
Potentially Acid Forming - Low Capacity (PAF-LC)	> 0.1	> 5 to ≤ 10	< 2	0
Potentially Acid Forming (PAF)	> 0.1	> 10	< 2	10

The results show that the waste rock from BVS Pit is overwhelmingly NAF with significant excess ANC. The bulk waste rock therefore has a high factor of safety with respect to potential for acid generation.

These waste rock results are consistent with the larger SMC exploration drill hole/assay database comprising 10,003 waste rock samples from 90 drill holes at BVS Pit described in **Section 3.2.1**. For these samples, Acid Base Account data was derived from existing total sulfur, calcium and magnesium assay data and used to calculate the NAPP value for each sample interval assayed. The results showed that for the larger waste rock database, 98 % of samples were classified as NAF, 1 % were classified as PAF-LC and 1 % were classified as PAF.

Hence, a small proportion of the samples (approx. 2%) are classified as PAF-LC or PAF. The small number of PAF-LC/PAF samples were collected from lithologies located in close proximity to the ore body. On this basis, it is expected that any small amount of PAF material within the BVS Pit waste rock will be highly localised in close proximity to the ore body. The management of waste rock, including any potentially PAF materials, is described in **Section 10**.

4.2 Multi-element test results

The multi-element test results for metals/metalloids in BVS Pit waste rock samples are provided in **Table B4** (**Attachment B**), which provides a comparison of the multi-element test results against the adopted reference criteria discussed in **Section 3.3.3**.(NEPC, 2013).

The multi-element results show that even using a vigorous four-acid digestion methodology the waste rock samples typically have low metal/metalloid concentrations in whole rock compared to the reference criteria. Minor exceptions include As and Pb in approx. 0.5 % and 5 % of the 196 BVS Pit waste rock samples, respectively.

Therefore, it is not expected that the concentrations of metals/metalloids present in waste rock will have any potential for impacts on rehabilitation activities at the project.

Investigations into the potential water solubility and mobility of metals/metalloids in waste rock materials is presented for KLC tests in **Section 4.3**.

4.3 KLC water extract test results

The KLC test results and trends for the eight BVS Pit waste rock samples (KLC 1 to KLC 8 and KLC 16) are presented in **Attachment D** and interpreted in this section**.**

4.3.1 pH, acidity and alkalinity

The pH of the waste rock leachate is typically within the range pH 6 to 9. The only two exceptions are:

- the first leachate sample from KLC 7 (schist) which has a pH of 4.84, although all subsequent leachate pH values are pH neutral (> pH 7), with negligible acidity (≤ 3 mg/L measured as $CaCO_3$) and excess alkalinity. This was the only BVS waste rock drill core sample classified as Uncertain in the Acid Base Account tests due to a finely balanced ANC:MPA ratio (sample number 207).
- KLC 3 (psammite), which can produce leachate at a pH value slightly greater than pH 9.

The leachate samples typically contain negligible acidity and excess alkalinity, resulting in a positive net alkalinity.

As discussed in **Section 4.1**, the Acid Base Account tests identified a small amount of waste rock located close to the ore body as PAF. The potential for acid generation from a blend of NAF and PAF waste rock materials was specifically tested in KLC 16 and the composition of the blended composite sample is detailed in **Table B3** (**Attachment B**). In summary, the KLC16 sample is a blend of 1 part PAF waste rock to 3 parts NAF waste rock (i.e. 25 % PAF to 75 % NAF) and therefore assessed NAF waste rock mixed with a high proportion (25 %) of PAF material (i.e. mineralised rock associated with the orebody). The KLC16 test was prepared from a total of 31 representative waste rock samples including 24 NAF samples and 7 PAF samples. This sample was specifically prepared with an unrepresentatively high proportion of PAF waste rock to ensure that the water used in the elution process interacted with and contacted the PAF waste rock and, hence, the water collected from this kinetic leach column contained drainage from the PAF waste rock. The KLC leachate results for these materials (KLC 16) show that the leachate is typically pH 6 to 8, has negligible acidity (≤ 3 mg/L) and excess alkalinity with an electrical conductivity (EC) of less than 350 µS/cm and low concentrations of metals and metalloids that are comparable to the referenced default toxicant guideline values. The only exception is dissolved aluminium, which is marginally elevated in the KLC16 leachate but can, at least partially, be present as part of fine colloidal material and pass through the standard laboratory filtration stage of analysis and would be expected to be sparingly soluble at neutral pH. Once the diluting effects of incident rainfall/infiltration in the field are considered for a range of larger particle size materials in a typical waste rock dump, the seepage quality from the storage of PAF materials within the NAF waste rock is expected to be pH neutral, non-saline and contain low concentrations of dissolved metals and metalloids (including aluminium).

While this sample does not represent any specific waste rock disposal ratio or storage scenario, the testing results collected from this sample demonstrate clearly that the NAF waste rock has the ability to neutralise PAF material at significantly higher proportions than will be present in the WRDs. This validates the Acid Base Account results discussed in **Section 4.1**.

Overall, this shows that the bulk waste rock stored in the Central and Southern WRDs (including any small amount of PAF materials) is unlikely to generate acidic leachate. It is therefore expected that bulk BVS waste rock materials will generate leachate that will remain pH neutral or slightly alkaline.

4.3.2 Salinity and major ions

The BVS Pit waste rock EC ranges from 115 to 1,560 µS/cm and generally shows a decreasing trend over time after initial KLC leaching.

The concentrations of dissolved calcium, sulfate and fluoride in KLC leachate are less than the applied livestock drinking water criteria of 1,000 mg/L, 1,000 mg/L and 2 mg/L, respectively (ANZG, 2018).

4.3.3 Residual Sulfur and ANC

The concentration of sulfate in leachate from the KLC tests has been used to calculate the residual sulfur content of the waste rock. The KLC results show that most (93.7 to 99.5 %) of the total sulfur content remains in the sample after leaching indicating a relatively slow rate of reaction.

The concentrations of dissolved Ca and Mg in leachate from the KLC tests have been used to calculate the residual ANC remaining in the waste rock. The KLC results indicate that most (97.3 to 100.0 %) of the measured ANC remains in the samples at the end of the current test period.

4.3.4 Reaction rates

The sulfate generation rate results obtained for the waste rock KLC tests have been used to determine the rate of sulfide oxidation in these materials. Most sulfate salts generated from sulfide reaction involving materials with a relatively low sulfide sulfur concentration are highly soluble and therefore will be collected in column leachate. The sulfate concentrations and oxidation rate calculations align well with existing static and dynamic geochemical data derived from a wide range of mine waste materials (AMIRA, 1995). The sulfate generation rate and associated sulfide oxidation rate for the waste rock KLC tests are shown in **Table 4-2**.

Table 4-2: Sulfate generation and sulfide oxidation rates for KLC tests on BVS Pit waste rock

KLC ID	Location	Sample description	Sulfate generation rate (mg/kg/week)	Oxidation rate (kg $O_2/m^3/s$)
KLC 1	BVS Pit	NAF Schist	4.91	3.14×10^{-9}
KLC 2		NAF Amphibolite	1.97	1.36×10^{-9}
KLC 3		NAF Psammite	0.54	3.44×10^{-10}
KLC 4		NAF Tectonic Breccia w/ vein and wall rock clasts	2.85	1.61×10^{-9}
KLC 5		NAF Psammite	2.36	1.48×10^{-9}
KLC 6		NAF Schist	5.26	3.18×10^{-9}
KLC 7		Uncertain Schist	18.9	1.14×10^{-8}
KLC 8		NAF Schist	0.88	5.56×10^{-10}
KLC 16		NAF/PAF Mixed Lithologies	22.62	1.47×10^{-8}

[#] Sulfate generation and sulfide oxidation rates for KLCs are averaged across the relevant KLC test period

The concentration of dissolved sulfate leached from the waste rock materials is variable, however all KLCs show a relatively consistent trend towards a long-term equilibrium value. The sulfate generation rate ranges from 0.54 to 22.62 mg/kg/week indicating that the rate of sulfide oxidation is typically low (equivalent to an oxidation rate ranging from 3.44×10^{-10} to 1.47×10^{-8} kg $O_2/m^3/s$). The highest sulfate generation rate is associated with the mixed PAF/NAF waste rock with elevated sulfur content in KLC 16 from BVS pit.

Mining waste materials with an oxidation rate in the low range (i.e., less than 5×10^{-8} kg $O_2/m^3/s$) and a moderate ANC level have an increased factor of safety and are likely to generate leachate that is pH neutral or slightly alkaline and/or has low levels of acidity (AMIRA, 1995). Hence, all the waste rock materials included in the KLC test program fall into this category.

Overall, the KLC results reflect the range of material characteristics predicted from the static geochemical test results presented in **Section 4.1**

4.3.5 Dissolved Metal/Metalloid Concentrations

The concentration of dissolved trace metals/metalloids in the KLC leachates from BVS Pit waste rock are typically low, and generally below the laboratory LOR (**Attachment D**). This indicates that most trace metals/metalloids have low solubility at the neutral to slightly alkaline pH of the KLC leachate and have concentrations below the applied water quality guideline values for livestock drinking water (ANZG, 2018).

Whilst it is noted that the concentration of some metals/metalloids in KLC leachate (i.e., Al, As, Cu, Cd, Mn, Ni and Zn) is sporadically greater than the applied freshwater aquatic ecosystem (95 % species protection) value (ANZG, 2018), most elevated metal/metalloid concentrations are associated with the first few KLC leachate events following initial sample preparation (i.e. crushing) and KLC set up.

As detailed in **Section 3.3.5.1,** the free leaching KLC test methodology essentially represents the worst case or maximum potential for sulfide oxidation and potential acid/metal/metalloid/salt generation in pore water for crushed materials under freely oxidising laboratory conditions. Whilst arbitrary comparisons against guideline concentrations can be useful in some situations and help to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the project site.

5 BV1 Pit and BV2 Pit Waste Rock Geochemistry

5.1 Acid Base Account and NAG test results

The Acid Base Account test and NAG results for the waste rock samples from BV1 and BV2 Pits (sample numbers 211 to 228) are presented in **Table B1 (Attachment B)** and summarised below.

- **pH**: The $pH_{(1:5)}$ values for the waste rock samples are shown in **Figure 5-1**. The pH ranges from 5.6 to 9.8 (median 9.5) ranges from pH neutral to alkaline. The two samples with a pH value less than 6 represent 'weathered Jurassic quartzose sandstone and conglomerate from 2 to 4 m depth in BV1 pit. The pH value for both samples was 5.6. These results show that the waste rock materials represented by the samples tested are not acidic under initial 'worst case' laboratory conditions.

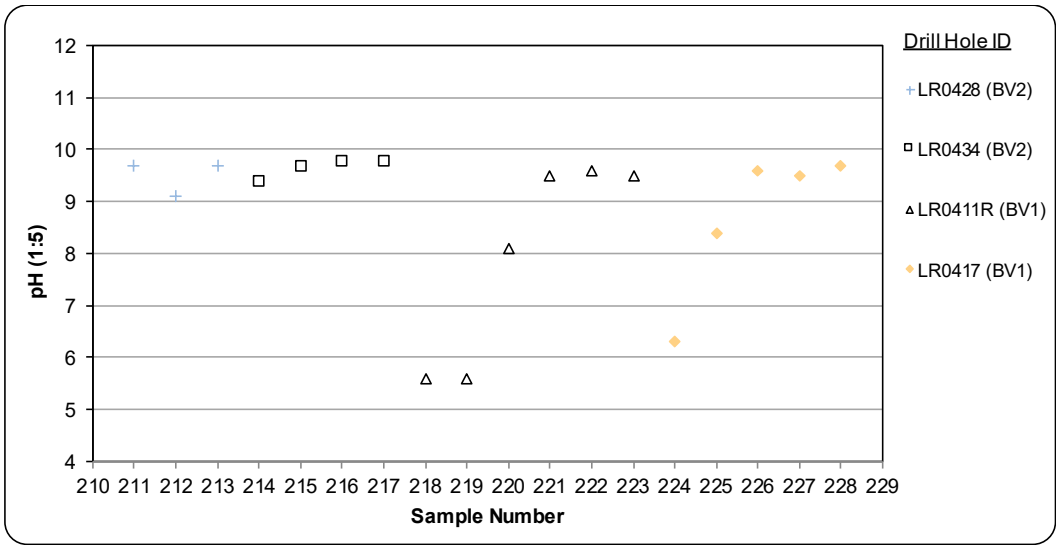


Figure 5-1: Waste rock pH values

- **EC**: The $EC_{(1:5)}$ values for the waste rock samples are presented in **Figure 5-2**. The EC ranges from 12 to 593 µS/cm and has a low median value of 113 µS/cm. According to DME Guidelines (DME, 1995), the EC values are typically in the 'very low' range. These results show that the waste rock samples tested generate low concentrations of salts under 'worst case' laboratory conditions.

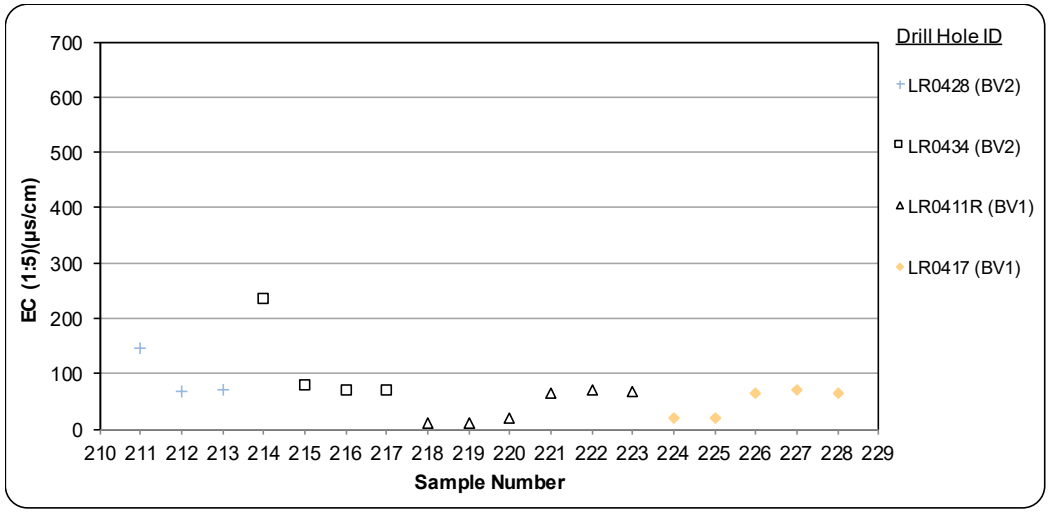


Figure 5-2: Waste rock EC values

- **Total sulfur**: The total sulfur values for the waste rock samples are presented in **Figure 5-3**. The total sulfur values range from < 0.01 to 0.42 %S and has a low median sulfur content of 0.05 %S (i.e. barren of sulfur).

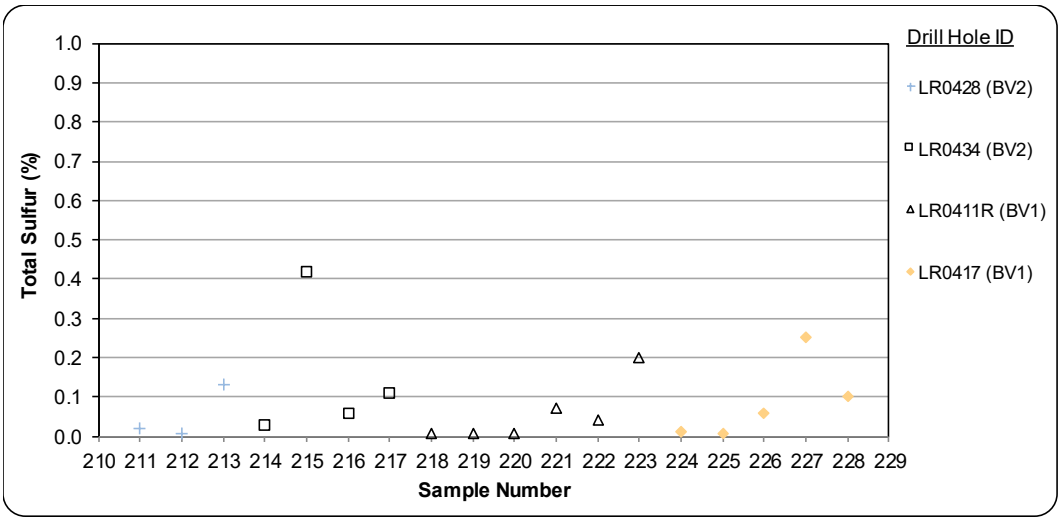


Figure 5-3: Waste rock total sulfur content

- **Scr**: The Scr values, for the five waste rock samples where Scr data are available, are presented in **Figure 5-4**. The results indicate that most of the total sulfur content in the waste rock samples is likely to be present as sulfide as a strong correlation between total sulfur and sulfide sulfur is evident.

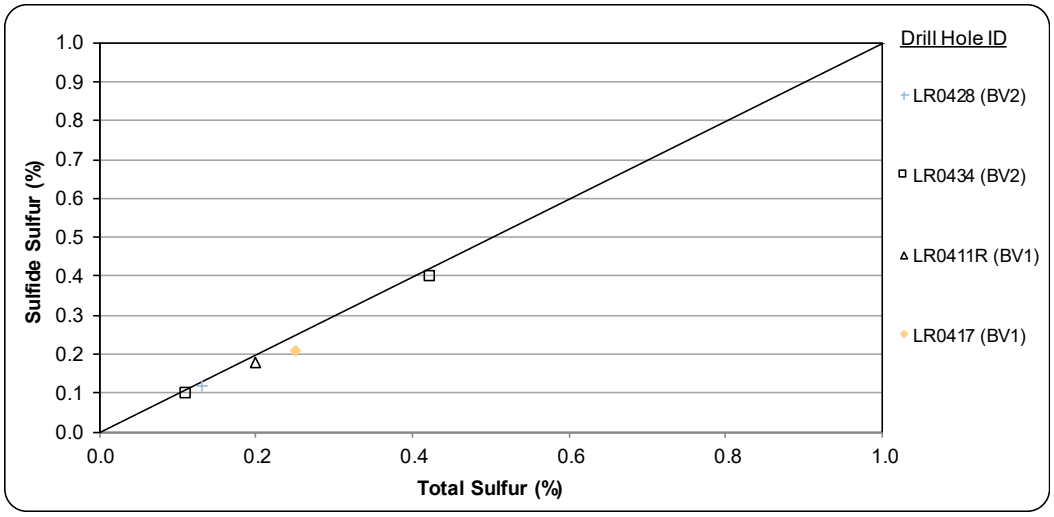


Figure 5-4: Waste rock total sulfur versus sulfide sulfur

- **MPA**: The MPA that could be generated through the oxidation of sulfur in all of the BV1/BV2 Pit waste rock samples tested ranges from 0.2 to 12.3 kg H_2SO_4/t (median 1.4 kg H_2SO_4/t). The MPA value is calculated from the total sulfur content or sulfide sulfur content (where available).
- **ANC**: The ANC of all of the BV1/BV2 Pit waste rock samples ranges from 1.8 to 180 kg H_2SO_4/t (median 15.8 kg H_2SO_4/t). The median ANC is approximately ten times greater than the median MPA.

- **ABCC tests**: The ABCC results are presented in **Figure B4 (Attachment B)**. The ABCC test results show that for the BV1/BV2 Pit samples tested, the majority of the acid buffering becomes available at lower pH values.
- **ANC:MPA ratio**: The ANC:MPA ratio of the waste rock samples ranges from 4.8 to 63.3 and has a median value of 10.4. ANC:MPA ratio lines have been plotted on **Figure 5-5** to illustrate the factor of safety associated with the samples. All of the waste rock samples have an ANC:MPA ratio greater than 2 and therefore a high factor of safety with respect to acid generation.

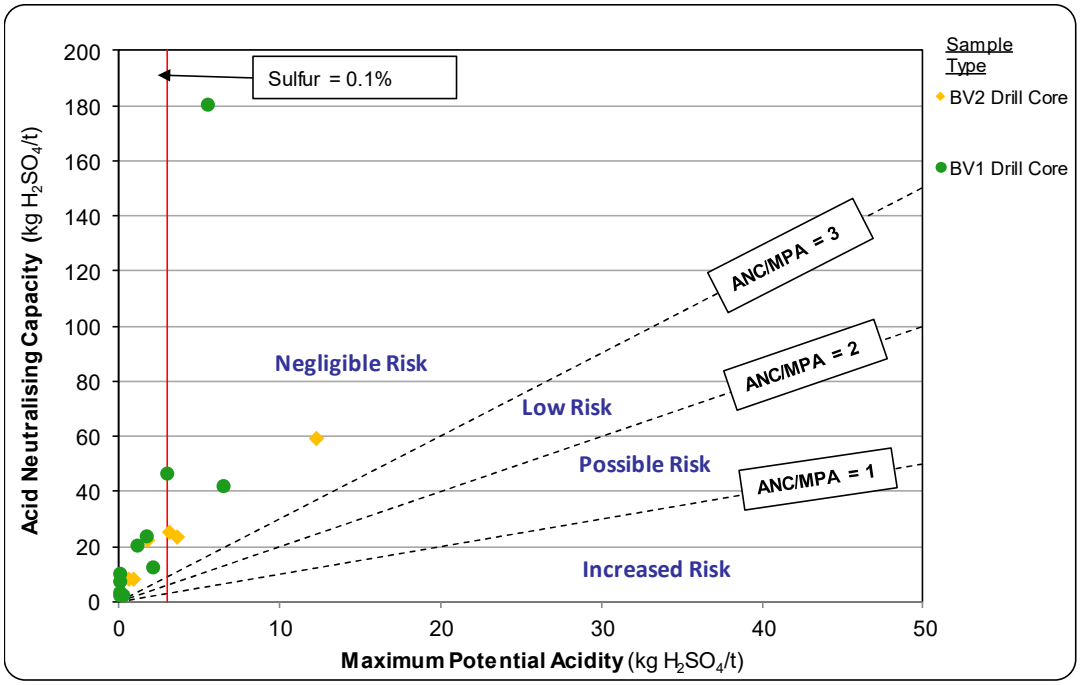


Figure 5-5: Waste rock ANC:MPA ratio

- **NAPP:** The NAPP value ranges from -174.4 to -55.4 kg H_2SO_4/t (median -41.6 kg H_2SO_4/t) (**Figure 5-6**) and therefore all of the waste rock samples tested have a negative NAPP value.

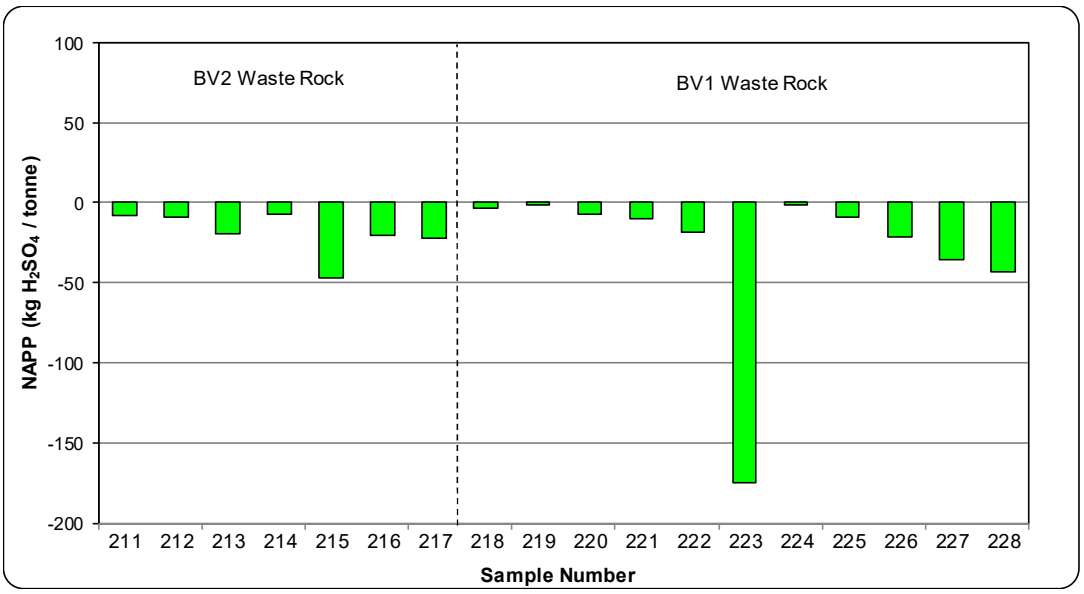


Figure 5-6: Waste rock NAPP values

- **NAG test**: The NAG_{pH} test results for the five waste rock samples subjected to this test are all greater than pH 4.5 and range from 10.2 to 11.1 (**Figure 5-7**). NAG capacity values titrated to pH 4.5 and pH 7.0 are below the laboratory LoR (0.1 kg H_2SO_4/t). Hence the combined NAPP and NAG results shown in **Figure 5-7** confirm that the waste rock is classified as NAF.

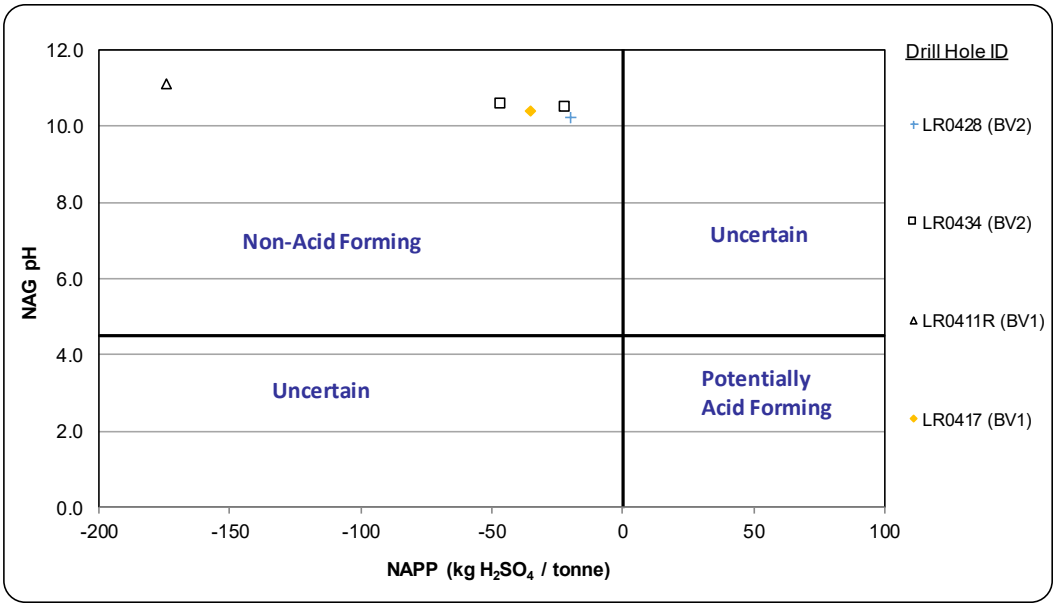


Figure 5-7: Waste rock NAG pH versus NAPP

Table 5-1 summarises the geochemical classification criteria used by RGS to classify the acid forming nature of the waste rock samples and gives a breakdown of the number of samples in each classification category. The results show that the bulk waste rock is classified as NAF (Barren) or NAF.

Table 5-1: Geochemical classification criteria for BV1/BV2 Pit waste rock samples

Classification	Sulfur (%)	NAPP value (kg H_2SO_4/t)	ANC:MPA Ratio	No. of samples (n=18)
Non-Acid Forming (Barren)	≤ 0.1	-	-	14
Non-Acid Forming	> 0.1	≤ -5	≥ 2	4
Uncertain	> 0.1	> -5 to ≤ +5	< 2	0
Potentially Acid Forming - Low Capacity	> 0.1	> 5 to ≤ 10	< 2	0
Potentially Acid Forming	> 0.1	> 10	< 2	0

5.2 Multi-element test results

The multi-element test results for metals/metalloids in four composite BV1/BV2 Pit waste rock samples are provided in **Table B4** (**Attachment B**), which provides a comparison of the multi-element test results against the adopted reference criteria discussed in **Section 3.3.3**.(NEPC, 2013).

The multi-element results show that the waste rock samples have low metal/metalloid concentrations in whole rock compared to the reference criteria. Therefore it is not expected that the concentrations of metals/metalloids present in waste rock will have any potential for impacts on rehabilitation activities at the project site.

Investigations into the potential water solubility and mobility of metals/metalloids in waste rock materials is presented for KLC tests in **Section 5.3**.

5.3 KLC water extract test results

The KLC test results and trends for the two composite BV1/BV2 Pit waste rock samples (KLC 13 and KLC 14) are presented in **Attachment D** and interpreted in this section**.**

5.3.1 pH, acidity and alkalinity

The pH of the waste rock leachate is typically within the pH range of 6 to 9.

The leachate samples contain negligible acidity and excess of alkalinity, resulting in a positive net alkalinity.

As discussed in **Section 5.1**, the Acid Base Account tests show that all BV1/BV2 Pit waste rock materials represented by the samples tested are NAF.

Overall, this shows that the bulk waste rock stored in the Northern WRD will not generate acidic leachate. and pH levels are likely to remain pH neutral or slightly alkaline.

5.3.2 Salinity and major ions

The BV1/BV2 Pit waste rock EC ranges from 620 to 4,610 µS/cm and generally shows a decreasing trend over time after initial KLC leaching. The EC in the BV2 Pit waste rock (KLC 13) is generally higher than KLC14 and aligns with the slightly elevated sulfate concentrations in the KLC 13 leachate. This result potentially shows a higher mobility of dissolved solids in the oxidised granite (KLC 13) relative to the fresh granite (KLC 14).

The dissolved sulfate concentration in the waste rock leachates ranges from 75 to 1,370 mg/L with elevated concentrations limited to some of the KLC 13 leachates. This trend in KLC 13 (BV2 waste rock) was also observed across other dissolved major cations (Na, Mg) and anions (Cl, F). The sulfate concentration is greater than the applied livestock drinking water criteria of 1,000 mg/L (ANZG, 2018) in two of the six KLC leachates collected from KLC 13 but shows a decreasing trend. The concentration of dissolved fluoride is generally greater than the livestock drinking water criteria of 2 mg/L for leachate collected from KLC 13 and KLC 14. There is a good correlation between sodium and sulfate concentrations and EC, inferring that the higher EC values in these samples are associated with the release of sulfate salts rather than chloride salts.

5.3.3 Residual Sulfur and ANC

The concentration of sulfate in leachate from the KLC tests has been used to calculate the residual sulfur content of the waste rock. The KLC results show that most (88.8 to 94.6 %) of the total sulfur content remains in the sample after leaching indicating a relatively slow rate of reaction.

The concentrations of dissolved Ca and Mg in leachate from the KLC tests have been used to calculate the residual ANC remaining in the waste rock. The KLC results indicate that at least 99.6% of the measured ANC remains in the samples at the end of the current test period.

5.3.4 Reaction rates

The sulfate generation rate results obtained for the waste rock KLC tests have been used to determine the rate of sulfide oxidation in these materials. Most sulfate salts generated from sulfide reaction involving materials with a relatively low sulfide sulfur concentration are highly soluble, and therefore will be collected in column leachate. The sulfate concentrations and oxidation rate calculations align well with existing static and dynamic geochemical data derived from a wide range of mine waste materials (AMIRA, 1995). The sulfate generation rate and associated sulfide oxidation rate for the waste rock KLC tests are shown in **Table 5-2**.

The concentration of dissolved sulfate leached from the waste rock materials is variable, however the KLCs show a relatively consistent trend towards a long-term equilibrium value. The sulfate generation rate ranges from 3.94 to 8.30 mg/kg/week indicating that the rate of sulfide oxidation is typically low (equivalent to an oxidation rate ranging from 2.57 to 5.16 x 10^{-8} kg $O_2/m^3/s$).

Mining waste materials with an oxidation rate in the low range (i.e., less than 5 x 10^{-8} kg $O_2/m^3/s$) and a moderate ANC level have an increased factor of safety and are likely to generate leachate that is pH neutral or slightly alkaline and/or has low levels of acidity (AMIRA, 1995). Hence, the BV1/BV2 Pit waste rock materials included in the KLC test program fall into this category.

Overall, the KLC results reflect the range of material characteristics predicted from the static geochemical test results presented in **Section 5.1**

Table 5-2: Sulfate generation and sulfide oxidation rates for KLC tests on BV1/BV2 Pit waste rock

KLC ID	Location	Sample description	Sulfate generation rate (mg/kg/week)	Oxidation rate (kg $O_2/m^3/s$)
KLC 13	BV2 pit	NAF oxidised granite	8.30	5.16×10^{-9}
KLC 14	BV1 pit	NAF Fresh granite and sericite schist	3.94	2.57×10^{-9}

[#] Sulfate generation and sulfide oxidation rates for KLCs are averaged across the relevant KLC test period

5.3.5 Dissolved metal/metalloid concentrations

The concentration of dissolved trace metals/metalloids in the KLC leachates from BV1/BV2 Pit waste rock are typically low, and generally below the laboratory LOR (**Attachment D**). This indicates that most trace metals/metalloids have low solubility at the neutral to slightly alkaline pH of the KLC leachate and have concentrations below the applied water quality guideline values for livestock drinking water (ANZG, 2018). The main exception is the dissolved molybdenum (Mo) concentration in leachates collected from KLC14 (BV1) which is greater than the applied water quality livestock drinking water guideline value of 0.15 mg/L.

Whilst it is noted that the concentration of some metals/metalloids in KLC leachate (i.e., Al, As, Cu and Zn) is sporadically greater than the applied freshwater aquatic ecosystem (95 % species protection) value (ANZG, 2018), most elevated metal/metalloid concentrations are associated with the first few KLC leachate events following initial sample preparation (i.e. crushing) and KLC set up.

As detailed in **Section 3.3.5.1,** the free leaching KLC test methodology essentially represents the 'worst case' or maximum potential for sulfide oxidation and potential acid/metal/metalloid/salt generation in pore water for crushed materials under freely oxidising laboratory conditions. Whilst arbitrary comparisons against guideline concentrations can be useful in some situations and help to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the project site.

6 Tailings Geochemistry

6.1 Acid Base Account and NAG test results

The Acid Base Account and NAG test results for the tailings samples are presented in **Table B1 (Attachment B)** and summarised below.

- **pH**: The $pH_{(1:5)}$ values for the tailings samples are presented in **Figure 6-1**. The pH ranges from 8.7 to 9.0 and is typically slightly alkaline (median pH 8.8). These results show that the tailing materials represented by the samples tested are not acidic under initial 'worst case' laboratory conditions.

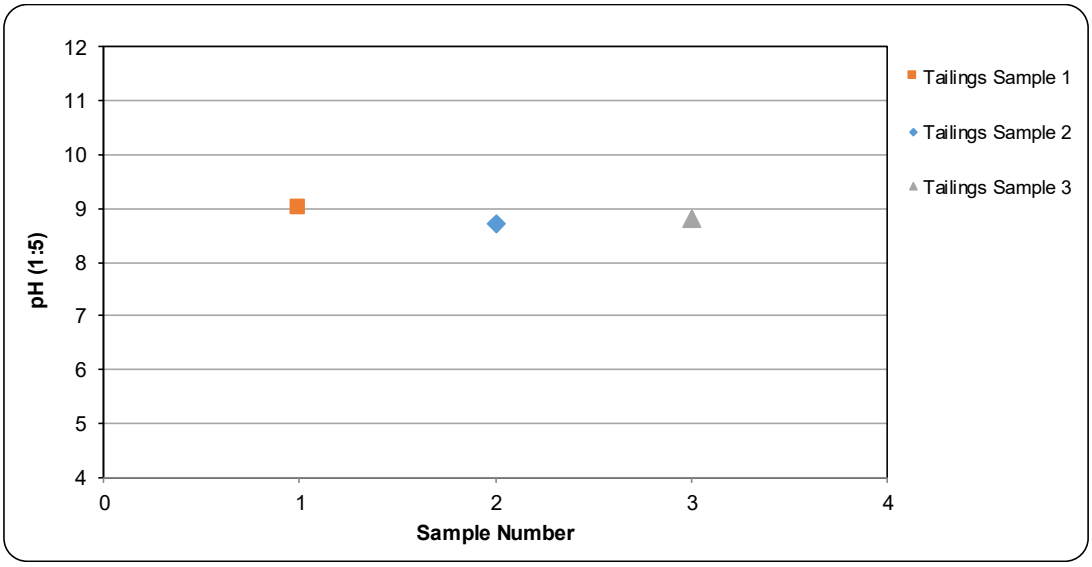


Figure 6-1: Tailings pH values

- **EC**: The $EC_{(1:5)}$ values for the tailings samples are presented in **Figure 6-2**. According to DME Guidelines (DME, 1995), the EC ranges from low to high (132 to 1,680 µS/cm) in the tailing samples under initial 'worst case' laboratory conditions.

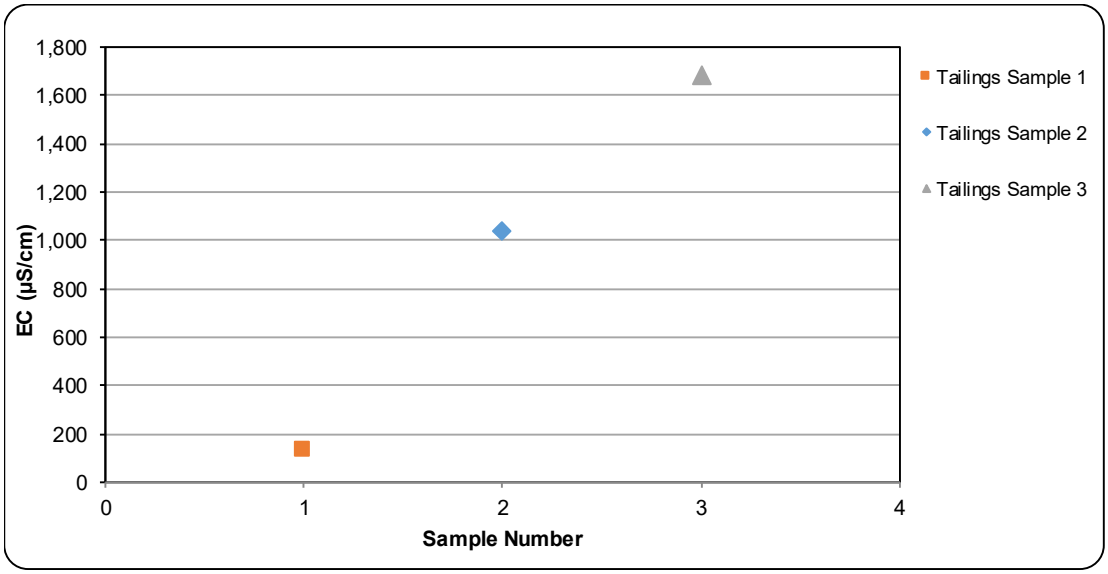


Figure 6-2: Tailings EC values

- **Total sulfur**: The total sulfur values for the tailings samples are presented in **Figure 6-3.** Total sulfur values range from 0.68 to 1.58 %.

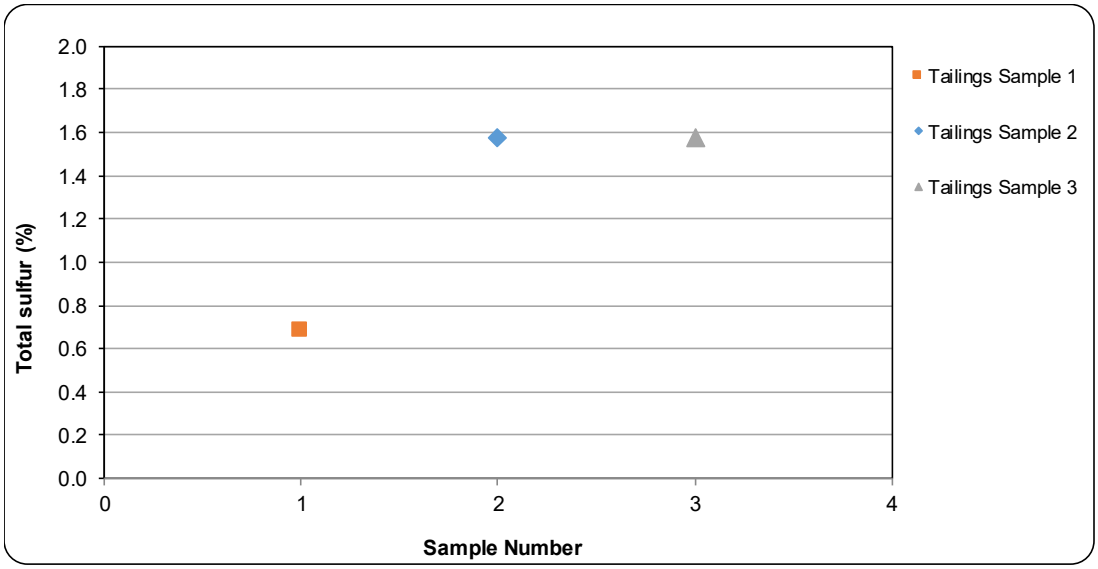


Figure 6-3: Tailings total sulfur content

- **Scr**: The Scr values are presented for the tailings samples in **Figure 6-4**. The results indicate that ~ 67 to 79 % of the total sulfur is present as sulfide in materials represented by these samples.

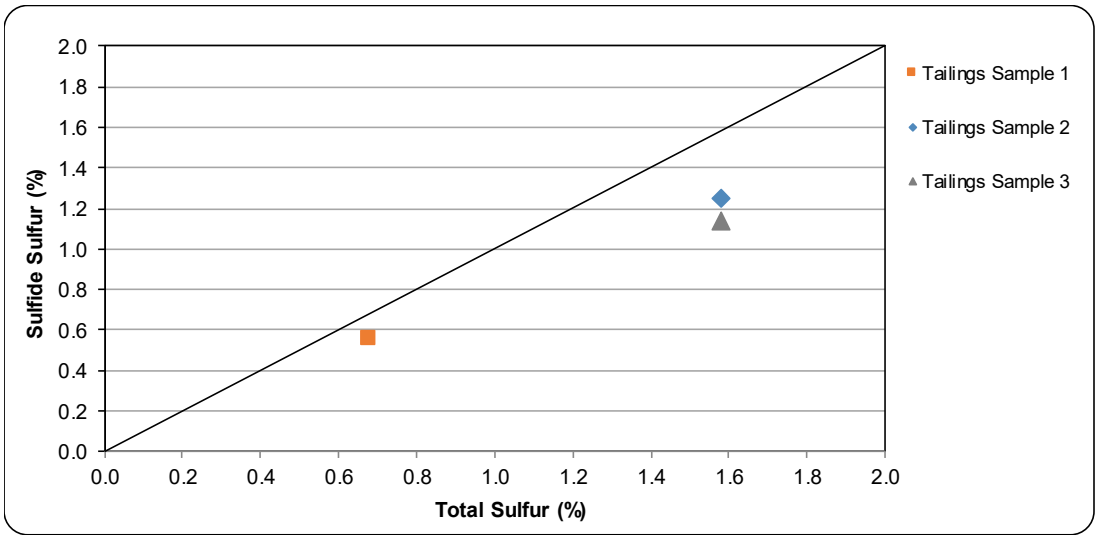


Figure 6-4: Tailings total sulfur versus sulfide sulfur

- **MPA**: The MPA that could be generated through the oxidation of sulfide in the tailing samples ranges from 17.0 to 38.3 kg H_2SO_4/t (mean 30.1 kg H_2SO_4/t /t) as calculated from the sulfide sulfur content.
- **ANC**: The ANC of the tailing samples ranges from 23.4 to 26.8 kg H_2SO_4/t /t (mean 24.6 kg H_2SO_4/t).
- **ABCC tests**: ABCC tests were completed the tailings samples and results are presented in **Figure B5** (**Attachment B)**. The ABCC test results show that whilst some acid buffering should be expected from the sample materials, the majority of this buffering may only be available at lower pH values.

- **ANC:MPA ratio**: The ANC:MPA ratio for the tailings samples ranges from 0.6 to 1.6 (mean 1.0). ANC:MPA ratio lines have been plotted on **Figure 6-5** to illustrate the factor of safety associated with the samples. Generally, those samples with an ANC:MPA ratio greater than 2 have negligible risk of acid generation and a high factor of safety in terms of potential for generating acidic drainage (COA, 2016; INAP, 2026). The tailing samples have an ANC:MPA ratio less than 2 indicating a reduced factor of safety with respect to potential acid generation, if materials represented by these samples are left exposed to oxidising conditions over time (COA, 2016; INAP, 2026).

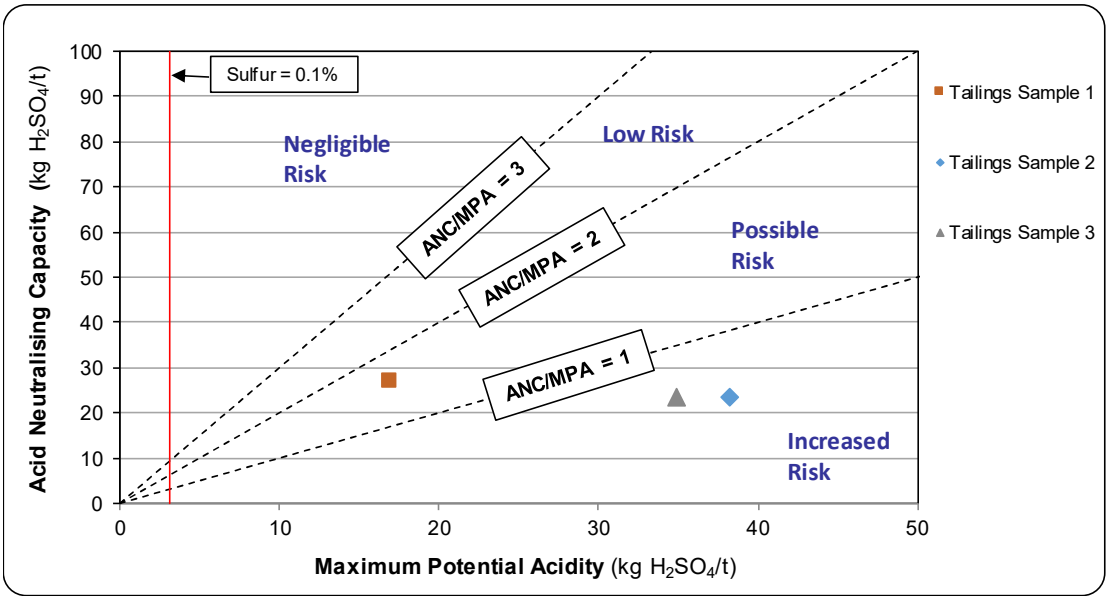


Figure 6-5: Tailings ANC:MPA ratio

- **NAPP**: The NAPP values for the tailing samples ranges from -9.8 to +14.7 kg H_2SO_4/t (**Figure 6-6**).

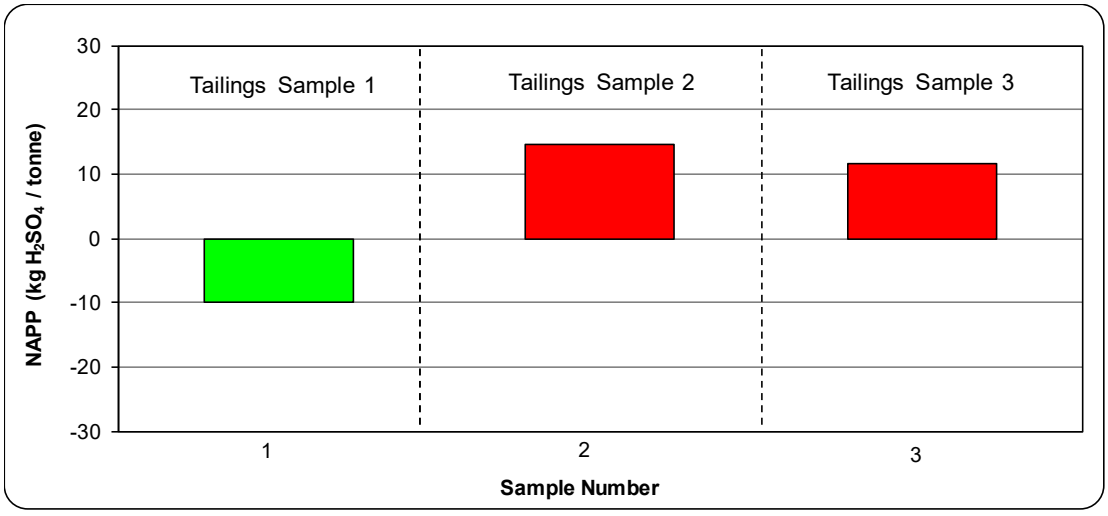


Figure 6-6: Tailings NAPP values

- **NAG**: The NAG_{pH} test results for the tailing samples range from pH 2.6 to pH 8.2. NAG capacity values titrated to pH 4.5 and pH 7.0 range from below the laboratory LoR (0.1 kg H_2SO_4/t) to 14.4 kg H_2SO_4/t and 18.2 kg H_2SO_4/t, respectively.

The NAG_{pH} and NAPP results shown in **Figure 6-7** indicate that materials represented by Tailings Sample 1 are NAF and Tailing Samples 2 and 3 are PAF.

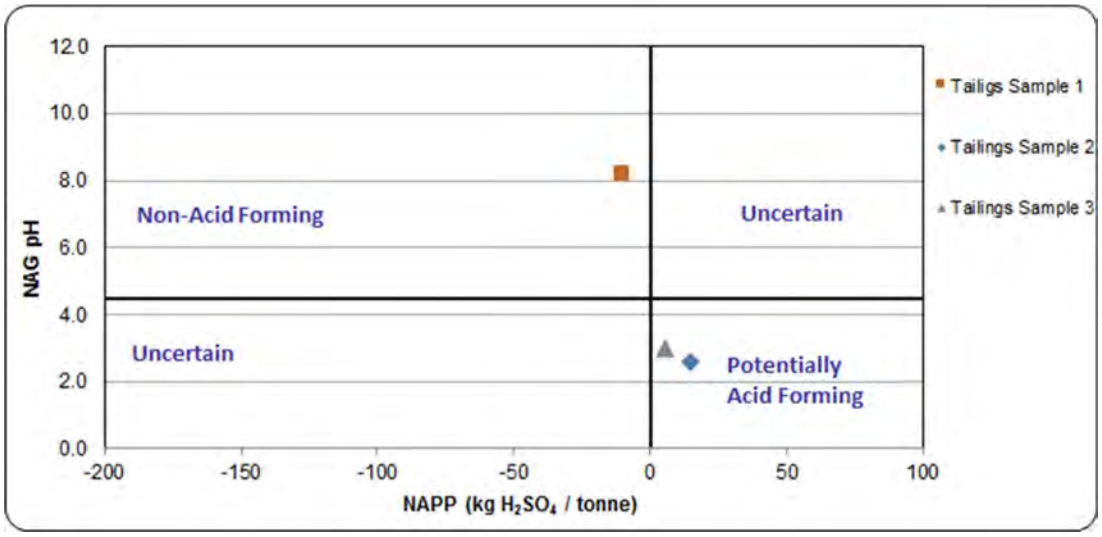


Figure 6-7: Tailings NAG pH versus NAPP

Table 6-1 summarises the geochemical classification criteria used by RGS to classify the acid forming nature of the tailings samples and gives a breakdown of the number of samples in each classification category. The results show that the Tailings Sample 1 is classified as NAF and Tailings Samples 2 and 3 are classified as PAF.

Table 6-1: Geochemical classification criteria for tailing samples

Classification	Sulfur (%)	NAPP value (kg H_2SO_4/t)	ANC:MPA Ratio	No. of samples (n=3)
Non-Acid Forming (Barren)	≤ 0.1	-	-	0
Non-Acid Forming	> 0.1	≤ -5	≥ 2	1
Uncertain	> 0.1	> -5 to ≤ +5	< 2	0
Potentially Acid Forming (Low Capacity)	> 0.1	> 5 to ≤ 10	< 2	0
Potentially Acid Forming	> 0.1	> 10	< 2	2

6.2 Multi-element test results

The multi-element test results for metals/metalloids in the solid tailing samples are provided in **Table B5 (Attachment B)**, which provides a comparison of the multi-element test results against the adopted reference criteria discussed in **Section 3.3.3**.(NEPC, 2013).

The multi-element results show that the tailing samples typically have low metal/metalloid concentrations compared to the reference criteria. The exception is one tailings sample (Tailing Sample 1), which has a slightly higher total chromium concentration (likely to be due to naturally occurring trivalent chromium present in ultramafic and mafic rocks). Leachate from Tailings Sample 1 was tested for total chromium and the concentrations are below the limits of reporting (refer **Section 6.3.5**).

Taking these multi-element results into account and noting that the tailings storage area will be covered at the end of mine life, it is not expected that the concentrations of metals/metalloids present in tailings solids will have any potential for impacts on rehabilitation activities at the project site.

Investigations into the potential water solubility and mobility of metals/metalloids in tailings are presented for static water extract tests and KLC tests in **Section 6.3**.

6.3 Water extract and KLC test results

The results from multi-element water extract tests on Tailing Samples 2 and 3 are presented in **Table B6 (Attachment B).** The KLC test program for Tailings Sample 1 (KLC 9) are presented in **Attachment D**.

6.3.1 pH, acidity and alkalinity

The pH of the water extracts and KLC leachate samples ranges from pH neutral to slightly alkaline (pH 6.5 and 8.8) and is within the applied guideline values of pH 6 to 9 (ANZG, 2018). The KLC leachate samples contain negligible acidity and excess of alkalinity, resulting in a positive net alkalinity.

As discussed in **Section 6.1**, the Acid Base Account tests show that Tailings Sample 1 is NAF and Tailings Samples 2 and 3 are PAF. **Section 10** describes the management measures for tailings.

6.3.2 Salinity and major ions

The EC values for the tailings sample water extracts and KLC leachate samples can be marginally greater than the applied freshwater aquatic ecosystem guideline value but is within the applied livestock drinking water criterion (ANZG, 2018). The EC concentration in KLC leachate is fairly consistent over the test period although for KLC 9, major ion concentrations are variable with sodium and chloride tending to decrease and calcium, magnesium and sulfate showing an increasing trend.

The sulfate concentration in the KLC leachates from the tailings (KLC9) ranged from 662 to 1,050 mg/L and remains below the applied livestock drinking water criterion of 1,000 mg/L until the last three leachate events. The concentration of fluoride was slightly greater than the livestock drinking water criterion of 2 mg/L in leachate from KLC 9 for the initial and final two leachate events of the test period.

6.3.3 Residual sulfur and ANC

The concentration of sulfate in leachate from the KLC tests has been used to calculate the residual sulfur content of the tailings. The KLC 9 test results show that 93.4 % of the total sulfur content remains in the sample material after leaching for 48 weeks.

The concentrations of dissolved Ca and Mg in leachate from the KLC tests have been used to calculate the residual ANC remaining in the tailing samples. The KLC 9 results indicate that 94.8 % of the measured ANC remains in the sample after 48 weeks of leaching.

6.3.4 Reaction rates

The sulfate generation rate obtained from the tailings sample (KLC 9) have been used to determine the rate of sulfide oxidation in this material. The sulfate generation rate and associated sulfide oxidation rate for the KLC test program are shown in **Table 6-2.**

The sulfate generation rate for the tailing sample (KLC 9) is 26.5 mg/kg/week indicating that the rate of sulfide oxidation is low (equivalent to an oxidation rate ranging from 8.74×10^{-9} kg $O_2/m^3/s$). Mining waste materials with an oxidation rate in the low range (i.e., less than 5×10^{-8} kg $O_2/m^3/s$) and a moderate ANC level have an increased factor of safety and are likely to generate leachate that is pH neutral (or in this case slightly alkaline) and/or has low levels of acidity (AMIRA, 1995). Hence, the tailing materials represented by the sample tested (Tailings Sample 1) fall into this category.

Table 6-2: Sulfate generation and sulfide oxidation rates for KLC test program on tailings

KLC ID	Sample description	Sulfate generation rate (mg/kg/week)	Oxidation rate (kg $O_2/m^3/s$)
KLC 9	Tailings Sample 1	26.50	8.74×10^{-9}

[#] Sulfate generation and sulfide oxidation rates for KLCs are averaged across the relevant KLC test period

Overall, the KLC results reflect the predicted NAF material characteristics predicted from the static geochemical test results for Tailings Sample 1 presented in **Section 6.1.**

6.3.5 Dissolved metal/metalloid concentrations and WAD cyanide

The concentrations in dissolved trace metals/metalloids in static water extracts and KLC leachates from NAF Tailings Sample 1 are generally low with most of the results below the relevant laboratory LOR (including chromium). This indicates that most trace metals/metalloids have low solubility at the neutral to slightly alkaline pH of the KLC leachate and have concentrations below the applied water quality guideline values for livestock drinking water (ANZG, 2018).

Whilst it is noted that the concentration of some dissolved metals/metalloids in KLC leachate (i.e., B, Cd, Cu and Zn) is sporadically greater than the applied freshwater aquatic ecosystem (95 % species protection) value (ANZG, 2018), this is most likely due to the crushed nature of the sample and KLC set up and reflects pore water chemistry under controlled laboratory conditions. As detailed in **Section 3.3.5.1,** the free leaching KLC test methodology essentially represents the 'worst case' or maximum potential for sulfide oxidation and potential acid/metal/metalloid/salt generation in pore water for crushed materials under freely oxidising laboratory conditions. Whilst arbitrary comparisons against guideline concentrations can be useful in some situations and help to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the project.

The weak acid dissociable (WAD) cyanide concentration in tailings water extracts is below the laboratory LOR and the concentration of WAD cyanide at the project is expected to be low.

7 Spent Heap Leach Residue Geochemistry

7.1 Acid Base Account and NAG test results

The Acid Base Account and NAG test results for the spent heap leach residue samples are presented in **Table B1 (Attachment B)** and summarised below.

- **pH**: The $pH_{(1:5)}$ values for the spent heap leach residue samples are presented in **Figure 7-1**. The pH ranges from 8.8 to 9.1 and is typically slightly alkaline. Materials represented by the samples tested add some alkalinity to initial contact water. These results show that the spent heap leach residue materials represented by the samples tested are not acidic under initial 'worst case' laboratory conditions.

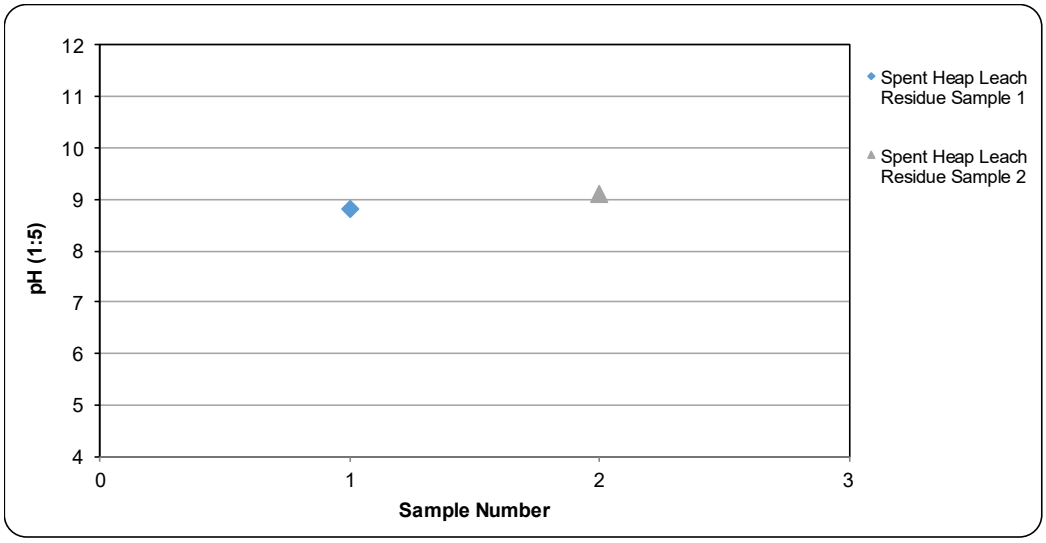


Figure 7-1: Spent heap leach residue pH values

- **EC**: The $EC_{(1:5)}$ values for the spent heap leach residue samples are presented in **Figure 7-2**. According to DME Guidelines (DME, 1995), the EC is low (158 to 267 µS/cm) in the spent heap leach residue samples under initial 'worst case' laboratory conditions.

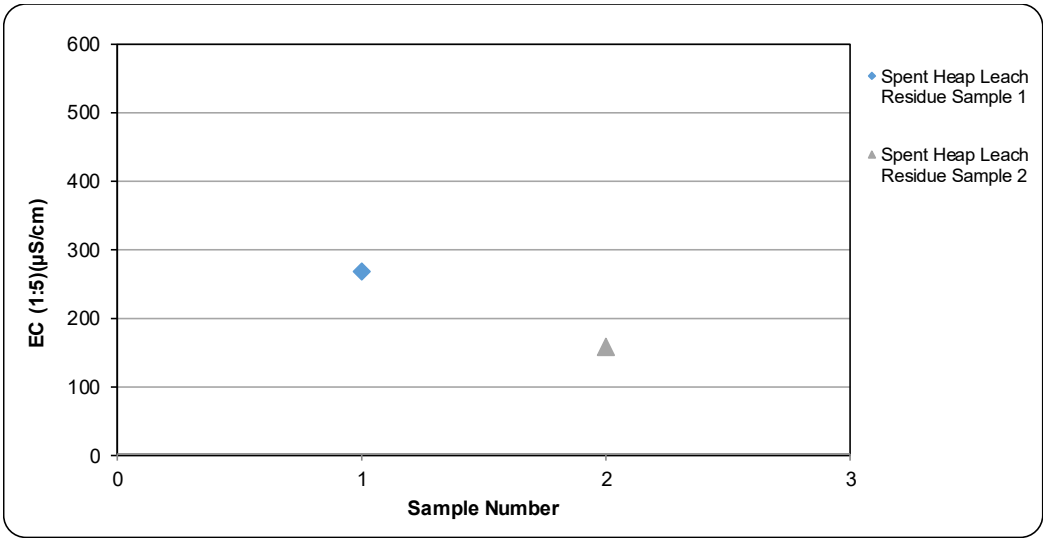


Figure 7-2: Spent heap leach residue EC values

- **Total sulfur**: The total sulfur values for the spent heap leach residue samples are presented in **Figure 7-3**. Total sulfur levels range from 0.78 to 1.11 %).

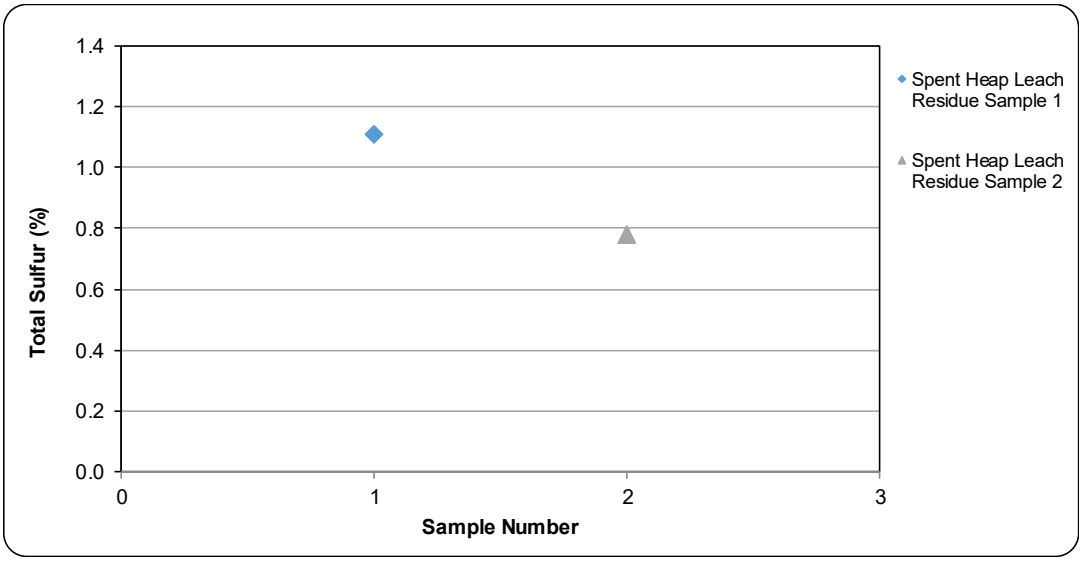


Figure 7-3: Spent heap leach residue total sulfur content

- **Scr**: The Scr values are presented for the spent heap leach residue samples in **Figure 7-4** and indicate that ~ 68 to 81 % of the total sulfur is present as sulfide in materials represented by these samples.

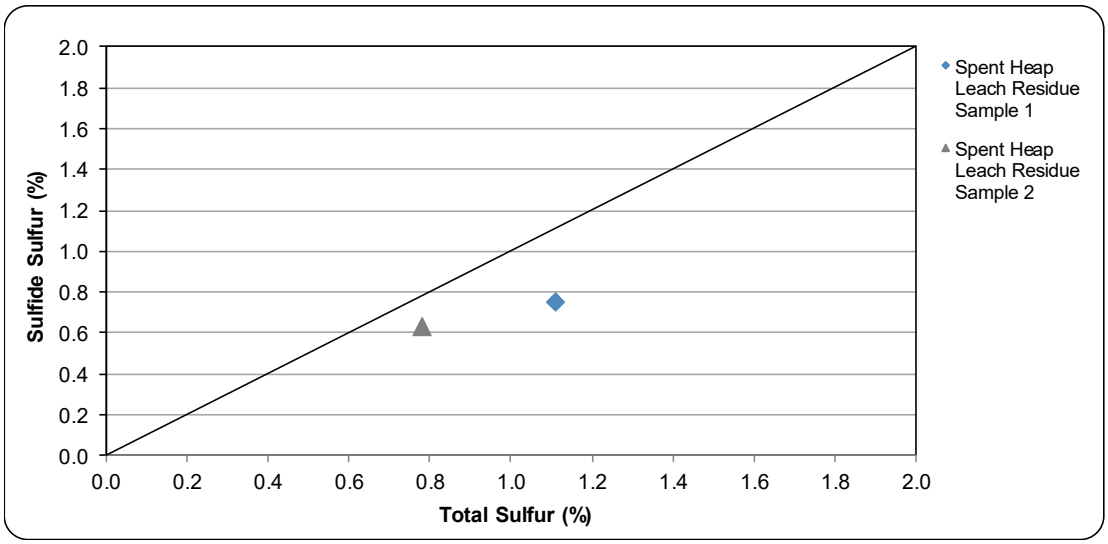


Figure 7-4: Spent heap leach residue total sulfur versus sulfide sulfur

- **MPA**: The MPA that could be generated through the oxidation of sulfide in the spent heap leach residue samples ranges from 19.3 to 23.0 kg H_2SO_4/t as calculated from the sulfide sulfur content.
- **ANC**: The ANC of the spent heap leach residue samples ranges from 11.4 to 13.7 kg H_2SO_4/t.
- **ABCC tests**: ABCC tests were completed the spent heap leach residue samples and results are presented in **Figure B5** (**Attachment B)**. The ABCC test results show that whilst some acid buffering should be expected from the sample materials, the majority of this buffering may only be available at lower pH values.

- **ANC:MPA ratio**: The ANC:MPA ratio for the spent heap leach residue samples ranges from 0.5 to 0.7. ANC:MPA ratio lines have been plotted on **Figure 7-5** to illustrate the factor of safety associated with the samples. Generally, those samples with an ANC:MPA ratio greater than 2 have negligible risk of acid generation and a high factor of safety in terms of potential for generating acidic drainage (COA, 2016; INAP, 2026). The spent heap leach residue samples have an ANC:MPA ratio less than 2 indicating a reduced factor of safety with respect to potential acid generation, if materials represented by these samples are left exposed to oxidising conditions over time (COA, 2016; INAP, 2026).

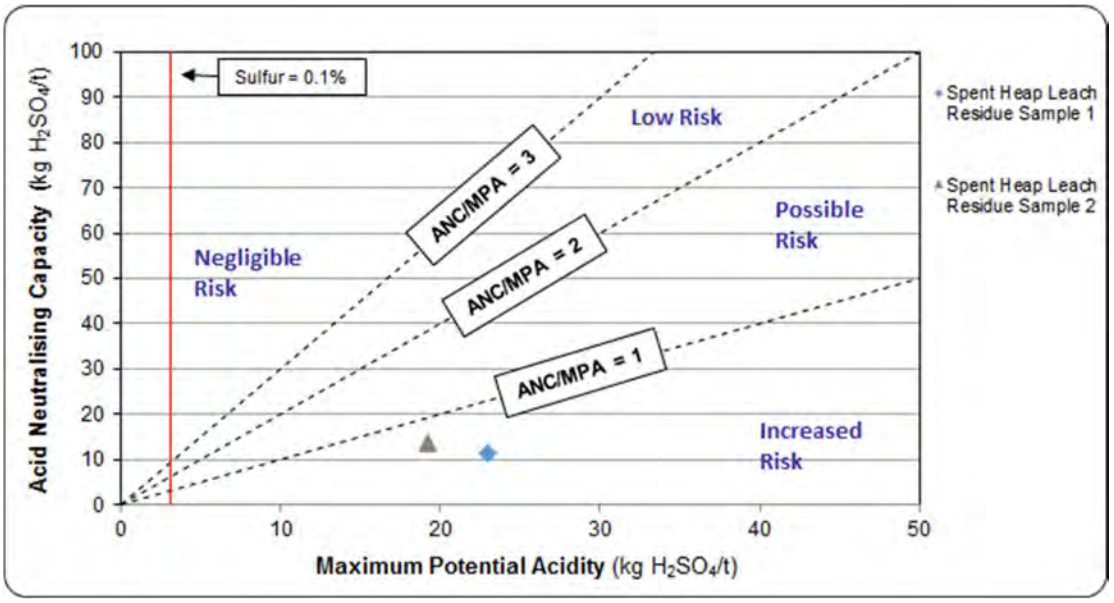


Figure 7-5: Spent heap leach residue ANC:MPA ratio

- **NAPP**: The NAPP values for the spent heap leach residue samples range from 5.6 to +11.6 kg H_2SO_4/t (**Figure 7-6**).

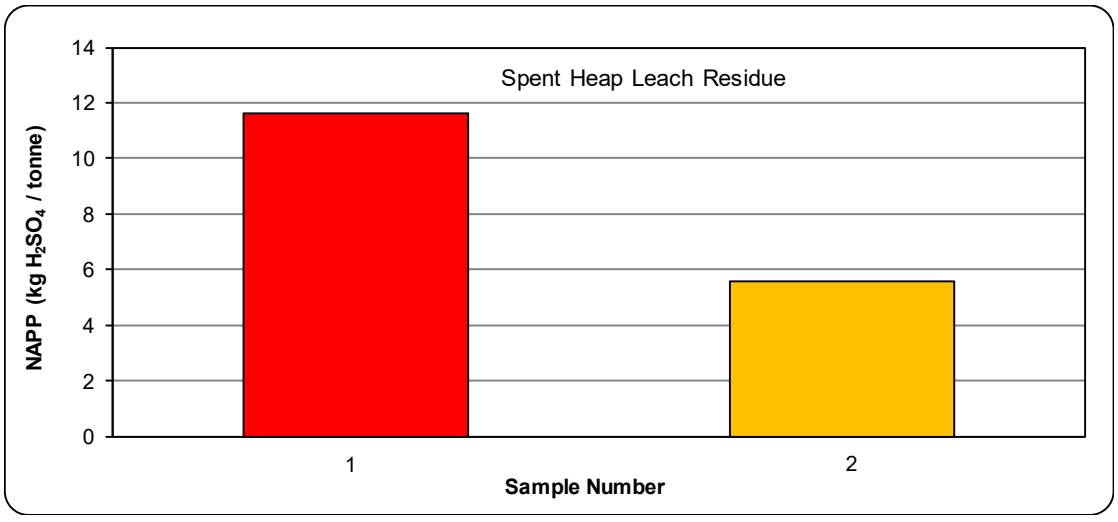


Figure 7-6: Spent heap leach residue NAPP values

- **NAG**: The NAG_{pH} test results for the spent heap leach residue samples range from pH 2.6 to pH 3.0. NAG capacity values titrated to pH 4.5 and pH 7.0 range from 6.7 kg H_2SO_4/t and 17.1 kg H_2SO_4/t, respectively. The NAG_{pH} and NAPP and results shown in **Figure 7-7** indicate that materials represented by the spent heap leach residue are PAF.

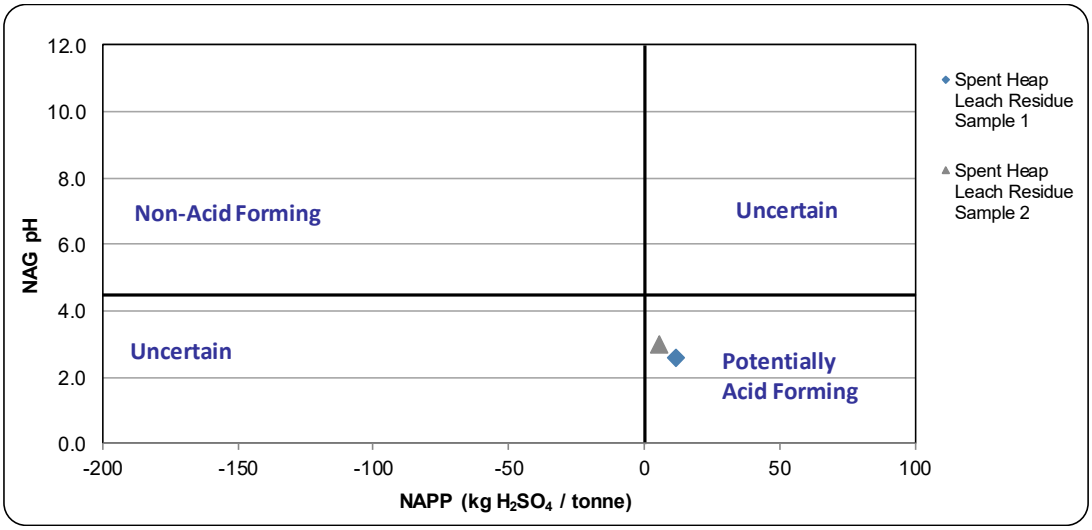


Figure 7-7: Spent heap leach residue NAG pH versus NAPP

Table 7-1 summarises the geochemical classification criteria used by RGS to classify the acid forming nature of the spent heap leach residue samples and gives a breakdown of the number of samples in each classification category. The results show that Spent Heap Leach Residue Sample 1 is classified as PAF and Spent Heap Leach Residue Sample is classified as PAF-LC.

Table 7-1: Geochemical classification criteria for spent heap leach residue samples

Classification	Sulfur (%)	NAPP value (kg H_2SO_4/t)	ANC:MPA Ratio	No. of samples (n=2)
Non-Acid Forming (Barren)	≤ 0.1	-	-	0
Non-Acid Forming	> 0.1	≤ -5	≥ 2	0
Uncertain	> 0.1	> -5 to ≤ +5	< 2	0
Potentially Acid Forming (Low Capacity)	> 0.1	> 5 to ≤ 10	< 2	1
Potentially Acid Forming	> 0.1	> 10	< 2	1

7.2 Multi-element test results

The multi-element test results for metals/metalloids in the solid spent heap leach residue samples are provided in **Table B7 (Attachment B)**, which provides a comparison of the multi-element test results against the adopted reference criteria discussed in **Section 3.3.3**.(NEPC, 2013).

The multi-element results show that the spent heap leach residue samples have low metal/metalloid concentrations compared to the reference criteria.

Taking these multi-element results into account and noting that the spent heap leach process residue will be reprocessed at the project, it is not expected that the concentrations of metals/metalloids present in these materials will present any environmental issues at the project site.

Investigations into the potential water solubility and mobility of metals/metalloids in spent heap leach residue materials are presented for KLC tests in **Section 7.3**.

7.3 KLC test results

The results for the KLC test program on spent heap leach residue samples under free draining (KLC 11) and saturated conditions (KLC 12) are presented in **Attachment D**.

7.3.1 pH, acidity and alkalinity

The pH of the KLC leachate samples ranges from pH neutral to slightly alkaline (pH 6.57 and 7.93) and is within the applied guideline values of pH 6 to 9 (ANZG, 2018). The pH value is generally higher in the spent heap leach residue material under unsaturated conditions (KLC 12) compared to free draining conditions (KLC 11).

The KLC leachate samples contain negligible acidity (≤ 6 mg/L as $CaCO_3$) and excess of alkalinity, resulting in a positive net alkalinity. The alkalinity released into KLC leachate is higher under saturated conditions.

As discussed in **Section 6.1**, the Acid Base Account and NAG tests indicate that Spent Heap Leach Residue Sample 1 is PAF and Spent Heap Leach Residue Sample 2 is PAF-LC.

7.3.2 Salinity and major ions

The EC values for the spent heap leach residue KLC leachate samples are low and less than the applied freshwater aquatic ecosystem and livestock drinking water criteria (ANZG, 2018). The EC concentration in KLC leachate is fairly consistent over the test period although under free draining conditions shows a decreasing trend. Major ion concentrations are relatively low and variable and generally dominated by calcium, potassium and sulfate.

The sulfate concentration in the KLC leachates from the spent heap leach residue KLC leachate ranges from 8 to 110 mg/L and typically remains more than an order of magnitude less than the applied livestock drinking water criterion of 1,000 mg/L. The concentration of fluoride is less than the livestock drinking water criterion of 2 mg/L in KLC leachate from the spent heap leach residue samples.

7.3.3 Residual sulfur and ANC

The concentration of sulfate in leachate from the KLC tests has been used to calculate the residual sulfur content of the spent heap leach residue materials. The KLC 11 and KLC 12 test results show that at least 99.2 % of the total sulfur content remains in the sample materials after leaching for 38 weeks.

The concentrations of dissolved Ca and Mg in leachate from the KLC tests have been used to calculate the residual ANC remaining in the spent heap leach residue samples. The KLC test results indicate that at least 97.2 % of the measured ANC remains in the sample materials after 38 weeks of leaching.

7.3.4 Reaction rates

The sulfate generation rate obtained from the spent heap leach residue samples (KLC 11 and KLC 12) have been used to determine the rate of sulfide oxidation in these materials. The sulfate generation rate and associated sulfide oxidation rate for the KLC test program are shown in **Table 7-2**.

The sulfate generation rate for the free leach sample (KLC 11) and saturated sample (KLC 12) is 9.08 and 6.02 mg/kg/week, respectively indicating that the rate of sulfide oxidation is low (equivalent to an oxidation rate ranging from 3.03 and 1.91 x 10^{-9} kg $O_2/m^3/s$). Mining waste materials with an oxidation rate in the low range (i.e., less than 5 x 10^{-8} kg $O_2/m^3/s$) and a moderate ANC level have an increased factor of safety and are likely to generate leachate that is pH neutral and/or has low levels of acidity (AMIRA, 1995). Hence, the spent heap residue materials represented by the samples tested fall into this category.

Overall, despite the spent heap leach residue samples having a PAF and PAF-LC classification using standard static geochemical Acid Base Account and NAG tests, the KLC results to date reflect a more benign material with NAF geochemical characteristics.

Table 7-2: Sulfate generation & sulfide oxidation rates for KLC tests on spent heap leach residue

KLC ID	Sample description	Sulfate generation rate (mg/kg/week)	Oxidation rate (kg $O_2/m^3/s$)
KLC 11	Spent Heap Leach Residue Sample 1	9.08	3.03 x 10^{-9}
KLC 12	Spent Heap Leach Residue Sample 2	6.02	1.91 x 10^{-9}

[#] Sulfate generation and sulfide oxidation rates for KLCs are averaged across the relevant KLC test period

7.3.5 Dissolved metal/metalloid concentrations

The concentrations in dissolved trace metals/metalloids in static water extracts and KLC leachates from the spent heap leach residue samples under both free leaching (KLC 11) and saturated (KLC 12) conditions are generally low with most of the results below the relevant laboratory LOR. This indicates that most trace metals/metalloids have low solubility at the neutral pH of the KLC leachate and have concentrations below the applied water quality guideline values for livestock drinking water (ANZG, 2018).

Whilst it is noted that the concentration of some dissolved metals/metalloids in KLC leachate (i.e., Al and Cu in KLC 11) and Al and Mn in KLC 12) are sporadically and marginally greater than the applied freshwater aquatic ecosystem (95 % species protection) value (ANZG, 2018), this is most likely due to the crushed nature of the sample and KLC set up and reflects pore water chemistry under controlled laboratory conditions. As detailed in **Section 3.3.5.1,** the free leaching KLC test methodology essentially represents the 'worst case' or maximum potential for sulfide oxidation and potential acid/metal/metalloid/salt generation in pore water for crushed materials under freely oxidising (KLC 11) or saturated (KLC 12) laboratory conditions. Whilst arbitrary comparisons against guideline concentrations can be useful in some situations and help to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the project.

8 Low Grade Ore Geochemistry

8.1 Acid Base Account and NAG test results

Acid Base Account and NAG results for a representative low grade ore sample are presented in **Table B1 (Attachment B)** and summarised below.

- **pH**: The $pH_{(1:5)}$ value for the low grade ore sample is 8.0 and classified as pH neutral to slightly alkaline. This result shows that the low grade ore material represented by the sample tested is not acidic under initial 'worst case' laboratory conditions.
- **EC**: According to DME Guidelines (DME, 1995), the $EC_{(1:5)}$ value for the low grade ore sample is very low (187 µS/cm).
- **Total sulfur**: The total sulfur content of the low grade ore sample is 0.8 %S.
- **Scr**: The Scr value for the low grade ore sample is 0.66 and indicates that ~ 83 % of the total sulfur is present as sulfide in material represented by this sample.
- **MPA**: The MPA that could be generated through the oxidation of sulfide in the low grade ore sample is 20.2 kg H_2SO_4/t. The MPA value was calculated from the sulfide sulfur content.
- **ANC**: The ANC of the low grade ore sample is 35.6 kg H_2SO_4/t.
- **ABCC tests**: ABCC tests were completed on the low grade ore sample and results are presented in **Figure B6** (**Attachment B**). The ABCC test results show that whilst some acid buffering should be expected from the sample material, the majority of this buffering may only be available at lower pH values.
- **ANC:MPA ratio**: The ANC:MPA ratio for the low grade ore samples is 1.8. ANC:MPA ratio lines have been plotted on **Figure 8-1** to illustrate the factor of safety associated with the samples. Generally, those samples with an ANC:MPA ratio greater than 2 have negligible risk of acid generation and a high factor of safety in terms of potential for generating acidic drainage (INAP, 2026; COA, 2016). The low grade ore sample has an ANC:MPA ratio just less than 2 and is unlikely to be a source of acidic drainage.
- **NAPP**: The NAPP value is negative (-15.4 kg H_2SO_4/t) for the low grade ore sample.
- **NAG**: The NAG_{pH} value for the low grade ore sample is pH 8.1. The NAG_{pH} and NAPP and results shown in **Figure 8-2** indicate that material represented by the low grade ore sample is NAF.

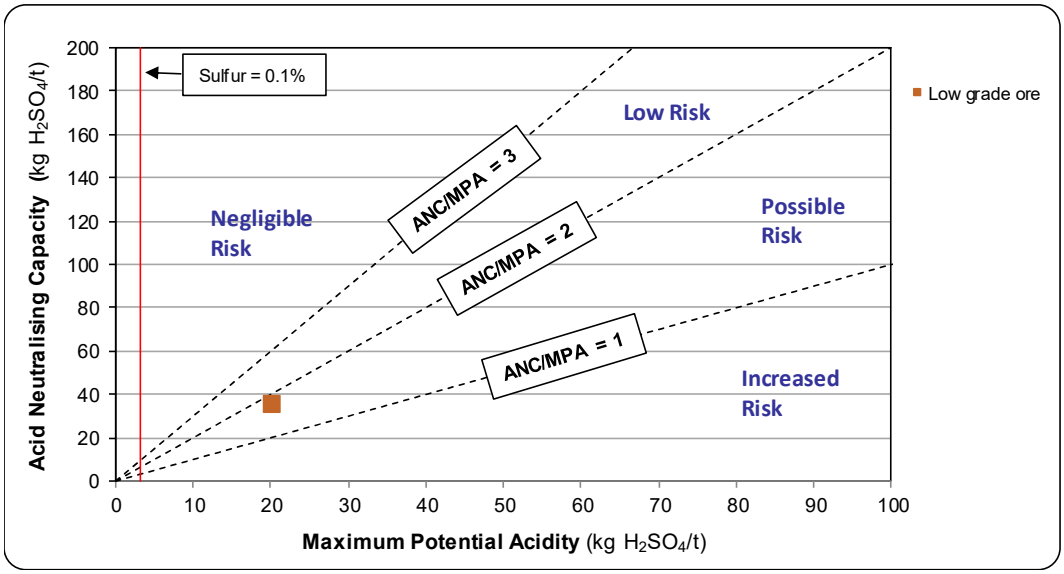


Figure 8-1: Low grade ore ANC:MPA ratio

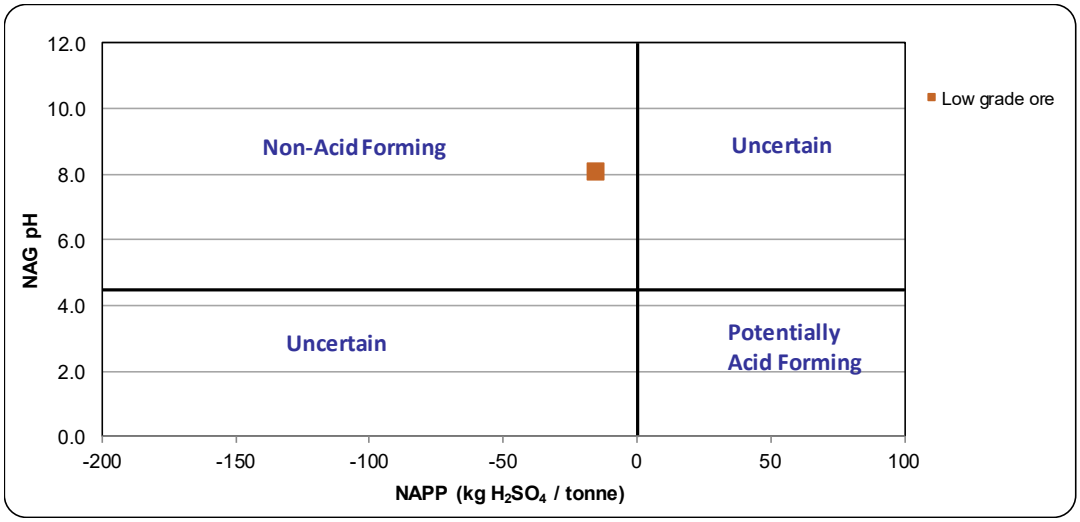


Figure 8-2: Low grade ore NAG pH vs. NAPP

Table 8-1 summarises the geochemical classification criteria used by RGS to classify the acid forming nature of the low grade ore sample and shows that it is classified as NAF.

Table 8-1: Geochemical classification criteria for low grade ore sample

Classification	Total S (%)	NAPP value (kg H_2SO_4/t)	ANC:MPA Ratio	No. of samples (n=1)
Non-Acid Forming (Barren)	≤ 0.1	-	-	0
Non-Acid Forming	> 0.1	≤ -5	≥ 2	1
Uncertain	> 0.1	> -5 to ≤ +5	< 2	0
Potentially Acid Forming – Low Capacity	> 0.1	> 5 to ≤ 10	< 2	0
Potentially Acid Forming	> 0.1	> 10	< 2	0

8.2 Multi-element test results

The multi-element test results for metals/metalloids in the low grade ore sample are provided in **Table B8 (Attachment B)**, which provides a comparison of the multi-element test results against the adopted reference criteria discussed in **Section 3.3.3**.(NEPC, 2013).

The multi-element results show that the low grade ore sample has low metal/metalloid concentrations compared to the reference criteria.

As discussed in **Section 10.2**, no low grade will remain at mine closure and therefore the concentrations of metals/metalloids present in these materials will not present any rehabilitation issues for the project.

Investigations into the potential water solubility and mobility of metals/metalloids in low grade ore materials are presented for KLC tests in **Section 8.3**.

8.3 KLC test results

The results for the KLC test program on the low grade ore sample under free draining conditions (KLC 10) are presented in **Attachment D**.

8.3.1 pH, acidity and alkalinity

The pH of the KLC leachate samples is in the pH neutral range (pH 6.46 and 7.52) and is within the applied guideline values of pH 6 to 9 (ANZG, 2018).

The KLC leachate samples contain negligible acidity (≤ 4 mg/L as $CaCO_3$) and excess of alkalinity, resulting in a positive net alkalinity.

As discussed in **Section 8.1**, the Acid Base Account and NAG tests show that the low grade ore sample is NAF.

8.3.2 Salinity and major ions

The EC values for the low grade ore KLC leachate samples are greater than the applied freshwater aquatic ecosystem guideline criterion for the first three leach events but shows a decreasing concentration trend over the test period. The EC values are all less than the applied livestock drinking water criterion (ANZG, 2018). Major ion concentrations are variable and generally dominated by calcium, magnesium and sulfate.

The sulfate concentration in the KLC leachates from the low grade ore KLC leachate ranges from 213 to 617 mg/L, shows a decreasing concentration trend, and is less than the applied livestock drinking water criterion of 1,000 mg/L. The concentration of fluoride is less than the livestock drinking water criterion of 2 mg/L in KLC leachate from the low grade ore sample.

8.3.3 Residual sulfur and ANC

The concentration of sulfate in leachate from the KLC tests has been used to calculate the residual sulfur content of the low grade ore material. The KLC 10 test results show that at least 98.7 % of the total sulfur content remains in the sample material after leaching for 48 weeks.

The concentrations of dissolved Ca and Mg in leachate from the KLC tests have been used to calculate the residual ANC remaining in the low grade ore sample. The KLC test results indicate that at least 99.3 % of the measured ANC remains in the sample material after 48 weeks of leaching.

8.3.4 Reaction rates

The sulfate generation rate obtained from the low grade ore sample (KLC 10) has been used to determine the rate of sulfide oxidation in this material. The sulfate generation rate and associated sulfide oxidation rate for the KLC test program are shown in **Table 8-2**.

The sulfate generation rate for the low grade ore sample (KLC 10) is 6.34 mg/kg/week indicating that the rate of sulfide oxidation is low (equivalent to an oxidation rate ranging from 4.08×10^{-9} kg $O_2/m^3/s$). Mining waste materials with an oxidation rate in the low range (i.e., less than 5×10^{-8} kg $O_2/m^3/s$) and a moderate ANC level have an increased factor of safety and are likely to generate leachate that is pH neutral and/or has low levels of acidity (AMIRA, 1995). Hence, the low grade ore material represented by the sample tested falls into this category.

Overall, the KLC results reflect the NAF material characteristics predicted for low grade ore from the static geochemical test results presented in **Section 8.1.**

Table 8-2: Sulfate generation and sulfide oxidation rates for KLC test on low grade ore

KLC ID	Sample description	Sulfate generation rate (mg/kg/week)	Oxidation rate (kg $O_2/m^3/s$)
KLC 10	Low grade ore	6.34	4.08×10^{-9}

[#] Sulfate generation and sulfide oxidation rates for KLCs are averaged across the relevant KLC test period

8.3.5 Dissolved metal/metalloid concentrations

The concentrations in dissolved trace metals/metalloids in KLC leachates from the low grade ore sample under free leaching (KLC 10) conditions are generally low with most of the results below the relevant laboratory LOR. This indicates that most trace metals/metalloids have low solubility at the neutral pH of the KLC leachate and have concentrations below the applied water quality guideline values for livestock drinking water (ANZG, 2018).

Whilst it is noted that the concentration of some dissolved metals/metalloids in KLC leachate (i.e., Cd, Cu, Ni and Zn are sporadically and marginally greater than the applied freshwater aquatic ecosystem (95 % species

protection) values (ANZG, 2018), this is most likely due to the crushed nature of the sample and KLC set up and reflects pore water chemistry under controlled laboratory conditions. As detailed in **Section 3.3.5.1,** the free leaching KLC test methodology essentially represents the 'worst case' or maximum potential for sulfide oxidation and potential acid/metal/metalloid/salt generation in pore water for crushed materials under freely oxidising laboratory conditions. Whilst arbitrary comparisons against guideline concentrations can be useful in some situations and help to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the project site.

9 High Grade Ore Geochemistry

9.1 Acid Base Account and NAG test results

Acid Base Account and NAG results for a representative high grade ore sample are presented in **Table B1 (Attachment B)** and summarised below.

- **pH**: The $pH_{(1:5)}$ value for the low grade ore sample is 7.0 and classified as pH neutral. This results shows that the high grade ore material represented by the sample tested is not acidic under initial 'worst case' laboratory conditions.
- **EC**: According to DME Guidelines (DME, 1995), the $EC_{(1:5)}$ value for the high grade ore sample is medium (799 µS/cm).
- **Total sulfur**: The total sulfur content of the high grade ore sample is 1.99 %S.
- **Scr**: The Scr value for the high grade ore sample is 1.66 and indicates that ~ 80 % of the total sulfur is present as sulfide in material represented by this sample.
- **MPA**: The MPA that could be generated through the oxidation of sulfide in the high grade ore sample is 50.8 kg H_2SO_4/t. The MPA value was calculated from the sulfide sulfur content.
- **ANC**: The ANC of the high grade ore sample is 18.9 kg H_2SO_4/t.
- **ABCC tests**: ABCC tests were completed on the high grade ore sample and results are presented in **Figure B6** (**Attachment B)**. The ABCC test results show that whilst some acid buffering should be expected from the sample material, the majority of this buffering may only be available at lower pH values.
- **ANC:MPA ratio**: The ANC:MPA ratio for the high grade ore samples is 0.4. ANC:MPA ratio lines have been plotted on **Figure 9-1** to illustrate the factor of safety associated with the samples. Generally, those samples with an ANC:MPA ratio greater than 2 have negligible risk of acid generation and a high factor of safety in terms of potential for generating acidic drainage (INAP, 2026; COA, 2016). The high grade ore sample has an ANC:MPA ratio less than 2 and therefore may be a source of acidic drainage.
- **NAPP**: The NAPP value is positive (31.9 kg H_2SO_4/t) for the high grade ore sample.
- **NAG**: The NAG_{pH} value for the high grade ore sample is pH 2.6. The NAG_{pH} and NAPP and results shown in **Figure 9-2** indicate that material represented by the high grade ore sample is PAF.

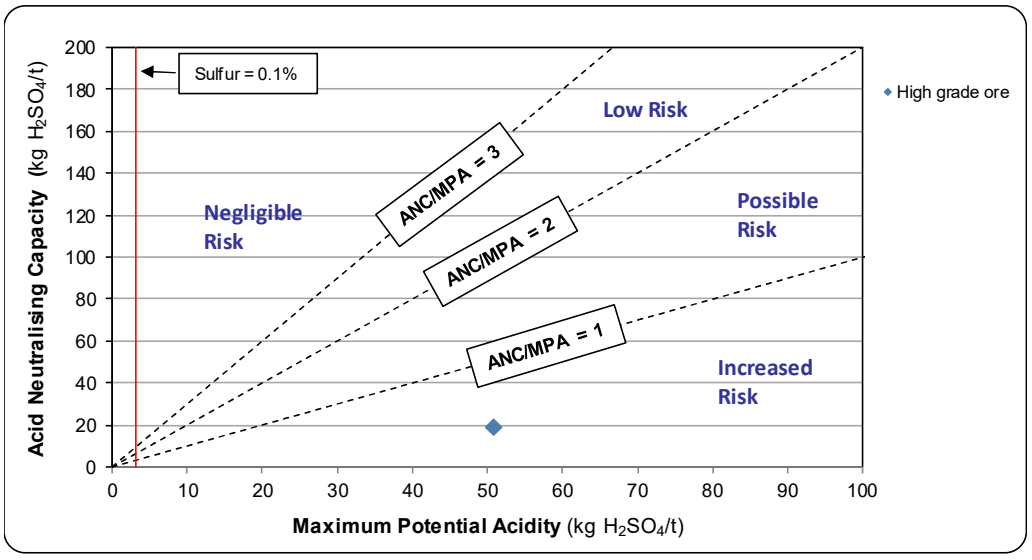


Figure 9-1: High grade ore ANC:MPA ratio

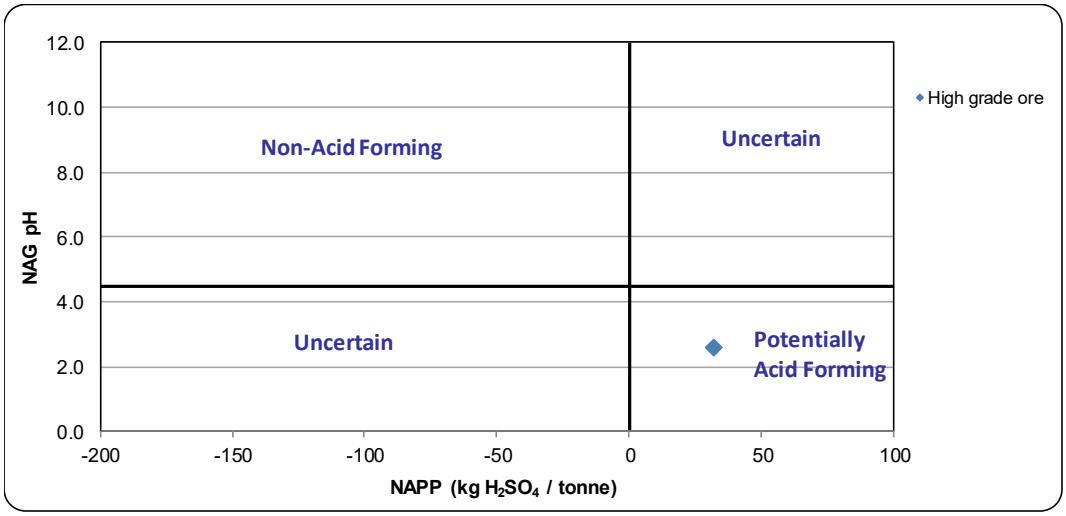


Figure 9-2: High grade ore NAG pH vs. NAPP

Table 9-1 summarises the geochemical classification criteria used by RGS to classify the acid forming nature of the high grade ore sample and shows that it is classified as PAF.

Table 9-1: Geochemical classification criteria for high grade ore sample

Classification	Total S (%)	NAPP value (kg H_2SO_4/t)	ANC:MPA Ratio	No. of samples (n=1)
Non-Acid Forming (Barren)	≤ 0.1	-	-	0
Non-Acid Forming	> 0.1	≤ -5	≥ 2	0
Uncertain	> 0.1	> -5 to ≤ +5	< 2	0
Potentially Acid Forming - Low Capacity	> 0.1	> 5 to ≤ 10	< 2	0
Potentially Acid Forming	> 0.1	> 10	< 2	1

9.2 Multi-element test results

The multi-element test results for metals/metalloids in the high grade ore sample are provided in **Table B8 (Attachment B)**, which provides a comparison of the multi-element test results against the adopted reference criteria discussed in **Section 3.3.3**.(NEPC, 2013).

The multi-element results show that the high grade ore sample has relatively low metal/metalloid concentrations compared to the reference criteria.

As discussed in **Section 10.2**, no high grade ore will remain at mine closure and therefore the concentrations of metals/metalloids present in these materials will not present any rehabilitation issues for the project.

Investigations into the potential water solubility and mobility of metals/metalloids in high grade ore materials are presented for KLC tests in **Section 9.3**.

9.3 KLC test results

The results for the KLC test program on the high grade ore sample under free draining conditions (KLC 15) are presented in **Attachment D**.

9.3.1 pH, acidity and alkalinity

The pH of the KLC leachate samples ranges from pH neutral to slightly alkaline (pH 4.47 and 6.30) and can be lower than the applied guideline value range of pH 6 to 9 (ANZG, 2018).

The KLC leachate samples initially have elevated acidity (200 mg/L as $CaCO_3$) which rapidly decreases to a negligible value (≤ 5 mg/L) with balanced alkalinity, resulting in a net alkalinity value close to zero.

As discussed in **Section 9.1**, the Acid Base Account and NAG tests show that the high grade ore sample is classified as PAF.

9.3.2 Salinity and major ions

The EC values for the high grade ore KLC leachate samples is greater than the applied freshwater aquatic ecosystem guideline criterion for the first leach event but displays a lower concentration trend over the remainder of the test period. The EC values are all less than the applied livestock drinking water criterion (ANZG, 2018). Major ion concentrations are variable and generally dominated by calcium, magnesium and sulfate.

The sulfate concentration in the KLC leachates from the high grade ore KLC leachate ranges from 367 to 1,160 mg/L, shows a reduced concentration trend, and after the initial leach event is less than the applied livestock drinking water criterion of 1,000 mg/L. The concentration of fluoride is less than the livestock drinking water criterion of 2 mg/L in KLC leachate from the high grade ore sample.

9.3.3 Residual sulfur and ANC

The concentration of sulfate in leachate from the KLC tests has been used to calculate the residual sulfur content of the high grade ore material. The KLC 15 test results show that at least 98.3 % of the total sulfur content remains in the sample material after leaching for 38 weeks.

The concentrations of dissolved Ca and Mg in leachate from the KLC tests have been used to calculate the residual ANC remaining in the high grade ore sample. The KLC test results indicate that at least 95.0 % of the measured ANC remains in the sample material after 38 weeks of leaching.

9.3.4 Reaction rates

The sulfate generation rate obtained from the high grade ore sample (KLC 15) has been used to determine the rate of sulfide oxidation in this material. The sulfate generation rate and associated sulfide oxidation rate for the KLC test program are shown in **Table 9-2**.

The sulfate generation rate for the high grade ore sample is 36.49 mg/kg/week indicating that the rate of sulfide oxidation is relatively low (equivalent to an oxidation rate ranging from 2.36×10^{-8} kg $O_2/m^3/s$). Mining waste materials with an oxidation rate in the low range (i.e., less than 5×10^{-8} kg $O_2/m^3/s$) and a moderate ANC level have an increased factor of safety and are likely to generate leachate that is pH neutral and/or has low levels of acidity (AMIRA, 1995). Hence, the high grade ore material represented by the sample tested falls into this category.

Overall, despite the high grade ore sample having a PAF classification using standard static geochemical Acid Base Account and NAG tests, the KLC results to date reflect a more benign material with 'Uncertain' geochemical characteristics**.**

Table 9-2: Sulfate generation and sulfide oxidation rates for KLC test on high grade ore

KLC ID	Sample description	Sulfate generation rate (mg/kg/week)	Oxidation rate (kg $O_2/m^3/s$)
KLC 15	High grade ore	36.49	2.36×10^{-8}

[#] Sulfate generation and sulfide oxidation rates for KLCs are averaged across the relevant KLC test period

9.3.5 Dissolved metal/metalloid concentrations

The concentrations in dissolved trace metals/metalloids in KLC leachates from the high grade ore sample under free leaching (KLC 15) conditions are generally low with many of the results below the relevant laboratory LOR. This indicates that most trace metals/metalloids have low solubility at the neutral pH of the

KLC leachate and have concentrations below the applied water quality guideline values for livestock drinking water (ANZG, 2018).

Whilst it is noted that the concentration of some dissolved metals/metalloids in KLC leachate (i.e., Al, Cd, Cu, Mn, Ni, Pb and Zn can be greater than the applied freshwater aquatic ecosystem (95 % species protection) values (ANZG, 2018), this is most likely due to the crushed nature of the sample and KLC set up and reflects pore water chemistry under controlled laboratory conditions. Most dissolved metal/metalloid concentrations in KLC leachate show a decreasing trend and the only metals/metalloids with concentrations greater than the applied livestock drinking water guideline criteria are Cd (during the first and second leach events) and Ni (during the first leach event).

As detailed in **Section 3.3.5.1,** the free leaching KLC test methodology essentially represents the 'worst case' or maximum potential for sulfide oxidation and potential acid/metal/metalloid/salt generation in pore water for crushed materials under freely oxidising laboratory conditions. Whilst arbitrary comparisons against guideline concentrations can be useful in some situations and help to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the project.

10 Geochemical Risks and Management Measures

10.1 Geochemical risks assessment and classification summary

Table 10-1 provides a summary of the results of the geochemical characterisation program presented in Sections 4 to 9 using the AMD risk classification scheme presented in Table 6 of the PAMD Handbook.

Section 10.2 provides additional discussion of the geochemical risks and implications for the handling and storage of mine materials

Table 10-1: Geochemical Characterisation and AMD Risk Classifications

Mine Waste Material	General AMD Risk Classification	Detailed AMD Risk Classification			
		AMD Risk	NMD Risk	SD Risk	Overall Classification
BVS Pit Waste Rock	NAF	Likely acid consuming (LAC)	Low potential for NMD	Low potential for SD	**LAC non-saline**
Satellite Pits Waste Rock	NAF	Likely acid consuming (LAC)	Low potential for NMD	Low potential for SD	**LAC non-saline**
Tailings	PAF	Moderate potential for acid generation (AG3)	N/A to PAF material	Moderate potential for SD	**PAF AG3 saline**
Spent Heap Leach Residue	PAF	Moderate potential for acid generation (AG3)	N/A to PAF material	Moderate potential for SD	**PAF AG3 saline**
Ore	PAF	Moderate potential for acid generation (AG3)	N/A to PAF material	Moderate potential for SD	**PAF AG3 saline**

AMD – Acid and Metalliferous Drainage
NMD – Neutral Metalliferous Drainage
SD – Saline Drainage
AG3 - Acid Generating Category 3 (Moderate potential)

10.2 Geochemistry Implications for Storage and Handling of Mine Materials

As discussed in **Section 1.2**, the mine materials will be stored and handled as follows:

- Waste rock from BVS Pit will be stored the southern and central WRDs, along with the dewatered tailings.
- Waste rock from BV1 Pit and BV2 Pit will be stored the northern WRD.
- High grade ore will be stockpiled in the mine industrial area or the heap leach pads for processing during mining operations. No high grade ore will be present at mine closure.
- Low grade ore will be stockpiled on dedicated pads prior to processing during mining operations. No low grade ore will be present at mine closure.
- Wet tailings will be stored in a dedicated Tailings Storage Cell during mining operations and post closure.
- Spent heap leach residues will be stockpiled on dedicated Heap Leach Pads prior to processing during mining operations. No spent heap leach residues will be present at mine closure.

This section provides an assessment of the geochemistry implications for the handling and storage of mine materials.

10.2.1 Central and Southern Waste Rock Dumps

The Central and Southern Waste Rock Dumps (WRDs) will store approximately 130 Million tonnes (Mt) of waste rock mined from the Big Vein South (BVS) Pit, co-disposed with approximately 12 Mt of dewatered tailings produced in the CIL Plant.

The large majority of waste rock from the BVS Pit (approximately 98%) is non-acid forming with significant excess acid neutralising capacity. The bulk waste rock stored in the Central and Southern WRDs will therefore have a high factor of safety with respect to potential for acid generation.

A small proportion of the waste rock (partially mineralised rock closely associated with the ore body) and dewatered tailings may have some potential for acid generation if stored in isolation. Any potentially acid forming waste rock or dewatered tailings will be selectively handled and encapsulated within NAF waste rock with excess ANC, within the WRD. This will ensure these materials do not generate acid drainage within the WRDs.

A Mine Material Management Plan (MMMP) has been developed for the project. The MMMP includes management measures for identifying, handling, storing and monitoring any potentially acid-forming materials, including a progressive MMMP monitoring program. The MMMP monitoring program specifically includes testing and analysis to confirm the geochemistry of the waste rock and tailings as they are produced and identify potentially acid forming waste rock that requires selective handling and storage. The MMMP also includes the selective handling and WRD waste storage procedures to ensure any potentially acid forming waste rock and tailings are fully encapsulated in non-acid forming waste rock within the WRDs.

The WRDs will be designed and operated to shed surface runoff and limit infiltration. Surface runoff quality from the WRDs will therefore not be adversely affected by the geochemistry of the waste rock. Surface runoff is likely to be pH neutral and non-saline, with negligible concentrations of metals and metalloids. However, surface runoff from the WRDs is expected to contain suspended sediments. Runoff from the WRDs will be captured in collection drains and directed to sediment dams for removal of suspended sediments.

The geochemical testing results show that seepage from the WRDs is likely to be pH neutral to slightly alkaline, with low salinity and low concentrations of metals and metalloids. Any seepage from the WRD batter slopes or the toe of the WRDs will be captured in the runoff collection drains located at the toe of the WRDs.

10.2.2 Northern Waste Rock Dump

The Northern WRD will store approximately 1.45 Mt of waste rock mined from BV1 Pit and BV2 Pit. Geochemical test results indicate that all of the waste rock from BV1 and BV2 Pits is non-acid forming with significant excess acid neutralising capacity. The bulk waste rock stored in the Northern WRD will therefore have a high factor of safety with respect to potential for acid generation. Due to the benign geochemistry of the waste rock, no specific handling or storage measures are required for waste rock from the BV1 and BV2 pits in the Northern WRD. Nonetheless, the MMMP includes progressive monitoring of the waste rock during mining in order to confirm the benign nature of these materials and identify any unexpected geochemistry.

Surface runoff and seepage from the Northern WRD will have the same characteristics as surface runoff and seepage from the Southern and Central WRDs and will be managed using the same water management strategies.

10.2.3 Tailings Storage Cell

The Tailings Storage Cell will be a lined containment structure that will store approximately 3.15 GL of tailings (settled solids) produced in the CIL Plant.

The tailings composition is variable, and ranges from NAF material with excess acid neutralising capacity to material that may have some potential for acid generation.

The geochemical testing results to date show that water from the stored wet tailings is pH neutral to slightly alkaline, with low salinity and low concentrations of metals and metalloids. Nonetheless, the MMMP includes progressive monitoring of the tailings stored in the Tailings Storage Cell in order to confirm the tailings geochemistry and water quality.

Water from the Tailings Storage Cell will be decanted and returned to the CIL pant over the life of the mine, via a return water pond, which will be designed with sufficient storage capacity to ensure nil discharge.

The Tailings Storage Cell will be rehabilitated and decommissioned at mine closure. This will involve covering the dewatered tailings with benign capping material (e.g. suitable subsoil) and topsoil and shaping the capped

surface to promote runoff and minimise infiltration. These measures will ensure that the stored tailings will not be a source of acid and metalliferous drainage in the long-term following mine closure.

10.2.4 Heap Leach Pads and Residues

Ore mined from BV1 Pit and BV2 Pit during the first two years of mining will be processed on fully lined Heap Leach Pads. The heap leaching process will produce dore gold, as well as spent heap leach residues.

The spent heap leach residues may have some inherent potential for acid generation, however, the geochemistry results to date indicate that these materials will generate pH neutral drainage with excess alkalinity. Nonetheless, the MMMP includes progressive monitoring of the spent heap leach residues stored in the Heap Leach Pad areas in order to confirm the residue geochemistry and water quality.

Process water and stormwater from the Heap Leach Pads will be collected in dedicated containment ponds. The Heap Leach ponds will be designed with sufficient storage capacity to ensure nil discharge. Stormwater from the Heap Leach stormwater pond will be reused in the Heap Leach process and/or pumped to the Tailings Storage Cell return water pond.

The spent heap leach residues will be fed through the CIL Plant over the life of the mine, producing approximately 1 Mt of dewatered tailings. Tailings produced by processing spent heap leach residues in the CIL Plant will be stored in the Central and Southern WRDs, along with the tailings produced from the processing of ore. Tailings produced from the spent heap leach residues will have similar geochemistry to the rest of the tailings produced by the CIL Plant and will be managed within the WRDs.

No spent heap leach residues will remain at the end of the mine life and hence, the Heap Leach Pad areas will be decommissioned at mine closure.

10.2.5 High Grade Ore Stockpiles

High grade ore may also be stockpiled in the mine industrial area for processing during mining operations. As discussed in **Section 10.2**, no high grade ore will be present at mine closure.

The high grade ore may have some inherent potential for acid generation, however, the geochemistry results to date indicate that these materials will generate more benign drainage with low concentrations of metals. Nonetheless, the MMMP includes progressive monitoring of the high grade ore stored in the mine industrial area in order to confirm the ore geochemistry and water quality.

Process water and stormwater from the mine industrial area will be collected in a dedicated containment dam. The mine industrial area dam will be designed with sufficient storage capacity to ensure nil discharge. Stormwater from the ore stockpile that collects in the mine industrial area dam will be reused in the site water management system.

The high grade ore will be fed through the CIL Plant over the life of the mine. The management of tailings produced by processing high grade ore is discussed in **Section 10.2.3**.

10.2.6 Low Grade Ore Stockpiles

Low grade ore will be stockpiled on dedicated pads prior to processing during mining operations. As discussed in **Section 10.2**, no low grade ore will be present at mine closure.

Geochemical test results indicate that all of the low grade ore is non-acid forming with excess acid neutralising capacity. The low grade ore will therefore have a high factor of safety with respect to potential for acid generation. Due to the benign geochemistry of the low grade ore, no specific handling or storage measures are required. Nonetheless, the MMMP includes progressive monitoring of the low grade ore during mining in order to confirm the benign nature of these materials and identify any unexpected geochemistry.

10.3 Mine Material Management Measures

The Environmental Authority (EA) will include a condition that requires the development and implementation of a Mine Material Management Plan prior to commencement of mining activities.

The MMMP includes the following:

- A progressive sampling program to validate the characterisation of mining materials presented in the EAR Geochemistry Report. The sampling program includes testing and analysis that confirms the waste rock and tailings geochemistry and the potential for waste rock to generate salinity, acidity, alkalinity and/or dissolved metals, metalloids and non-metallic inorganic substances.
- Mine waste management strategies, including strategies to manage any waste rock or tailings materials that are identified as potentially acid forming and any associated risk of acid and metalliferous drainage (AMD) (e.g. selective handling and/or encapsulation of waste rock and tailings).
    - A mine waste materials balance and disposal plan for all stages of the project.
    - Contingency measures and procedures for unexpected geochemical test results.
    - Record keeping specifications for all mine materials, including mine material characterisation and disposal records.
    - A program for monitoring and review of the effectiveness of the Mine Material Management Plan.

The MMMP will be reviewed and updated annually to ensure that it continues to operate effectively.

If the annual review identifies the need for revision, the MMMP will be revised, updated and re-issued as required.

In addition, the proponent will be required to implement multi-faceted surface water and groundwater monitoring programs in accordance with the EA requirements for the project. These monitoring programs and their components are described in the EAR Surface Water Report and EAR Groundwater Report, respectively.

11 References

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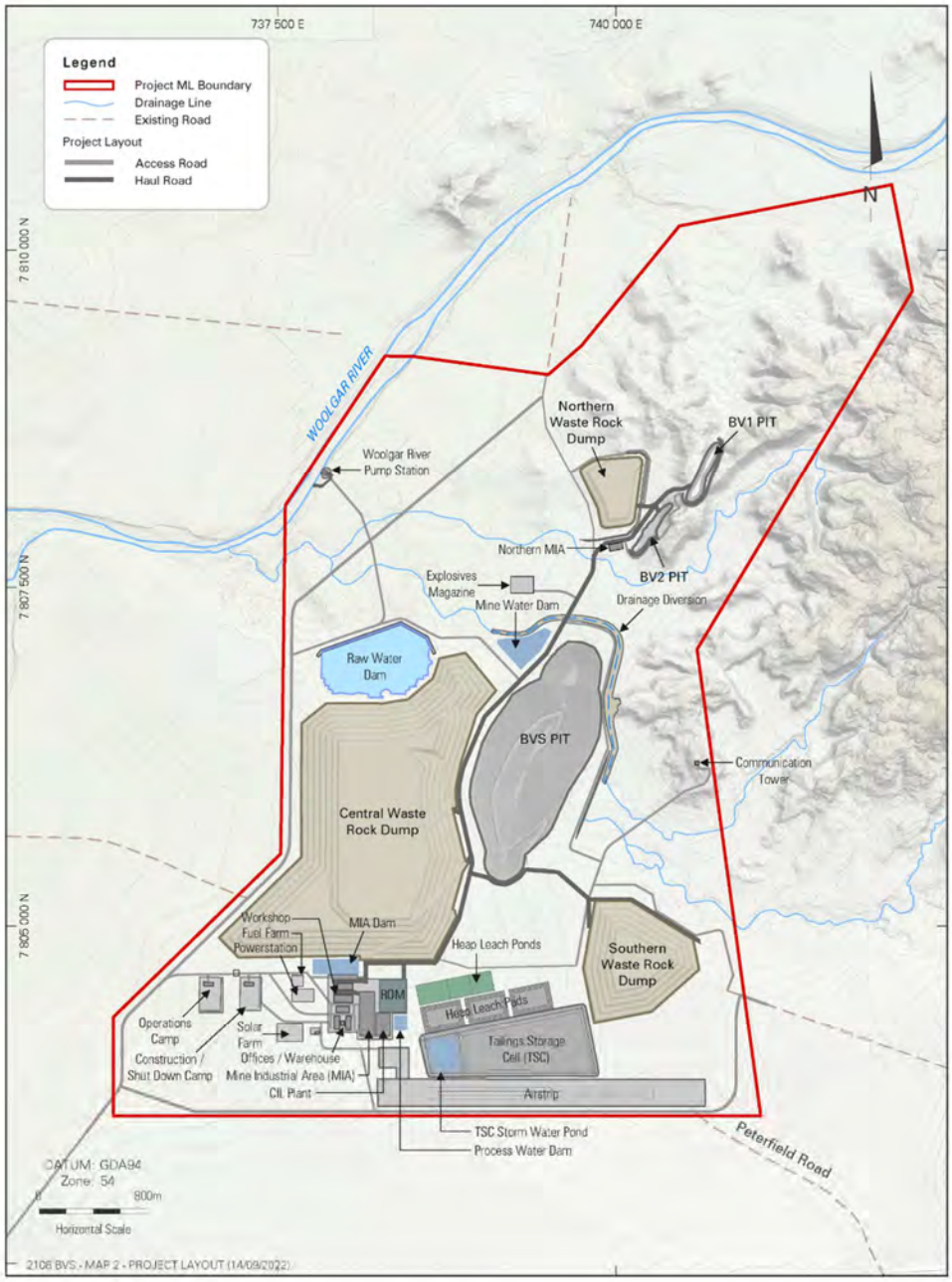


Source: Hansen Environmental Consultants

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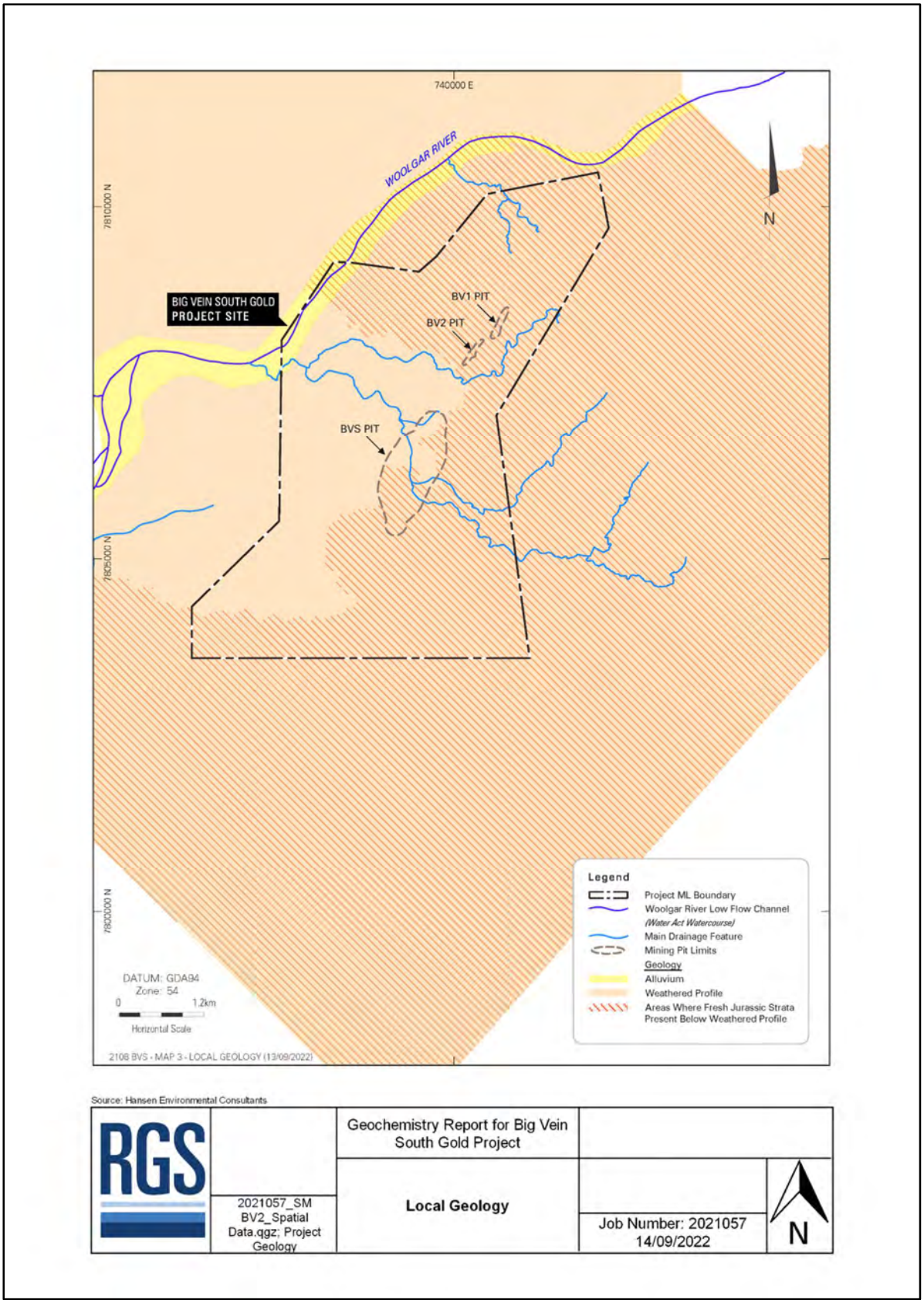
Map 1: Project Location



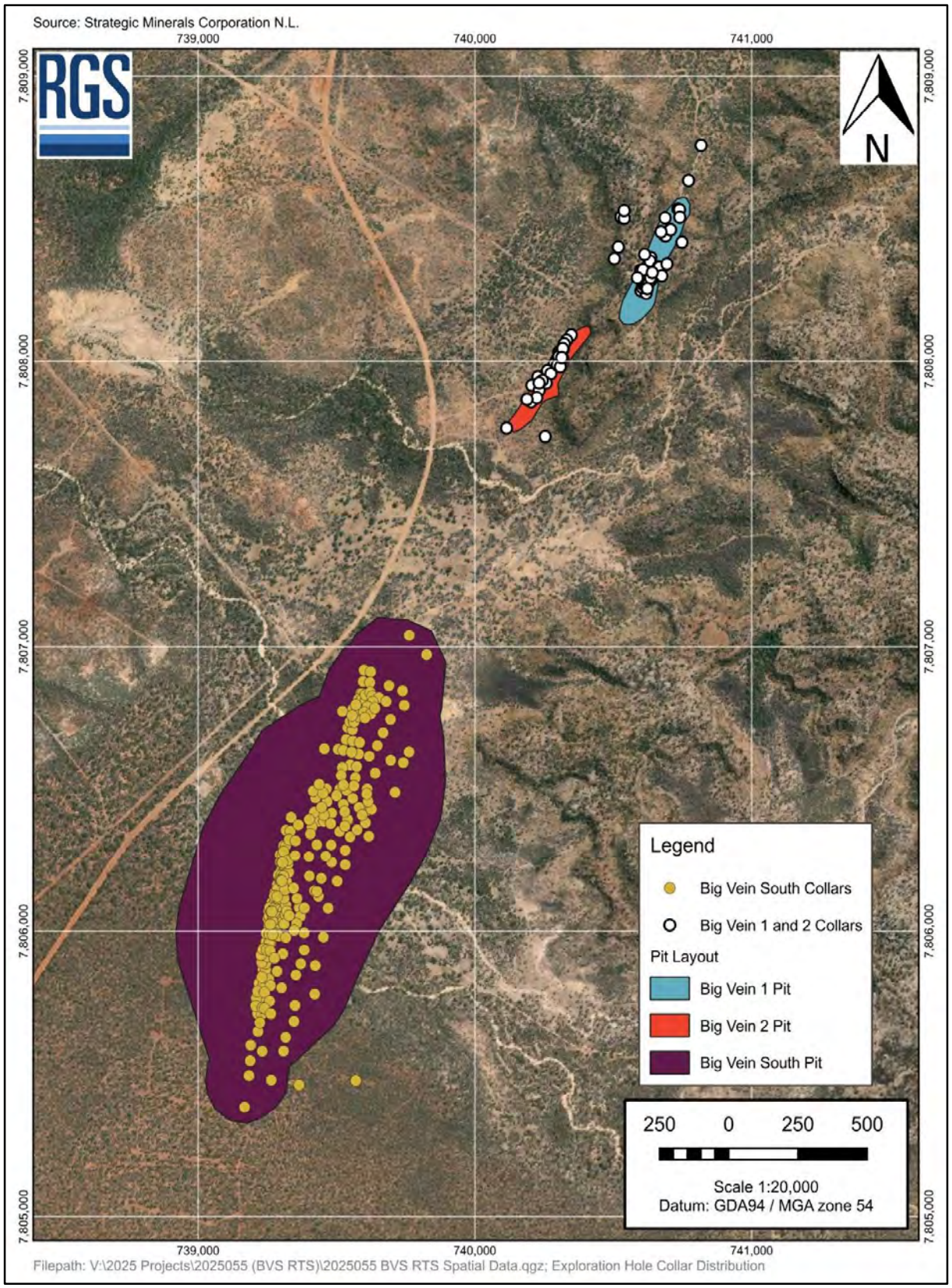
Source: Hansen Environmental Consulting

RGS		Geochemistry Report for Big Vein South Gold Project	
	2021057_SM BV2_Spatial Data.qgz; Project Layout	**Project Layout**	Job Number: 2021057 14/09/2022

Map 2: Project Layout



Map 3: Local Geology



Map 4: Collar locations of drill holes sampled at BVS, BV1 and BV2 Pits

12 Attachments

Attachment A: Geochemical assessment of mining waste materials

Attachment B: Static geochemistry summary tables and ABCC test results

Attachment C: ALS and Trilab static geochemistry data (Certificates of Analyses)

Attachment D: RGS KLC test program - summary tables and data trends

Attachment E: ALS kinetic leach data (Certificates of Analyses)

Attachment F: Supplementary information for BV1/BV2

Attachment A

Geochemical Assessment of Mining Waste 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 amount of acid that could be generated by a material based on either direct measurement of the pyritic sulfur 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:

$$FeS_2 + 15/4\ O_2 + 7/2\ H_2O \text{ ---> } Fe(OH)_3 + 2\ H_2SO_4$$

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.

NAPP

The 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 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. A NAPP assessment involves a series of analytical tests that include:

Determination of pH and EC

pH and EC measured on 1:5 w:v water extract. This gives an indication of the inherent acidity and salinity of the mining waste material when initially exposed in an emplacement area.

Total sulfur content and 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 assumes 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.

ANC

The ANC is determined by addition of acid to a known weight of sample, then back titration with NaOH to determine the amount of residual acid. The ANC measures the capacity of a sample to react with and neutralise acid and 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 acid consumed during the reaction process.

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 can provide a direct assessment of the potential for a material to produce acid after a period of exposure and weathering and is used to refine the results of the theoretical NAPP predictions. The NAG test can be used as a stand-alone test but is recommended that this only be considered after site specific calibration work is carried out.

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 major elements (i.e. Al, Ca, Fe, K, Mg, Na and S) and a range of minor elements.

The concentration of these elements in samples can be directly compared with the median concentration in un-mineralised soils to determine the Geochemical Abundance Index (GAI) and level of significance (COA, 2016; INAP, 2026; Bowen, 1979). 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-atomic emission spectroscopy (AES), and atomic absorption spectrometry (AAS).

Multi-element composition of water extracts

Multi-element composition of 1:5 (w:v [deionised water]) water extracts from solid samples determined using a combination of ICP-mass spectroscopy (ICP-MS), ICP-atomic emission spectroscopy (AES), and atomic absorption spectrometry (AAS).

Under some conditions (e.g. low pH) the solubility and mobility of common environmentally important elements can increase significantly.

KINETIC LEACH COLUMN TESTS

Kinetic leach column (KLC) tests can be used to provide information on the reaction kinetics of mine waste materials. The major objectives of kinetics tests are to:

- Provide time-dependent data on the kinetics and rate of acid generation and acid neutralising reactions under laboratory controlled (or onsite conditions);
- Investigate metal(loid) release and drainage/seepage quality; and
- Assess treatment options such as addition of alkaline materials.

The KLC tests simulate the weathering process that leads to acid and base generation and reaction under laboratory controlled or site conditions. The kinetic tests allow an assessment of the acid forming or acid consuming characteristics and indicate the rate of acid generation/consumption, over what period it will occur, and what management controls may be required.

In the free draining KLC test used in this project, deionised water was typically added to the samples on a monthly basis to simulate rainfall. The mixture was then allowed to leach products and by-products of any acid producing and consuming reactions. Samples of leachate were collected and analysed monthly. In the single saturated KLC test (KLC 12), a head of water was maintained above the sample material and leachate samples collected monthly.

KLC tests provide real-time information and generally continue for months up to about a year or more. Monitoring includes trends in pH, sulfate, acidity or alkalinity, and dissolved metals/metalloids, for example. The pH of the collected leachate simulates the acid drainage/consumption process, acidity or alkalinity levels indicate the rate of acid production and acid neutralisation, and sulfate production can be related to the rate of sulfide oxidation. Metal/metalloid concentration data provides an indication of metal/metalloid solubility and potential mobility into pore water.

Figure A1 provides a representation of the typical medium and large KLC test columns used in the KLC test program.



Figure A1: Typical KLC test columns used for the Big Vein South Project

Attachment B

Static geochemistry summary tables and ABCC test results

Table B1: Acid Base Account Test Results

Sample Number	Strategic Sample ID	Drill Hole ID	Sample Type	Description	From (m)	To (m)	pH[1]	EC[1] (µS/cm)	Total S[4] (%)	Scr[2] (%)	MPA[2] kg H_2SO_4/t	ANC[2] kg H_2SO_4/t	NAPP[2] kg H_2SO_4/t	ANC: MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5) kg H_2SO_4/t	NAG Capacity (pH 7) kg H_2SO_4/t	Sample Classification[3]
196 Waste rock samples selected from BVS Pit using the SWC Assay Database																		
1	254369	LR0187	Waste Rock	Diorite	65	66	-	-	0.15	-	4.6	71.0	-66.4	15.5				Non-Acid Forming
2	254383	LR0187	Waste Rock	Diorite	78	79	-	-	0.08	-	2.5	69.2	-66.8	28.2				Non-Acid Forming (Barren)
3	255174	LR0193	Waste Rock	Diorite	94	95	-	-	0.25	-	7.7	52.3	-44.6	6.8				Non-Acid Forming
4	255189	LR0193	Waste Rock	Diorite	108	109	-	-	0.79	-	24.2	69.2	-45.0	2.9				Non-Acid Forming
5	257926	LR0216	Waste Rock	Diorite	85	86	-	-	1.78	-	54.5	95.4	-40.9	1.8				Non-Acid Forming
6	257928	LR0216	Waste Rock	Diorite	87	88	-	-	1.35	-	41.3	65.4	-24.1	1.6				Non-Acid Forming
7	30604_SMC	LR0239	Waste Rock	Diorite	71	72	-	-	0.19	-	5.8	47.6	-41.8	8.2				Non-Acid Forming
8	258617	LRD0223	Waste Rock	Diorite	49	50	-	-	0.33	-	10.1	59.8	-49.7	5.9				Non-Acid Forming
9	33143	LR0248	Waste Rock	Dolerite	80	81	-	-	0.46	-	14.1	176.0	-161.9	12.5				Non-Acid Forming
10	33571	LR0249	Waste Rock	Dolerite	100	101	-	-	0.26	-	8.0	165.0	-157.0	20.7				Non-Acid Forming
11	33573	LR0249	Waste Rock	Dolerite	102	103	-	-	0.30	-	9.2	148.0	-138.8	16.1				Non-Acid Forming
12	34210	LR0251	Waste Rock	Dolerite	197	198	-	-	0.17	-	5.2	55.0	-49.8	10.6				Non-Acid Forming
13	34214	LR0251	Waste Rock	Dolerite	201	202	-	-	0.38	-	11.6	139.0	-127.4	11.9				Non-Acid Forming
14	35085	LR0255	Waste Rock	Dolerite	49	50	-	-	0.26	-	8.0	134.0	-126.0	16.8				Non-Acid Forming
15	37769	LR0263	Waste Rock	Dolerite	90	91	-	-	0.31	-	9.5	181.0	-171.5	19.1				Non-Acid Forming
16	38826	LR0267	Waste Rock	Dolerite	53	54	-	-	0.39	-	11.9	144.0	-132.1	12.1				Non-Acid Forming
17	40855	LR0274	Waste Rock	Dolerite	54	55	-	-	0.32	-	9.8	101.0	-91.2	10.3				Non-Acid Forming
18	40856	LR0274	Waste Rock	Dolerite	55	56	-	-	0.18	-	5.5	134.0	-128.5	24.3				Non-Acid Forming
19	40887	LR0274	Waste Rock	Dolerite	84	85	-	-	1.20	-	36.8	156.0	-119.3	4.2				Non-Acid Forming
20	41998	LR0279	Waste Rock	Dolerite	50	51	-	-	0.26	-	8.0	59.4	-51.4	7.5				Non-Acid Forming
21	42716	LR0282	Waste Rock	Dolerite	128	129	-	-	2.28	-	69.8	119.0	-49.2	1.7				Non-Acid Forming
22	36387	LR0259	Waste Rock	Micro-granodiorite	67	68	-	-	0.07	-	2.1	38.7	-36.6	18.1				Non-Acid Forming (Barren)
23	36431	LR0259	Waste Rock	Micro-granodiorite	109	110	-	-	0.42	-	12.9	93.3	-80.4	7.3				Non-Acid Forming
24	39278	LR0268	Waste Rock	Micro-granodiorite	45	46	-	-	0.78	-	23.9	114.0	-90.1	4.8				Non-Acid Forming
25	39419	LR0268	Waste Rock	Quartzite	179	180	-	-	0.33	-	10.1	42.2	-32.1	4.2				Non-Acid Forming
26	260144	LD0235	Waste Rock	Schist	75.4	76	-	-	0.18	-	5.5	49.1	-43.6	8.9				Non-Acid Forming
27	260145	LD0235	Waste Rock	Schist	76	76.3	-	-	0.10	-	3.1	54.1	-51.0	17.7				Non-Acid Forming (Barren)
28	260712	LD0236	Waste Rock	Schist	36	37	-	-	1.14	-	34.9	49.8	-14.9	1.4				Non-Acid Forming
29	260767	LD0236	Waste Rock	Schist	88	89	-	-	0.06	-	1.8	70.7	-68.9	38.5				Non-Acid Forming (Barren)
30	255602	LR0197	Waste Rock	Schist	134	135	-	-	0.93	-	28.5	53.7	-25.2	1.9				Non-Acid Forming
31	255712	LR0198	Waste Rock	Schist	66	67	-	-	0.83	-	25.4	55.6	-30.2	2.2				Non-Acid Forming
32	257919	LR0216	Waste Rock	Schist	79	80	-	-	1.40	-	42.9	80.3	-37.4	1.9				Non-Acid Forming
33	258144	LR0219	Waste Rock	Schist	26	27	-	-	0.30	-	9.2	62.0	-52.8	6.7				Non-Acid Forming
34	258273	LR0219	Waste Rock	Schist	52	53	-	-	0.82	-	25.1	104.0	-78.9	4.1				Non-Acid Forming
35	258181	LR0219	Waste Rock	Schist	61	62	-	-	3.83	-	117.3	87.8	29.5	0.7				Potentially Acid Forming
36	258236	LR0219	Waste Rock	Schist	114	115	-	-	2.12	-	64.9	50.9	14.0	0.8				Potentially Acid Forming
37	258238	LR0219	Waste Rock	Schist	116	117	-	-	2.87	-	87.9	51.8	36.1	0.6				Potentially Acid Forming
38	258248	LR0219	Waste Rock	Schist	125	126	-	-	0.91	-	27.9	58.3	-30.4	2.1				Non-Acid Forming
39	258263	LR0219	Waste Rock	Schist	139	140	-	-	0.27	-	8.3	56.6	-48.3	6.8				Non-Acid Forming
40	258374	LR0220	Waste Rock	Schist	89	90	-	-	1.63	-	49.9	62.1	-12.2	1.2				Non-Acid Forming
41	36264	LR0221	Waste Rock	Schist	158	159	-	-	0.53	-	16.2	52.7	-36.5	3.2				Non-Acid Forming
42	258923	LR0225	Waste Rock	Schist	63	64	-	-	0.11	-	3.4	51.4	-48.0	15.3				Non-Acid Forming
43	258927	LR0225	Waste Rock	Schist	67	68	-	-	0.26	-	8.0	59.8	-51.8	7.5				Non-Acid Forming
44	258944	LR0225	Waste Rock	Schist	83	84	-	-	0.41	-	12.6	57.4	-44.8	4.6				Non-Acid Forming
45	259035	LR0226	Waste Rock	Schist	61	62	-	-	0.62	-	19.0	59.9	-40.9	3.2				Non-Acid Forming
46	259037	LR0226	Waste Rock	Schist	63	64	-	-	0.19	-	5.8	53.1	-47.3	9.1				Non-Acid Forming
47	259074	LR0226	Waste Rock	Schist	98	99	-	-	0.40	-	12.3	65.5	-53.3	5.3				Non-Acid Forming
48	259167	LR0227	Waste Rock	Schist	53	54	-	-	0.40	-	12.3	101.0	-88.8	8.2				Non-Acid Forming
49	259168	LR0227	Waste Rock	Schist	54	55	-	-	0.67	-	20.5	89.6	-69.1	4.4				Non-Acid Forming
50	259176	LR0227	Waste Rock	Schist	62	63	-	-	0.94	-	28.8	71.4	-42.6	2.5				Non-Acid Forming

Table B1: Acid Base Account Test Results

Sample Number	Strategic Sample ID	Drill Hole ID	Sample Type	Description	From	To	pH[1]	EC[1]	Total S[4]	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5)	NAG Capacity (pH 7)	Sample Classification[3]
					(m)			(µS/cm)	(%)	(%)	kg H_2SO_4/t					kg H_2SO_4/t		
51	259209	LR0227	Waste Rock	Schist	93	94	-	-	0.79	-	24.2	57.4	-33.2	2.4				Non-Acid Forming
52	259262	LR0228	Waste Rock	Schist	39	40	-	-	0.30	-	9.2	118.0	-108.8	12.8				Non-Acid Forming
53	259263	LR0228	Waste Rock	Schist	40	41	-	-	0.46	-	14.1	76.5	-62.4	5.4				Non-Acid Forming
54	259290	LR0228	Waste Rock	Schist	66	67	-	-	0.89	-	27.3	64.1	-36.8	2.4				Non-Acid Forming
55	259304	LR0228	Waste Rock	Schist	79	80	-	-	0.55	-	16.8	57.7	-40.9	3.4				Non-Acid Forming
56	259325	LR0228	Waste Rock	Schist	99	100	-	-	0.29	-	8.9	68.9	-60.0	7.8				Non-Acid Forming
57	259559	LR0231	Waste Rock	Schist	99	100	-	-	0.19	-	5.8	51.0	-45.2	8.8				Non-Acid Forming
58	259723	LR0232	Waste Rock	Schist	48	49	-	-	0.04	-	1.2	48.5	-47.3	39.6				Non-Acid Forming (Barren)
59	259748	LR0232	Waste Rock	Schist	72	73	-	-	0.06	-	1.8	43.7	-41.9	23.8				Non-Acid Forming (Barren)
60	259819	LR0232	Waste Rock	Schist	140	141	-	-	0.35	-	10.7	56.5	-45.8	5.3				Non-Acid Forming
61	30081_SMC	LR0237	Waste Rock	Schist	75	76	-	-	0.15	-	4.6	46.1	-41.5	10.0				Non-Acid Forming
62	30092_SMC	LR0237	Waste Rock	Schist	86	87	-	-	0.37	-	11.3	51.4	-40.1	4.5				Non-Acid Forming
63	30131_SMC	LR0237	Waste Rock	Schist	123	124	-	-	0.66	-	20.2	65.8	-45.6	3.3				Non-Acid Forming
64	30170_SMC	LR0237	Waste Rock	Schist	160	161	-	-	0.60	-	18.4	76.9	-58.5	4.2				Non-Acid Forming
65	30341_SMC	LR0238	Waste Rock	Schist	79	80	-	-	0.15	-	4.6	49.3	-44.7	10.7				Non-Acid Forming
66	30344_SMC	LR0238	Waste Rock	Schist	82	83	-	-	0.09	-	2.8	43.9	-41.1	15.9				Non-Acid Forming (Barren)
67	30402_SMC	LR0238	Waste Rock	Schist	137	138	-	-	0.28	-	8.6	59.8	-51.2	7.0				Non-Acid Forming
68	30424_SMC	LR0238	Waste Rock	Schist	158	159	-	-	0.38	-	11.6	92.8	-81.2	8.0				Non-Acid Forming
69	30602_SMC	LR0239	Waste Rock	Schist	69	70	-	-	0.21	-	6.4	61.8	-55.4	9.6				Non-Acid Forming
70	30695_SMC	LR0239	Waste Rock	Schist	158	159	-	-	0.57	-	17.5	61.8	-44.3	3.5				Non-Acid Forming
71	30708_SMC	LR0239	Waste Rock	Schist	170	171	-	-	0.30	-	9.2	63.3	-54.1	6.9				Non-Acid Forming
72	30936_SMC	LR0240	Waste Rock	Schist	124	125	-	-	0.17	-	5.2	43.5	-38.3	8.4				Non-Acid Forming
73	30968_SMC	LR0240	Waste Rock	Schist	154	155	-	-	0.65	-	19.9	65.6	-45.7	3.3				Non-Acid Forming
74	32009_SMC	LR0245	Waste Rock	Schist	97	98	-	-	0.20	-	6.1	54.7	-48.6	8.9				Non-Acid Forming
75	32024_SMC	LR0245	Waste Rock	Schist	111	112	-	-	0.03	-	0.9	86.1	-85.2	93.7				Non-Acid Forming (Barren)
76	32058_SMC	LR0245	Waste Rock	Schist	144	145	-	-	0.08	-	2.5	121.0	-118.6	49.4				Non-Acid Forming (Barren)
77	32059_SMC	LR0245	Waste Rock	Schist	145	146	-	-	0.23	-	7.0	50.1	-43.1	7.1				Non-Acid Forming
78	32084_SMC	LR0245	Waste Rock	Schist	168	169	-	-	0.19	-	5.8	57.2	-51.4	9.8				Non-Acid Forming
79	32102_SMC	LR0245	Waste Rock	Schist	185	186	-	-	0.12	-	3.7	78.4	-74.7	21.3				Non-Acid Forming
80	32142_SMC	LR0245	Waste Rock	Schist	223	224	-	-	1.08	-	33.1	83.3	-50.2	2.5				Non-Acid Forming
81	32390	LR0246	Waste Rock	Schist	69	70	-	-	0.31	-	9.5	41.1	-31.6	4.3				Non-Acid Forming
82	32398	LR0246	Waste Rock	Schist	77	78	-	-	0.29	-	8.9	55.3	-46.4	6.2				Non-Acid Forming
83	32434	LR0246	Waste Rock	Schist	111	112	-	-	0.21	-	6.4	47.2	-40.8	7.3				Non-Acid Forming
84	32450	LR0246	Waste Rock	Schist	126	127	-	-	0.16	-	4.9	51.4	-46.5	10.5				Non-Acid Forming
85	32473	LR0246	Waste Rock	Schist	148	149	-	-	0.07	-	2.1	40.0	-37.9	18.7				Non-Acid Forming (Barren)
86	32517	LR0246	Waste Rock	Schist	190	191	-	-	0.58	-	17.8	66.8	-49.0	3.8				Non-Acid Forming
87	32523	LR0246	Waste Rock	Schist	195	196	-	-	0.71	-	21.7	44.3	-22.6	2.0				Non-Acid Forming
88	32706	LR0247	Waste Rock	Schist	93	94	-	-	0.22	-	6.7	45.9	-39.2	6.8				Non-Acid Forming
89	32842	LR0247	Waste Rock	Schist	222	223	-	-	0.49	-	15.0	41.1	-26.1	2.7				Non-Acid Forming
90	33266	LR0248	Waste Rock	Schist	197	198	-	-	0.52	-	15.9	56.0	-40.1	3.5				Non-Acid Forming
91	33567	LR0249	Waste Rock	Schist	96	97	-	-	0.25	-	7.7	162.0	-154.3	21.2				Non-Acid Forming
92	33863	LR0250	Waste Rock	Schist	40	41	-	-	0.11	-	3.4	52.0	-48.6	15.4				Non-Acid Forming
93	33967	LR0250	Waste Rock	Schist	139	140	-	-	0.42	-	12.9	119.0	-106.1	9.3				Non-Acid Forming
94	34109	LR0251	Waste Rock	Schist	101	102	-	-	0.30	-	9.2	42.7	-33.5	4.6				Non-Acid Forming
95	34119	LR0251	Waste Rock	Schist	111	112	-	-	0.45	-	13.8	51.5	-37.7	3.7				Non-Acid Forming
96	35396	LR0256	Waste Rock	Schist	131	132	-	-	0.14	-	4.3	59.3	-55.0	13.8				Non-Acid Forming
97	35417	LR0256	Waste Rock	Schist	151	152	-	-	0.08	-	2.5	49.4	-47.0	20.2				Non-Acid Forming (Barren)
98	35468	LR0256	Waste Rock	Schist	199	200	-	-	0.36	-	11.0	40.9	-29.9	3.7				Non-Acid Forming
99	35833	LR0256	Waste Rock	Schist	206	217	-	-	0.70	-	21.4	54.4	-33.0	2.5				Non-Acid Forming
100	35675	LR0257	Waste Rock	Schist	180	181	-	-	0.49	-	15.0	37.8	-22.8	2.5				Non-Acid Forming

Table B1: Acid Base Account Test Results

Sample Number	Strategic Sample ID	Drill Hole ID	Sample Type	Description	From	To	pH[1]	EC[1]	Total S[4]	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5)	NAG Capacity (pH 7)	Sample Classification[3]
					(m)			(µS/cm)	(%)	(%)	kg H_2SO_4/t					kg H_2SO_4/t		
101	36388	LR0259	Waste Rock	Schist	68	69	-	-	0.16	-	4.9	46.4	-41.5	9.5				Non-Acid Forming
102	36446	LR0259	Waste Rock	Schist	123	124	-	-	2.12	-	64.9	35.6	29.3	0.5				Potentially Acid Forming
103	37556	LR0262	Waste Rock	Schist	144	145	-	-	0.18	-	5.5	76.2	-70.7	13.8				Non-Acid Forming
104	37822	LR0263	Waste Rock	Schist	140	141	-	-	0.05	-	1.5	36.0	-34.5	23.5				Non-Acid Forming (Barren)
105	37823	LR0263	Waste Rock	Schist	141	142	-	-	0.05	-	1.5	36.1	-34.6	23.6				Non-Acid Forming (Barren)
106	37843	LR0263	Waste Rock	Schist	160	161	-	-	0.32	-	9.8	56.6	-46.8	5.8				Non-Acid Forming
107	37851	LR0263	Waste Rock	Schist	168	169	-	-	1.03	-	31.5	44.5	-13.0	1.4				Non-Acid Forming
108	37861	LR0263	Waste Rock	Schist	177	178	-	-	0.34	-	10.4	43.2	-32.8	4.1				Non-Acid Forming
109	38114	LR0264	Waste Rock	Schist	93	94	-	-	1.43	-	43.8	43.0	0.8	1.0				Uncertain
110	38132	LR0264	Waste Rock	Schist	110	111	-	-	0.13	-	4.0	62.9	-58.9	15.8				Non-Acid Forming
111	38137	LR0264	Waste Rock	Schist	115	116	-	-	0.53	-	16.2	45.8	-29.6	2.8				Non-Acid Forming
112	38161	LR0264	Waste Rock	Schist	137	138	-	-	0.17	-	5.2	52.9	-47.7	10.2				Non-Acid Forming
113	38356	LR0265	Waste Rock	Schist	41	42	-	-	0.33	-	10.1	46.3	-36.2	4.6				Non-Acid Forming
114	38377	LR0265	Waste Rock	Schist	61	62	-	-	0.39	-	11.9	62.8	-50.9	5.3				Non-Acid Forming
115	38389	LR0265	Waste Rock	Schist	72	73	-	-	0.31	-	9.5	53.7	-44.2	5.7				Non-Acid Forming
116	38399	LR0265	Waste Rock	Schist	82	83	-	-	1.61	-	49.3	58.1	-8.8	1.2				Non-Acid Forming
117	38424	LR0265	Waste Rock	Schist	105	106	-	-	0.46	-	14.1	69.7	-55.6	4.9				Non-Acid Forming
118	38590	LR0266	Waste Rock	Schist	49	50	-	-	0.24	-	7.4	30.4	-23.1	4.1				Non-Acid Forming
119	38619	LR0266	Waste Rock	Schist	77	78	-	-	0.22	-	6.7	44.0	-37.3	6.5				Non-Acid Forming
120	38667	LR0266	Waste Rock	Schist	122	123	-	-	0.82	-	25.1	52.7	-27.6	2.1				Non-Acid Forming
121	38843	LR0267	Waste Rock	Schist	69	70	-	-	0.41	-	12.6	47.8	-35.2	3.8				Non-Acid Forming
122	38858	LR0267	Waste Rock	Schist	84	85	-	-	0.31	-	9.5	48.9	-39.4	5.2				Non-Acid Forming
123	38894	LR0267	Waste Rock	Schist	118	119	-	-	1.10	-	33.7	45.9	-12.2	1.4				Non-Acid Forming
124	39287	LR0268	Waste Rock	Schist	53	54	-	-	0.43	-	13.2	49.3	-36.1	3.7				Non-Acid Forming
125	39351	LR0268	Waste Rock	Schist	114	115	-	-	0.79	-	24.2	74.6	-50.4	3.1				Non-Acid Forming
126	39403	LR0268	Waste Rock	Schist	163	164	-	-	0.92	-	28.2	68.6	-40.4	2.4				Non-Acid Forming
127	39407	LR0268	Waste Rock	Schist	167	168	-	-	0.39	-	11.9	34.6	-22.7	2.9				Non-Acid Forming
128	39337	LR0269	Waste Rock	Schist	101	102	-	-	1.82	-	55.7	36.7	19.0	0.7				Potentially Acid Forming
129	39429	LR0269	Waste Rock	Schist	188	189	-	-	0.88	-	27.0	56.6	-29.7	2.1				Non-Acid Forming
130	39784	LR0270	Waste Rock	Schist	97	98	-	-	0.20	-	6.1	47.2	-41.1	7.7				Non-Acid Forming
131	39854	LR0270	Waste Rock	Schist	164	165	-	-	0.77	-	23.6	40.5	-16.9	1.7				Non-Acid Forming
132	40610	LR0273	Waste Rock	Schist	63	64	-	-	0.75	-	23.0	68.2	-45.2	3.0				Non-Acid Forming
133	40685	LR0273	Waste Rock	Schist	134	135	-	-	2.60	-	79.6	53.2	26.4	0.7				Potentially Acid Forming
134	40876	LR0274	Waste Rock	Schist	74	75	-	-	0.44	-	13.5	122.0	-108.5	9.1				Non-Acid Forming
135	40902	LR0274	Waste Rock	Schist	98	99	-	-	0.04	-	1.2	46.3	-45.1	37.8				Non-Acid Forming (Barren)
136	40910	LR0274	Waste Rock	Schist	106	107	-	-	0.35	-	10.7	49.0	-38.3	4.6				Non-Acid Forming
137	40916	LR0274	Waste Rock	Schist	112	113	-	-	0.31	-	9.5	37.9	-28.4	4.0				Non-Acid Forming
138	41096	LR0274	Waste Rock	Schist	170	171	-	-	3.22	-	98.6	43.2	55.4	0.4				Potentially Acid Forming
139	40978	LR0274	Waste Rock	Schist	171	172	-	-	0.55	-	16.8	40.5	-23.7	2.4				Non-Acid Forming
140	41012	LR0274	Waste Rock	Schist	203	204	-	-	0.55	-	16.8	39.1	-22.3	2.3				Non-Acid Forming
141	41048	LR0274	Waste Rock	Schist	237	238	-	-	0.38	-	11.6	40.7	-29.1	3.5				Non-Acid Forming
142	41162	LR0275	Waste Rock	Schist	57	58	-	-	0.76	-	23.3	38.1	-14.8	1.6				Non-Acid Forming
143	42045	LR0279	Waste Rock	Schist	94	95	-	-	0.42	-	12.9	44.7	-31.8	3.5				Non-Acid Forming
144	42252	LR0280	Waste Rock	Schist	133	134	-	-	0.34	-	10.4	76.2	-65.8	7.3				Non-Acid Forming
145	42285	LR0280	Waste Rock	Schist	164	165	-	-	2.71	-	83.0	35.0	48.0	0.4				Potentially Acid Forming
146	42302	LR0280	Waste Rock	Schist	180	181	-	-	0.96	-	29.4	34.6	-5.2	1.2				Non-Acid Forming
147	42471	LR0281	Waste Rock	Schist	121	122	-	-	0.82	-	25.1	57.8	-32.7	2.3				Non-Acid Forming
148	42658	LR0282	Waste Rock	Schist	73	74	-	-	0.75	-	23.0	54.8	-31.8	2.4				Non-Acid Forming
149	42977	LR0284	Waste Rock	Schist	108	109	-	-	1.01	-	30.9	37.5	-6.6	1.2				Non-Acid Forming
150	43141	LR0285	Waste Rock	Schist	123	124	-	-	0.79	-	24.2	37.3	-13.1	1.5				Non-Acid Forming

Table B1: Acid Base Account Test Results

Sample Number	Strategic Sample ID	Drill Hole ID	Sample Type	Description	From	To	pH[1]	EC[1]	Total S[4]	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5)	NAG Capacity (pH 7)	Sample Classification[3]
					(m)			(µS/cm)	(%)	(%)	kg H_2SO_4/t					kg H_2SO_4/t		
151	43142	LR0285	Waste Rock	Schist	124	125	-	-	0.74	-	22.7	46.5	-23.8	2.1				Non-Acid Forming
152	43323	LR0286	Waste Rock	Schist	132	133	-	-	0.73	-	22.4	44.3	-21.9	2.0				Non-Acid Forming
153	256327	LRD0203	Waste Rock	Schist	43	44	-	-	0.16	-	4.9	72.2	-67.3	14.7				Non-Acid Forming
154	256328	LRD0203	Waste Rock	Schist	44	45	-	-	0.07	-	2.1	73.5	-71.4	34.3				Non-Acid Forming (Barren)
155	256387	LRD0203	Waste Rock	Schist	99	100	-	-	0.39	-	11.9	62.4	-50.5	5.2				Non-Acid Forming
156	256449	LRD0204	Waste Rock	Schist	54	55	-	-	0.08	-	2.5	90.4	-88.0	36.9				Non-Acid Forming (Barren)
157	256454	LRD0204	Waste Rock	Schist	59	60	-	-	0.20	-	6.1	61.8	-55.7	10.1				Non-Acid Forming
158	34256	LRD0218	Waste Rock	Schist	90.1	91.1	-	-	2.12	-	64.9	64.7	0.2	1.0				Uncertain
159	34257	LRD0218	Waste Rock	Schist	91.1	92	-	-	1.03	-	31.5	51.4	-19.9	1.6				Non-Acid Forming
160	260608	LRD0218	Waste Rock	Schist	102.5	103.3	-	-	2.71	-	83.0	62.5	20.5	0.8				Potentially Acid Forming
161	260614	LRD0218	Waste Rock	Schist	108.9	108.95	-	-	0.67	-	20.5	82.0	-61.5	4.0				Non-Acid Forming
162	260619	LRD0218	Waste Rock	Schist	113.9	114.4	-	-	1.11	-	34.0	104.0	-70.0	3.1				Non-Acid Forming
163	260631	LRD0218	Waste Rock	Schist	124.9	125.9	-	-	2.27	-	69.5	68.4	1.1	1.0				Uncertain
164	258629	LRD0223	Waste Rock	Schist	60	61	-	-	0.68	-	20.8	53.4	-32.6	2.6				Non-Acid Forming
165	260748	LD0236	Waste Rock	Stockwork (>25% veining) (NOT RC)	70	71	-	-	0.87	-	26.6	50.6	-24.0	1.9				Non-Acid Forming
166	253742	LR0182	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	43	44	-	-	1.41	-	43.2	55.2	-12.0	1.3				Non-Acid Forming
167	253970	LR0185	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	108	109	-	-	0.09	-	2.8	83.5	-80.7	30.3				Non-Acid Forming (Barren)
168	253978	LR0185	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	116	117	-	-	0.38	-	11.6	45.1	-33.5	3.9				Non-Acid Forming
169	253990	LR0185	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	127	128	-	-	0.28	-	8.6	55.9	-47.3	6.5				Non-Acid Forming
170	253991	LR0185	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	128	129	-	-	0.27	-	8.3	73.4	-65.1	8.9				Non-Acid Forming
171	254009	LR0185	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	145	146	-	-	0.40	-	12.3	72.7	-60.5	5.9				Non-Acid Forming
172	254015	LR0185	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	151	152	-	-	0.09	-	2.8	53.5	-50.7	19.4				Non-Acid Forming (Barren)
173	254187	LR0186	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	91	92	-	-	0.38	-	11.6	63.2	-51.6	5.4				Non-Acid Forming
174	254206	LR0186	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	108	109	-	-	0.71	-	21.7	51.6	-29.9	2.4				Non-Acid Forming
175	254207	LR0186	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	109	110	-	-	1.26	-	38.6	48.1	-9.5	1.2				Non-Acid Forming
176	254208	LR0186	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	110	111	-	-	0.62	-	19.0	61.3	-42.3	3.2				Non-Acid Forming
177	254235	LR0186	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	136	137	-	-	0.46	-	14.1	56.1	-42.0	4.0				Non-Acid Forming
178	254242	LR0186	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	142	143	-	-	2.81	-	86.1	71.1	15.0	0.8				Potentially Acid Forming
179	254401	LR0187	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	95	96	-	-	0.18	-	5.5	56.2	-50.7	10.2				Non-Acid Forming
180	254416	LR0187	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	110	111	-	-	0.18	-	5.5	54.7	-49.2	9.9				Non-Acid Forming
181	254761	LR0190	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	76	77	-	-	0.02	-	0.6	55.5	-54.9	90.6				Non-Acid Forming (Barren)
182	255049	LR0192	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	93	94	-	-	0.16	-	4.9	48.2	-43.3	9.8				Non-Acid Forming
183	255405	LR0196	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	65	66	-	-	0.08	-	2.5	51.6	-49.2	21.1				Non-Acid Forming (Barren)
184	257903	LR0216	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	63	64	-	-	0.51	-	15.6	52.6	-37.0	3.4				Non-Acid Forming
185	258165	LR0219	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	46	47	-	-	1.96	-	60.0	106.0	-46.0	1.8				Non-Acid Forming
186	258205	LR0219	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	84	85	-	-	0.32	-	9.8	47.3	-37.5	4.8				Non-Acid Forming
187	258367	LR0220	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	82	83	-	-	0.33	-	10.1	52.1	-42.0	5.2				Non-Acid Forming
188	259255	LR0228	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	33	34	-	-	0.52	-	15.9	60.1	-44.2	3.8				Non-Acid Forming
189	259604	LR0231	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	141	142	-	-	0.91	-	27.9	42.0	-14.1	1.5				Non-Acid Forming
190	259935	LR0233	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	81	82	-	-	0.12	-	3.7	69.7	-66.0	19.0				Non-Acid Forming
191	42256	LR0280	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	137	138	-	-	1.22	-	37.4	39.0	-1.6	1.0				Uncertain
192	260247	LRD0203	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	134	134.38	-	-	0.74	-	22.7	61.5	-38.8	2.7				Non-Acid Forming
193	260174	LRD0204	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	92.58	92.7	-	-	0.46	-	14.1	100.0	-85.9	7.1				Non-Acid Forming
194	260605	LRD0218	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	100	100.5	-	-	0.92	-	28.2	72.0	-43.8	2.6				Non-Acid Forming
195	258667	LRD0223	Waste Rock	Vein Breccia w/ >90% vein clasts (NOT RC)	96	97	-	-	0.65	-	19.9	53.7	-33.8	2.7				Non-Acid Forming
196	258671	LRD0223	Waste Rock	Vein Breccia w/ >90% vein clasts (NOT RC)	100	101	-	-	0.37	-	11.3	66.4	-55.1	5.9				Non-Acid Forming

Table B1: Acid Base Account Test Results

Sample Number	Strategic Sample ID	Drill Hole ID	Sample Type	Description	From (m)	To (m)	pH[1]	EC[1] (µS/cm)	Total S[4] (%)	Scr[2] (%)	MPA[2] kg H_2SO_4/t	ANC[2] kg H_2SO_4/t	NAPP[2] kg H_2SO_4/t	ANC: MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5) kg H_2SO_4/t	NAG Capacity (pH 7) kg H_2SO_4/t	Sample Classification[3]
14 Waste Rock Drill Core Samples from the BVS Pit																		
197	RGS01 LD0317 39 45	LD0317	Waste Rock	Schist	39	45	9.0	352	0.14	0.129	4.0	50.0	-46.0	12.7	9.9	<0.1	<0.1	Non-Acid Forming
198	RGS02 LD0317 53.97 58.69	LD0317	Waste Rock	Amphibolite	54.0	58.7	9.0	272	0.32	0.301	9.2	119.0	-109.8	12.9	10.4	<0.1	<0.1	Non-Acid Forming
199	RGS04 LD0317 111 117.2	LD0317	Waste Rock	Schist	111	117.2	9.2	262	0.68	-	20.8	58.0	-37.2	2.8	-	-	-	Non-Acid Forming
200	RGS05 LD0318 169 175	LD0318	Waste Rock	Schist	169	175	9.6	157	0.20	-	6.1	33.9	-27.8	5.5	-	-	-	Non-Acid Forming
201	RGS06 LD0319 49 54	LD0319	Waste Rock	Psammite	49	54	9.6	204	0.06	0.055	1.8	75.2	-73.4	40.9	9.9	<0.1	<0.1	Non-Acid Forming (Barren)
202	RGS07 LD0320 43.5 49.59	LD0320	Waste Rock	Schist	44	50	9.5	154	0.18	-	5.5	15.5	-10.0	2.8	-	-	-	Non-Acid Forming
203	RGS08 LD0320 170 176.06	LD0320	Waste Rock	Tectonic Breccia w/ vein and wallrock clasts	170	176	8.8	593	1.11	0.802	24.6	106.0	-81.4	4.3	8.9	<0.1	<0.1	Non-Acid Forming
204	RGS09 LD0321 38.73 46	LD0321	Waste Rock	Psammite	39	46	9.4	214	0.43	0.371	11.4	38.2	-26.8	3.4	9.3	<0.1	<0.1	Non-Acid Forming
205	RGS10 LD0317 226 231.42	LD0317	Waste Rock	Schist	226	231	9.5	200	0.08	-	2.5	49.5	-47.1	20.2	-	-	-	Non-Acid Forming (Barren)
206	RGS11 LD0318 42.32 47	LD0318	Waste Rock	Schist	42	47	9.2	258	0.72	0.554	17.0	36.7	-19.7	2.2	9.3	<0.1	<0.1	Non-Acid Forming
207	RGS12 LD0318 93.7 96.58	LD0318	Waste Rock	Schist	94	97	8.9	415	1.79	1.360	41.7	43.4	-1.7	1.0	8.9	<0.1	<0.1	Uncertain
208	RGS13 LD0320 107.51 113	LD0320	Waste Rock	Schist	108	113	9.5	166	0.06	-	1.8	35.1	-33.3	19.1	-	-	-	Non-Acid Forming (Barren)
209	RGS14 LD0321 179 185.69	LD0321	Waste Rock	Schist	179	186	9.4	188	0.21	-	6.4	18.0	-11.6	2.8	-	-	-	Non-Acid Forming
210	RGS16 LD0324 176.43 180.64	LD0324	Waste Rock	Schist	176	181	9.5	209	0.09	0.037	1.1	55.6	-54.5	49.1	10.2	<0.1	<0.1	Non-Acid Forming (Barren)
18 Waste Rock Drill Core Samples from BV1 and BV2 Pits																		
211	521323 LR0428 3	-	Waste Rock BV2	Oxidised Granite, unmineralised	3.0	4.0	9.7	145	0.02		0.6	8.3	-7.7	13.6				Non-Acid Forming (Barren)
212	521336 LR0428 16	-	Waste Rock BV2	Oxidised Granite within alteration halo, unmineralised	16.0	17.0	9.1	69	0.005		0.2	9.3	-9.1	60.7				Non-Acid Forming (Barren)
213	521362 LR0428 40	-	Waste Rock BV2	Fresh Granite with Schist bands, unmineralised (FW of vein)	40.0	41.0	9.7	70	0.13	0.119	3.6	23.3	-19.7	6.4	10.2	<0.1	<0.1	Non-Acid Forming
214	521597 LR0434 6	-	Waste Rock BV2	Oxidised Granite near top of the hole	6.0	7.0	9.4	236	0.03		0.9	8.0	-7.1	8.7				Non-Acid Forming (Barren)
215	521621 LR0434 28	-	Waste Rock BV2	Fresh sericite altered Granite with minor veining, potential mineralisation	28.0	29.0	9.7	81	0.42	0.400	12.3	59.0	-46.8	4.8	10.6	<0.1	<0.1	Non-Acid Forming
216	521638 LR0434 45	-	Waste Rock BV2	Fresh, unaltered Granite (FW of vein)	45.0	46.0	9.8	71	0.06		1.8	22.3	-20.5	12.1				Non-Acid Forming (Barren)
217	521646 LR0434 52	-	Waste Rock BV2	Secondary zone of alteration, unlikely economic, potential mineralisation with quartz and sericite	52.0	53.0	9.8	70	0.11	0.104	3.2	25.3	-22.1	7.9	10.5	<0.1	<0.1	Non-Acid Forming (Barren)
218	518397 LR0411R 2	-	Waste Rock BV1	Two samples of unconformatable Jurassic quartzose sandstone and conglomerate that forms part of the overburden on some holes, FeOx weathering.	2.0	3.0	5.6	12	0.005		0.2	3.1	-2.9	20.2				Non-Acid Forming (Barren)
219	518398 LR0411R 3	-	Waste Rock BV1		3.0	4.0	5.6	12	0.005		0.2	2.1	-1.9	13.7				Non-Acid Forming (Barren)
220	518417 LR0411R 21	-	Waste Rock BV1	Oxidised and altered micaceous Schist	21.0	22.0	8.1	19	0.005		0.2	7.1	-6.9	46.4				Non-Acid Forming (Barren)
221	518430 LR0411R 33	-	Waste Rock BV1	Fresh Granite with 10-25% Schist bands, weak-moderate sericite alteration	33.0	34.0	9.5	65	0.07		2.1	12.3	-10.2	5.7				Non-Acid Forming (Barren)
222	518445 LR0411R 47	-	Waste Rock BV1	Granite within alteration zone associated with ore zone	47.0	48.0	9.6	72	0.04		1.2	19.9	-18.7	16.2				Non-Acid Forming (Barren)
223	518463 LR0411R 64	-	Waste Rock BV1	Undifferentiated mafic dike (likely dolerite), chlorite and carbonate altered.	64.0	65.0	9.5	68	0.20	0.184	5.6	180.0	-174.4	31.9	11.1	<0.1	<0.1	Non-Acid Forming
224	518608 LR0417 6	-	Waste Rock BV1	Oxidised sandstone near the base of the unconformity	6.0	7.0	6.3	19	0.01		0.3	1.8	-1.5	5.9				Non-Acid Forming (Barren)
225	518622 LR0417 19	-	Waste Rock BV1	Massive partially oxidised granite	19.0	20.0	8.4	21	0.005		0.2	9.7	-9.5	63.3				Non-Acid Forming (Barren)
226	518652 LR0417 48	-	Waste Rock BV1	Granite/Granofels within alteration zone associated with ore zone, weak sericite alt	48.0	49.0	9.6	66	0.06		1.8	23.6	-21.8	12.8				Non-Acid Forming (Barren)
227	518669 LR0417 64	-	Waste Rock BV1	Fresh Granite with 10-25% Schist bands, moderate sericite alteration next to ore zone	64.0	65.0	9.5	71	0.25	0.214	6.6	41.8	-35.2	6.4	10.4	<0.1	<0.1	Non-Acid Forming
228	518684 LR0417 78	-	Waste Rock BV1	Granite/Granofels within alteration zone associated with ore zone, weak sericite alt	78.0	79.0	9.7	66	0.10		3.1	46.0	-42.9	15.0				Non-Acid Forming (Barren)

Table B1: Acid Base Account Test Results

Sample Number	Strategic Sample ID	Drill Hole ID	Sample Type	Description	From (m)	To (m)	pH[1]	EC[1] (µS/cm)	Total S[4] (%)	Scr[2] (%)	MPA[2] kg H_2SO_4/t	ANC[2] kg H_2SO_4/t	NAPP[2] kg H_2SO_4/t	ANC:MPA Ratio	NAG_{pH}	NAG Capacity (pH 4.5) kg H_2SO_4/t	NAG Capacity (pH 7) kg H_2SO_4/t	Sample Classification[3]
3 Tailings Samples																		
1	Strategic Woolgar Tailings	-	Tailings	Tailings Sample 1	NA		9.0	132	0.68	0.554	17.0	26.8	-9.8	1.6	8.2	<0.1	<0.1	Non-Acid Forming
2	PSM Woolgar Gold-106 slurry	-	Tailings	Tailings Sample 2	NA		8.7	1,040	1.58	1.250	38.3	23.6	14.7	0.6	2.6	14.4	18.2	Potentially Acid Forming
3	PSM Woolgar Gold-106 cakes	-	Tailings	Tailings Sample 3	NA		8.8	1,680	1.58	1.140	34.9	23.4	11.5	0.7	2.7	11.2	16.0	Potentially Acid Forming
3 Spent Heap Leach Residue Samples																		
1	HLBRT-1_25mm	-	Heap Leach Residue	Spent Heap Leach Residue Sample 1	NA		8.8	267	1.11	0.752	23.0	11.4	11.6	0.5	2.6	13.6	17.1	Potentially Acid Forming
2	HLBRT-2_12.5mm	-	Heap Leach Residue	Spent Heap Leach Residue Sample 2	NA		9.1	158	0.78	0.629	19.3	13.7	5.6	0.7	3.0	6.7	10.0	Potentially Acid Forming-LC
2 Ore Samples																		
1	1046C LD0324 34-58.6	-	Low Grade Ore	Low Grade Ore	34.0	58.6	8.0	187	0.80	0.658	20.2	35.6	-15.4	1.8	8.1	<0.1	<0.1	Non-Acid Forming
2	1046G LD0324	-	High Grade Ore	High Grade Ore	103.4	139.3	7.0	799	1.99	1.660	50.8	18.9	31.9	0.4	2.6	30.5	35.8	Potentially Acid Forming

Notes:

1. Current pH and EC are provided for 1:5 sample:water extracts.
2. Scr = Chromium Reducible Sulfur; MPA = Maximum Potential Acidity; ANC = Acid Neutralising Capacity; NAPP = Net Acid Producing Potential and NAG = Net Acid Generation.
3. Sample classification criteria detail provided in report text.
4. Where total sulfur results are less than the laboratory LOR (0.01 %S), a value of half of the LOR is used.

Table B2: Composite Waste Rock Samples from BV1 and BV2 Pits prepared for Multi-Element Test Program

Sample Number	Strategic Sample ID	Sample Type	Description	From	To	Sample Classification	RGS Composite Sample ID
				(m)			
211	521323 LR0428 3	Waste Rock BV2	Oxidised Granite, unmineralised	3.0	4.0	Non-Acid Forming (Barren)	2021057_C003
212	521336 LR0428 16	Waste Rock BV2	Oxidised Granite within alteration halo, unmineralised	16.0	17.0	Non-Acid Forming (Barren)	
214	521597 LR0434 6	Waste Rock BV2	Oxidised Granite near top of the hole	6.0	7.0	Non-Acid Forming (Barren)	
213	521362 LR0428 40	Waste Rock BV2	Fresh Granite with Schist bands, unmineralised (FW of vein)	40.0	41.0	Non-Acid Forming	2021057_C004
215	521621 LR0434 28	Waste Rock BV2	Fresh sericite altered Granite with minor veining, potential mineralisation	28.0	29.0	Non-Acid Forming	
216	521638 LR0434 45	Waste Rock BV2	Fresh, unaltered Granite (FW of vein)	45.0	46.0	Non-Acid Forming (Barren)	
217	521646 LR0434 52	Waste Rock BV2	Secondary zone of alteration, unlikely economic, potential mineralisation with quartz and sericite	52.0	53.0	Non-Acid Forming (Barren)	
218	518397 LR0411R 2	Waste Rock BV1	Two samples of unconformatable Jurassic quartzose sandstone and conglomerate that forms part of the overburden on some holes, FeOx weathering.	2.0	3.0	Non-Acid Forming (Barren)	2021057_C005
219	518398 LR0411R 3	Waste Rock BV1		3.0	4.0	Non-Acid Forming (Barren)	
224	518608 LR0417 6	Waste Rock BV1	Oxidised sandstone near the base of the unconformity	6.0	7.0	Non-Acid Forming (Barren)	
225	518622 LR0417 19	Waste Rock BV1	Massive partially oxidised granite	19.0	20.0	Non-Acid Forming (Barren)	
220	518417 LR0411R 21	Waste Rock BV1	Oxidised and altered micaceous Schist	21.0	22.0	Non-Acid Forming (Barren)	2021057_C006
221	518430 LR0411R 33	Waste Rock BV1	Fresh Granite with 10-25% Schist bands, weak-moderate sericite alteration	33.0	34.0	Non-Acid Forming (Barren)	
222	518445 LR0411R 47	Waste Rock BV1	Granite within alteration zone associated with ore zone	47.0	48.0	Non-Acid Forming (Barren)	
223	518463 LR0411R 64	Waste Rock BV1	Undifferentiated mafic dike (likely dolerite), chlorite and carbonate altered.	64.0	65.0	Non-Acid Forming	
226	518652 LR0417 48	Waste Rock BV1	Granite/Granofels within alteration zone associated with ore zone, weak sericite alt	48.0	49.0	Non-Acid Forming (Barren)	
227	518669 LR0417 64	Waste Rock BV1	Fresh Granite with 10-25% Schist bands, moderate sericite alteration next to ore zone	64.0	65.0	Non-Acid Forming	
228	518684 LR0417 78	Waste Rock BV1	Granite/Granofels within alteration zone associated with ore zone, weak sericite alt	78.0	79.0	Non-Acid Forming (Barren)	

Table B3: Samples used for KLC test program

Sample Number	Strategic Sample ID	Sample Type	Description	From (m)	To (m)	Sample Classification	KLC ID	KLC Details
197	RGS01 LD0317 39 45	Waste Rock	Schist	39	45	Non-Acid Forming	KLC 1	10 kg of material. Free leach large column.
198	RGS02 LD0317 53.97 58.69	Waste Rock	Amphibolite	54	58.7	Non-Acid Forming	KLC 2	10 kg of material. Free leach large column.
201	RGS06 LD0319 49 54	Waste Rock	Psammite	49	54	Non-Acid Forming (Barren)	KLC 3	10 kg of material. Free leach large column.
203	RGS08 LD0320 170 176.06	Waste Rock	Tectonic Breccia w/ vein and wallrock clasts	170	176	Non-Acid Forming	KLC 4	10 kg of material. Free leach large column.
204	RGS09 LD0321 38.73 46	Waste Rock	Psammite	39	46	Non-Acid Forming	KLC 5	10 kg of material. Free leach large column.
206	RGS11 LD0318 42.32 47	Waste Rock	Schist	42	47	Non-Acid Forming	KLC 6	9 kg of material. Free leach large column.
207	RGS12 LD0318 93.7 96.58	Waste Rock	Schist	94	97	Uncertain	KLC 7	2.5 kg of material. Free leach large column.
210	RGS16 LD0324 176.43 180.64	Waste Rock	Schist	176	181	Non-Acid Forming (Barren)	KLC 8	10 kg of material. Free leach large column.
1	Tailings	Tailings	Tailings Sample 1	NA		Non-Acid Forming	KLC 9	5 kg of material. Free leach large column.
1	1046C LD0324 34-58.6	Low Grade Ore	Low Grade Ore	34	58.6	Uncertain	KLC 10	11 kg of material. Free leach large column.
1	HLBRT-1_25mm	Heap leach residue	Spent Heap leach residue Sample 1	NA		Potentially Acid Forming	KLC 11	1 kg of material. Free leach medium column.
2	HLBRT-2_12.5mm	Heap leach residue	Spent Heap leach residue Sample 2	NA		Potentially Acid Forming	KLC 12	1 kg of material. Saturated medium column.
211	521323 LR0428 3	Waste Rock BV2	Oxidised Granite, unmineralised	3.0	4.0	Non-Acid Forming (Barren)	KLC 13	10 kg of material. Free leach large column.
212	521336 LR0428 16	Waste Rock BV2	Oxidised Granite within alteration halo, unmineralised	16.0	17.0	Non-Acid Forming (Barren)		
213	521362 LR0428 40	Waste Rock BV2	Fresh Granite with Schist bands, unmineralised (FW of vein)	40.0	41.0	Non-Acid Forming		
214	521597 LR0434 6	Waste Rock BV2	Oxidised Granite near top of the hole	6.0	7.0	Non-Acid Forming (Barren)		
215	521621 LR0434 28	Waste Rock BV2	Fresh sericite altered Granite with minor veining, potential mineralisation	28.0	29.0	Non-Acid Forming		
216	521638 LR0434 45	Waste Rock BV2	Fresh, unaltered Granite (FW of vein)	45.0	46.0	Non-Acid Forming (Barren)		
217	521646 LR0434 52	Waste Rock BV2	Secondary zone of alteration, unlikely economic, potential mineralisation with quartz and sericite	52.0	53.0	Non-Acid Forming (Barren)		
218	518397 LR0411R 2	Waste Rock BV1	Two samples of unconformatable Jurassic quartzose sandstone and conglomerate that forms part of the overburden on some holes, FeOx weathering.	2.0	3.0	Non-Acid Forming (Barren)	KLC 14	10 kg of material. Free leach large column.
219	518398 LR0411R 3	Waste Rock BV1		3.0	4.0	Non-Acid Forming (Barren)		
220	518417 LR0411R 21	Waste Rock BV1	Oxidised and altered micaceous Schist	21.0	22.0	Non-Acid Forming (Barren)		
221	518430 LR0411R 33	Waste Rock BV1	Fresh Granite with 10-25% Schist bands, weak-moderate sericite alteration	33.0	34.0	Non-Acid Forming (Barren)		
222	518445 LR0411R 47	Waste Rock BV1	Granite within alteration zone associated with ore zone	47.0	48.0	Non-Acid Forming (Barren)		
223	518463 LR0411R 64	Waste Rock BV1	Undifferentiated mafic dike (likely dolerite), chlorite and carbonate altered.	64.0	65.0	Non-Acid Forming		
224	518608 LR0417 6	Waste Rock BV1	Oxidised sandstone near the base of the unconformity	6.0	7.0	Non-Acid Forming (Barren)		
225	518622 LR0417 19	Waste Rock BV1	Massive partially oxidised granite	19.0	20.0	Non-Acid Forming (Barren)		
226	518652 LR0417 48	Waste Rock BV1	Granite/Granofels within alteration zone associated with ore zone, weak sericite alt	48.0	49.0	Non-Acid Forming (Barren)		
227	518669 LR0417 64	Waste Rock BV1	Fresh Granite with 10-25% Schist bands, moderate sericite alteration next to ore zone	64.0	65.0	Non-Acid Forming		
228	518684 LR0417 78	Waste Rock BV1	Granite/Granofels within alteration zone associated with ore zone, weak sericite alteration	78.0	79.0	Non-Acid Forming (Barren)		

Table B3: Samples used for KLC test program

Sample Number	Strategic Sample ID	Sample Type	Description	From (m)	To (m)	Sample Classification	KLC ID	KLC Details
2	1046G LD0324	High-Grade Ore	High-Grade Ore	103.4	139.3	Potentially Acid Forming	KLC 15	2 kg of material. Free leach medium column.
158	34256	Waste Rock	Schist	90.1	91.1	Uncertain		
159	34257	Waste Rock	Schist	91.1	92	Non-Acid Forming		
107	37851	Waste Rock	Schist	168	169	Non-Acid Forming		
102	36446	Waste Rock	Schist	123	124	Potentially Acid Forming		
128	39337	Waste Rock	Schist	101	102	Potentially Acid Forming		
131	39854	Waste Rock	Schist	164	165	Non-Acid Forming		
123	38894	Waste Rock	Schist	118	119	Non-Acid Forming		
109	38114	Waste Rock	Schist	93	94	Uncertain		
116	38399	Waste Rock	Schist	82	83	Non-Acid Forming		
160	260608	Waste Rock	Schist	102.5	103.3	Potentially Acid Forming		
163	260631	Waste Rock	Schist	124.9	125.9	Uncertain		
28	260712	Waste Rock	Schist	36	37	Non-Acid Forming		
37	258238	Waste Rock	Schist	116	117	Potentially Acid Forming		
189	259604	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	141	142	Non-Acid Forming		1 kg of material (PAF/NAF BVS waste rock). Free leach medium column.
40	258374	Waste Rock	Schist	89	90	Non-Acid Forming	KLC 16	
36	258236	Waste Rock	Schist	114	115	Potentially Acid Forming		1.5 kg of material (PAF/NAF BVS waste rock + spent heap leach residue (Sample 1). Free leach medium column.
185	258165	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	46	47	Non-Acid Forming	KLC 17	
175	254207	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	109	110	Non-Acid Forming		
32	257919	Waste Rock	Schist	79	80	Non-Acid Forming		
5	257926	Waste Rock	Diorite	85	86	Non-Acid Forming		
6	257928	Waste Rock	Diorite	87	88	Non-Acid Forming		
30	255602	Waste Rock	Schist	134	135	Non-Acid Forming		
166	253742	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	43	44	Non-Acid Forming		
178	254242	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	142	143	Potentially Acid Forming		
152	43323	Waste Rock	Schist	132	133	Non-Acid Forming		
150	43141	Waste Rock	Schist	123	124	Non-Acid Forming		
21	42716	Waste Rock	Dolerite	128	129	Non-Acid Forming		
191	42256	Waste Rock	Vein %50-90% (>wallrock) (RC ONLY)	137	138	Uncertain		
146	42302	Waste Rock	Schist	180	181	Non-Acid Forming		
142	41162	Waste Rock	Schist	57	58	Non-Acid Forming		
138	41096	Waste Rock	Schist	170	171	Potentially Acid Forming		

Notes:

KLC = Kinetic leach column.

Table B4: Multi-Element Test Results for Waste Rock

		RGS Sample ID >		2021057_C003	2021057_C004	2021057_C005	2021057_C006	147	65	115	90	131	61	157	172	150	1	75	4	3	5	82	15	198	123	21	11	55
		Strategic Sample ID-->		-	-	-	-	32390	32398	32434	32450	32473	32517	32523	32706	32842	33143	33266	33567	33571	33573	33863	33967	34109	34119	34210	34214	34256
		Sample Digestion Method-->		2-acid	2-acid	2-acid	2-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Waste Rock BV2	Waste Rock BV2	Waste Rock BV1	Waste Rock BV1	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS
Major Elements																												
Aluminium (Al)	%	0.01	-	2.09	1.98	0.33	1.62	2.26	1.47	1.91	2.68	1.00	0.73	0.65	1.38	2.19	4.45	1.10	4.28	4.11	3.89	2.17	1.91	2.00	1.61	2.29	3.83	0.96
Calcium (Ca)	%	0.01		0.15	1.03	0.03	0.7	1.20	1.67	1.33	1.50	1.27	1.73	1.18	1.12	1.19	5.52	1.58	4.98	5.15	4.59	1.54	3.19	1.00	1.30	2.78	3.92	1.80
Iron (Fe)	%	0.01	-	4.33	4.11	0.79	3.35	3.86	3.47	3.43	4.88	1.62	3.11	2.72	3.51	4.00	9.38	3.42	8.25	8.67	8.26	3.94	9.08	3.82	3.04	5.38	9.61	3.55
Potassium (K)	%	0.01	-	0.83	0.7	0.07	0.31	0.82	0.55	0.43	0.89	0.36	0.50	0.53	0.48	0.45	0.24	0.40	0.23	0.25	0.29	0.79	0.51	0.38	0.37	0.20	0.21	0.47
Magnesium (Mg)	%	0.01	-	0.99	1.13	0.07	0.79	1.15	0.93	1.04	1.68	0.40	0.69	0.51	0.92	0.95	3.42	0.78	2.92	3.09	3.05	1.15	2.34	1.11	0.83	1.37	2.66	0.64
Sodium (Na)	%	0.01	-	0.09	0.03	0.01	0.03	0.07	0.03	0.06	0.05	0.05	0.02	0.01	0.04	0.03	0.04	0.02	0.01	0.04	0.07	0.07	0.04	0.04	0.03	0.19	0.10	0.03
Trace Elements																												
Antimony (Sb)	mg/kg	0.01	-	0.2	0.4	0.1	5.3	<2	2	12	2	<2	2	4	3	<2	<2	<2	<2	<2	<2	<2	4	<2	<2	<2	<2	6
Arsenic (As)	mg/kg	0.1	300	4	38	1	48	2	14	3	9	4	22	39	22	3	<2	21	<2	<2	<2	2	7	14	2	<2	<2	60
Boron (B)	mg/kg	10	20,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10
Cadmium (Cd)	mg/kg	0.01	100	0.26	0.35	0.02	0.1	<0.5	<0.5	<0.5	<0.5	0.7	0.9	1.1	<0.5	4.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	0.6	16
Chromium (Cr) - hexavalent	mg/kg	1	240	41	46	12	33	47	28	40	48	21	9	12	29	36	77	17	64	83	70	61	32	42	25	27	54	9
Cobalt (Co)	mg/kg	0.1	300	19.2	14.5	2.3	10.6	14	13	11	14	4	11	11	12	21	49	13	38	42	43	12	30	15	12	25	41	17
Copper (Cu)	mg/kg	0.2	20,000	47.5	25	4.1	12.6	29	30	21	15	7	22	38	23	56	38	26	12	21	25	17	49	32	30	175	143	61
Lead (Pb)	mg/kg	0.2	600	18	34	4	17	10	32	36	28	44	37	38	18	268	18	49	28	8	19	20	15	20	45	7	46	1,180
Manganese (Mn)	mg/kg	5	9,000	562	482	179	488	455	586	416	460	363	1,260	891	444	630	1,620	713	1,330	1,290	1,250	448	1,280	391	426	847	1,500	758
Mercury (Hg)	mg/kg	0.01	400	0.1	0.11	<0.01	0.09	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	1	1	<1	1	<1	<1	1	<1	<1	<1
Molybdenum (Mo)	mg/kg	0.05	-	1.39	1.52	0.96	3.3	1	<1	2	1	1	<1	2	<1	1	1	1	<1	<1	<1	1	2	1	2	1	<1	<1
Nickel (Ni)	mg/kg	0.2	800	36.3	31.7	6.8	22	36	34	40	46	15	23	25	40	31	26	32	24	26	24	37	40	37	31	29	50	22
Selenium (Se)	mg/kg	0.2	700	0.3	0.2	<0.2	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium (Th)	mg/kg	0.2	-	14.2	13.7	3.5	15.9	20	20	20	<20	<20	<20	<20	20	20	<20	20	<20	<20	<20	<20	<20	20	<20	<20	<20	<20
Uranium (U)	mg/kg	0.05	-	2.33	2.93	0.39	2.59	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vanadium (V)	mg/kg	1	-	41	40	7	32	42	23	37	134	11	6	6	23	32	155	13	104	163	148	81	139	35	22	166	287	12
Zinc (Zn)	mg/kg	2	30,000	166	232	11	62	56	65	114	101	65	100	274	210	245	155	66	159	137	130	65	84	75	91	82	201	1,040

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreational use.

Table B4: Multi-Element Test Results for Waste Rock

		RGS Sample ID >	140	14	83	122	128	196	159	185	88	113	25	197	36	2	108	132	84	109	189	121	56	141	127	171	62	160	166	95	170
		Strategic Sample ID-->	34257	35085	35396	35417	35468	35675	35833	36264	36387	36388	36431	36446	37556	37769	37822	37823	37843	37851	37861	38114	38132	38137	38161	38356	38377	38389	38399	38424	38590
		Sample Digestion Method-->	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS
Major Elements																															
Aluminium (Al)	%	0.01	-	2.57	3.91	2.08	2.10	1.23	0.98	1.51	2.58	1.18	1.49	2.48	0.59	0.85	4.93	0.39	0.87	1.97	1.49	2.10	0.46	1.85	2.07	1.08	2.11	0.85	0.90	1.17	0.61	2.63
Calcium (Ca)	%	0.01		1.23	3.40	1.54	1.31	1.29	1.02	1.16	1.07	1.52	1.34	2.59	1.01	2.07	5.24	1.36	1.27	1.54	1.35	1.04	1.32	1.75	1.23	1.29	1.12	1.70	1.16	1.13	1.44	1.12
Iron (Fe)	%	0.01	-	4.94	11.70	3.59	3.50	1.86	2.41	4.53	2.78	1.77	2.90	7.57	2.79	2.86	9.09	0.63	1.34	2.62	3.58	4.19	2.69	3.88	4.53	2.98	3.95	3.08	4.14	5.29	3.42	5.33
Potassium (K)	%	0.01	-	0.46	0.59	0.44	0.48	0.36	0.27	0.52	1.40	0.36	0.62	0.59	0.45	0.42	0.55	0.22	0.27	0.64	0.45	0.42	0.36	0.61	0.37	0.31	0.63	0.32	0.39	0.44	0.40	0.63
Magnesium (Mg)	%	0.01	-	1.26	2.07	1.05	1.10	0.49	0.60	0.99	0.63	0.72	1.05	1.78	0.32	0.79	3.56	0.08	0.31	0.69	0.76	1.20	0.41	1.18	1.22	0.84	0.99	0.70	0.86	1.00	0.74	1.21
Sodium (Na)	%	0.01	-	0.05	0.08	0.10	0.07	0.08	0.02	0.02	0.12	0.06	0.08	0.01	0.01	0.04	0.03	0.04	0.06	0.08	0.03	0.03	<0.01	0.03	0.05	0.03	0.06	0.03	0.03	0.01	0.03	0.10
Trace Elements																															
Antimony (Sb)	mg/kg	0.01	-	<2	<2	2	<2	<2	<2	<2	<2	<2	2	3	6	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Arsenic (As)	mg/kg	0.1	300	8	3	<2	<2	<2	2	17	21	<2	2	8	65	16	5	<2	<2	4	15	6	67	15	72	5	6	11	15	15	19	6
Boron (B)	mg/kg	10	20,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium (Cd)	mg/kg	0.01	100	<0.5	<0.5	<0.5	<0.5	<0.5	7.8	6.7	3.5	<0.5	<0.5	0.8	10.4	0.8	<0.5	0.8	<0.5	2.2	<0.5	1.3	<0.5	<0.5	<0.5	0.5	<0.5	1.0	1.0	1.4	0.8	<0.5
Chromium (Cr) - hexavalent	mg/kg	1	240	43	31	50	44	30	24	29	29	51	78	25	10	16	81	15	29	31	32	41	15	32	50	20	40	12	15	22	13	62
Cobalt (Co)	mg/kg	0.1	300	15	42	8	8	11	8	14	6	9	13	26	8	8	45	1	3	8	17	12	13	11	22	7	10	9	13	19	9	13
Copper (Cu)	mg/kg	0.2	20,000	9	169	11	3	45	31	40	22	20	76	38	54	7	21	3	2	25	51	14	12	4	68	6	20	23	26	81	15	24
Lead (Pb)	mg/kg	0.2	600	12	2	42	27	41	466	470	156	9	6	59	469	38	37	51	22	139	54	83	30	23	13	15	27	29	34	46	34	54
Manganese (Mn)	mg/kg	5	9,000	541	2,860	478	391	322	362	890	880	473	551	1,260	1,010	583	1,510	182	217	537	482	763	972	743	421	589	505	740	773	1,150	917	638
Mercury (Hg)	mg/kg	0.01	400	<1	<1	<1	<1	1	<1	1	<1	1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1
Molybdenum (Mo)	mg/kg	0.05	-	<1	<1	2	1	2	2	2	1	4	8	1	2	1	1	4	3	2	2	1	1	1	7	<1	1	2	2	1	1	6
Nickel (Ni)	mg/kg	0.2	800	27	47	24	28	36	20	31	15	27	48	31	21	17	33	6	12	28	41	34	31	33	53	18	32	21	30	41	22	39
Selenium (Se)	mg/kg	0.2	700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium (Th)	mg/kg	0.2	-	<20	<20	<20	20	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	20	<20	20	20	<20	<20	<20	20	20	<20	20
Uranium (U)	mg/kg	0.05	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Vanadium (V)	mg/kg	1	-	41	273	42	41	16	13	18	21	28	41	96	5	12	151	4	14	28	23	32	5	31	58	17	33	9	12	16	7	41
Zinc (Zn)	mg/kg	2	30,000	87	106	80	77	54	271	412	264	82	71	144	533	94	208	68	177	166	80	165	36	73	63	60	81	118	131	190	67	157

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreational use.

Table B4: Multi-Element Test Results for Waste Rock

		RGS Sample ID >	139	117	10	162	144	158	12	151	148	38	47	195	136	94	44	191	73	137	17	6	9	7	149	100	180	107	176	116	146
		Strategic Sample ID-->	38619	38667	38826	38843	38858	38894	39278	39287	39337	39351	39403	39407	39419	39429	39784	39854	40610	40685	40855	40856	40876	40887	40902	40910	40916	40978	41012	41048	41096
		Sample Digestion Method-->	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS
Major Elements																															
Aluminium (Al)	%	0.01	-	0.44	0.67	3.64	2.07	0.44	0.65	1.60	0.60	0.40	2.10	0.65	0.53	1.12	1.19	1.97	0.66	1.89	1.20	4.36	4.27	2.37	3.11	2.04	1.28	1.60	0.44	0.58	1.70	0.96
Calcium (Ca)	%	0.01		1.24	1.33	3.94	1.15	1.23	1.18	3.71	1.19	1.20	2.01	1.90	1.03	1.24	1.44	1.92	1.04	1.59	1.24	2.89	4.54	4.18	4.30	1.19	1.41	1.10	1.36	1.12	1.33	1.21
Iron (Fe)	%	0.01	-	1.61	3.52	7.46	4.66	2.57	2.58	3.59	2.64	3.06	6.11	3.43	1.71	2.88	4.01	3.28	3.13	4.99	3.69	9.65	10.00	4.47	8.96	4.24	2.50	2.78	2.33	2.44	4.38	4.16
Potassium (K)	%	0.01	-	0.27	0.35	0.28	0.33	0.30	0.42	0.35	0.28	0.35	0.28	0.30	0.29	0.28	0.46	0.62	0.29	0.81	0.74	0.78	0.55	0.56	0.58	0.44	0.41	0.49	0.36	0.32	0.29	0.64
Magnesium (Mg)	%	0.01	-	0.36	0.69	2.58	1.09	0.50	0.44	1.06	0.57	0.35	1.69	0.72	0.37	0.80	0.82	1.07	0.62	1.43	0.58	2.24	2.24	1.60	2.83	1.25	0.74	0.79	0.41	0.58	1.03	0.42
Sodium (Na)	%	0.01	-	0.01	0.04	0.03	0.04	0.02	0.02	0.03	0.03	0.01	0.03	0.02	0.04	0.02	0.02	0.07	0.03	0.06	0.01	0.02	0.05	0.04	0.02	0.04	0.05	0.06	0.02	0.03	0.04	0.03
Trace Elements																															
Antimony (Sb)	mg/kg	0.01	-	<2	4	<2	4	2	<2	<2	<2	2	3	<2	<2	<2	<2	2	<2	<2	5	<2	<2	<2	<2	<2	<2	<2	<2	2	<2	16
Arsenic (As)	mg/kg	0.1	300	3	33	8	7	18	42	7	13	85	6	39	8	5	27	<2	33	473	44	8	<2	5	33	<2	10	4	39	16	5	188
Boron (B)	mg/kg	10	20,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Cadmium (Cd)	mg/kg	0.01	100	0.5	1.3	<0.5	<0.5	0.6	2.2	17.1	<0.5	4.1	0.6	<0.5	1.2	1.4	5.5	<0.5	8.0	<0.5	6.6	0.5	0.8	<0.5	3.6	<0.5	<0.5	<0.5	4.1	6.5	<0.5	38.9
Chromium (Cr) - hexavalent	mg/kg	1	240	14	14	59	37	14	12	46	18	9	24	10	13	29	18	54	16	37	13	39	38	59	48	47	30	27	17	19	37	19
Cobalt (Co)	mg/kg	0.1	300	3	15	35	21	7	8	17	7	17	21	12	6	10	13	11	12	24	16	37	39	15	45	14	6	11	11	7	14	12
Copper (Cu)	mg/kg	0.2	20,000	9	47	26	61	10	17	81	10	65	44	23	17	36	57	60	55	44	49	69	55	63	32	4	5	23	56	26	38	155
Lead (Pb)	mg/kg	0.2	600	24	120	29	24	30	102	856	16	174	62	42	74	101	235	9	403	13	387	11	12	24	169	12	29	25	287	434	36	2,710
Manganese (Mn)	mg/kg	5	9,000	815	737	1,170	540	709	802	945	819	868	873	1,600	626	557	1,210	647	462	457	936	1,080	1,560	1,365	2,750	515	387	447	1,255	681	674	1,250
Mercury (Hg)	mg/kg	0.01	400	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1
Molybdenum (Mo)	mg/kg	0.05	-	3	2	1	4	2	1	4	2	5	1	11	1	3	1	2	6	7	2	1	2	6	1	2	2	3	2	2	3	3
Nickel (Ni)	mg/kg	0.2	800	10	35	29	40	15	22	37	21	26	33	35	16	22	28	28	33	38	20	49	49	38	32	37	18	30	13	15	27	34
Selenium (Se)	mg/kg	0.2	700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium (Th)	mg/kg	0.2	-	<20	20	<20	<20	<20	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	20	20	20	<20	<20	<20	<20
Uranium (U)	mg/kg	0.05	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	10	<10	10
Vanadium (V)	mg/kg	1	-	4	10	93	38	4	7	41	7	4	86	6	4	21	16	43	9	39	14	271	290	61	83	34	24	21	3	5	27	9
Zinc (Zn)	mg/kg	2	30,000	56	96	143	137	58	187	829	54	228	160	46	105	132	365	102	450	67	418	128	155	277	362	99	155	204	240	444	98	2,120

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreational use.

Table B4: Multi-Element Test Results for Waste Rock

		RGS Sample ID >	188	51	155	35	167	168	192	64	81	8	183	177	111	133	156	29	186	174	50	53	124	71	103	152	72	161
		Strategic Sample ID-->	41162	41998	42045	42252	42256	42285	42302	42471	42658	42716	42977	43141	43142	43323	253742	253970	253978	253990	253991	254009	254015	254187	254206	254207	254208	254235
		Sample Digestion Method-->	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS
Major Elements																													
Aluminium (Al)	%	0.01	-	0.80	3.53	1.92	1.06	0.79	0.71	1.07	0.94	0.47	2.85	0.78	1.03	1.18	0.79	1.47	0.75	1.06	0.75	0.82	1.68	1.69	0.72	0.94	1.68	0.60	0.76
Calcium (Ca)	%	0.01		1.06	1.84	1.18	2.09	1.13	1.13	1.03	1.69	1.55	4.24	1.08	1.12	1.35	1.25	1.18	2.34	1.06	1.12	1.87	1.80	1.30	1.63	1.40	1.19	1.62	1.16
Iron (Fe)	%	0.01	-	3.58	6.51	3.19	2.45	2.42	3.09	3.37	2.42	2.63	8.41	2.31	2.09	2.30	3.17	3.48	2.33	3.73	3.86	3.00	4.00	3.03	2.28	2.02	2.52	3.01	3.94
Potassium (K)	%	0.01	-	0.39	1.16	0.55	0.67	0.53	0.51	0.30	0.61	0.35	0.30	0.53	0.69	0.78	0.57	0.88	0.45	0.40	0.45	0.40	0.72	0.57	0.50	0.60	0.99	0.40	0.48
Magnesium (Mg)	%	0.01	-	0.53	1.96	0.91	0.72	0.39	0.33	0.64	0.57	0.54	1.94	0.38	0.38	0.46	0.56	0.56	0.67	0.69	0.77	0.73	0.96	0.78	0.56	0.42	0.41	0.52	0.79
Sodium (Na)	%	0.01	-	0.03	0.04	0.04	0.04	0.01	0.01	0.04	0.03	0.02	0.13	0.01	0.01	0.01	0.01	0.01	0.02	0.05	0.03	0.04	0.05	0.08	0.02	0.01	0.02	0.02	0.02
Trace Elements																													
Antimony (Sb)	mg/kg	0.01	-	<2	<2	<2	<2	3	22	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	8	3	4	4	<2	2	5	27	2	3
Arsenic (As)	mg/kg	0.1	300	32	<2	4	33	58	77	39	15	26	26	39	35	28	43	111	16	18	24	16	32	7	30	35	42	46	27
Boron (B)	mg/kg	10	20,000	<10	<10	<10	<10	10	10	<10	<10	<10	10	10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10
Cadmium (Cd)	mg/kg	0.01	100	2.3	<0.5	<0.5	1.8	4.0	50.1	4.8	1.6	1.5	1.7	2.3	1.9	1.8	4.3	0.9	2.4	0.6	0.6	<0.5	3.4	0.6	3.9	22.7	36.3	7.3	0.7
Chromium (Cr) - hexavalent	mg/kg	1	240	13	57	25	16	19	11	23	14	9	51	9	12	13	11	18	11	24	14	20	30	29	11	10	15	12	14
Cobalt (Co)	mg/kg	0.1	300	10	21	11	8	8	12	12	7	7	93	8	8	8	13	20	5	15	16	8	22	7	6	5	10	10	16
Copper (Cu)	mg/kg	0.2	20,000	32	33	29	18	15	95	42	23	26	346	22	25	21	29	59	6	46	38	12	44	6	13	107	139	43	42
Lead (Pb)	mg/kg	0.2	600	184	9	29	81	239	3,290	348	62	75	4	196	219	80	181	88	137	24	29	25	142	69	135	1,730	4,030	388	26
Manganese (Mn)	mg/kg	5	9,000	779	820	382	598	805	790	662	705	1,250	994	556	588	695	1,360	538	574	482	599	593	837	593	686	637	784	1,050	708
Mercury (Hg)	mg/kg	0.01	400	<1	<1	<1	<1	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Molybdenum (Mo)	mg/kg	0.05	-	2	1	5	1	2	1	2	<1	1	2	1	1	2	<1	1	1	2	3	2	4	2	1	1	1	1	1
Nickel (Ni)	mg/kg	0.2	800	28	47	31	29	20	20	29	16	16	123	20	20	18	21	86	13	21	24	18	39	22	18	15	17	23	28
Selenium (Se)	mg/kg	0.2	700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium (Th)	mg/kg	0.2	-	<20	<20	<20	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	20	<20	20	<20	20	<20	<20	<20	<20	<20	<20
Uranium (U)	mg/kg	0.05	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10
Vanadium (V)	mg/kg	1	-	6	127	21	12	9	5	17	9	3	161	6	9	11	7	14	8	15	9	9	26	21	7	8	14	6	7
Zinc (Zn)	mg/kg	2	30,000	188	79	69	101	244	2,830	313	94	90	76	154	116	173	211	73	148	67	73	47	227	92	220	1,060	1,570	356	54

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreational use.

Table B4: Multi-Element Test Results for Waste Rock

			RGS Sample ID >	40	34	74	125	105	54	199	102	43	98	93	130	48	45	68	30	120	187	39	31	67	86
			Strategic Sample ID-->	254242	254369	254383	254401	254416	254761	255049	255174	255189	255405	255602	255712	256327	256328	256387	256449	256454	257903	257919	257926	257928	258144
			Sample Digestion Method-->	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS
Major Elements																									
Aluminium (Al)	%	0.01	-	0.64	2.11	1.26	0.71	1.51	1.51	1.01	2.17	1.57	1.74	1.54	1.43	1.59	0.93	1.01	1.07	0.88	1.02	0.58	1.27	0.53	2.64
Calcium (Ca)	%	0.01		2.01	2.14	1.59	1.30	1.36	1.80	1.00	1.40	1.99	1.42	1.45	1.27	1.89	1.92	1.65	2.30	1.32	1.06	2.01	2.26	1.65	1.52
Iron (Fe)	%	0.01	-	4.09	3.82	3.34	3.03	3.08	2.71	3.08	3.88	4.14	1.44	3.45	3.58	3.19	2.39	2.33	3.01	3.17	2.80	3.93	5.03	3.42	5.27
Potassium (K)	%	0.01	-	0.49	0.74	0.42	0.40	0.54	0.22	0.36	0.40	0.68	0.69	0.48	0.68	0.68	0.56	0.61	0.57	0.45	0.59	0.43	0.79	0.36	0.50
Magnesium (Mg)	%	0.01	-	0.56	1.16	0.98	0.69	0.75	0.83	0.70	1.07	0.76	0.36	0.80	0.53	0.84	0.62	0.54	0.83	0.71	0.64	0.85	1.11	0.67	1.43
Sodium (Na)	%	0.01	-	0.01	0.07	0.03	0.06	0.10	0.05	0.06	0.04	0.02	0.06	0.01	0.03	0.03	0.05	0.05	0.07	0.03	0.04	0.02	0.04	0.02	0.04
Trace Elements																									
Antimony (Sb)	mg/kg	0.01	-	5	<2	<2	3	<2	<2	<2	<2	<2	<2	<2	3	<2	<2	2	5	4	<2	3	5	4	3
Arsenic (As)	mg/kg	0.1	300	153	6	17	22	18	<2	48	4	14	2	3	26	12	15	17	25	27	12	41	42	45	19
Boron (B)	mg/kg	10	20,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	10	10	<10	10	10	<10	<10	<10	<10	10
Cadmium (Cd)	mg/kg	0.01	100	2.0	<0.5	0.8	0.5	<0.5	<0.5	<0.5	<0.5	3.6	<0.5	6.7	9.8	<0.5	<0.5	1.2	<0.5	0.8	1.0	2.6	<0.5	0.6	0.9
Chromium (Cr) - hexavalent	mg/kg	1	240	18	51	27	15	26	48	26	39	19	29	24	17	23	15	16	20	16	17	16	19	18	38
Cobalt (Co)	mg/kg	0.1	300	14	10	8	9	12	6	11	17	15	3	13	15	8	6	6	7	14	7	16	22	21	18
Copper (Cu)	mg/kg	0.2	20,000	54	7	6	12	28	2	22	60	51	2	56	125	6	3	14	10	20	24	51	74	50	23
Lead (Pb)	mg/kg	0.2	600	127	20	29	35	27	5	36	32	196	6	88	1,570	11	8	45	10	64	78	103	19	30	34
Manganese (Mn)	mg/kg	5	9,000	1,070	503	436	486	470	337	383	562	969	273	607	739	530	417	458	512	483	747	1,110	1,340	838	863
Mercury (Hg)	mg/kg	0.01	400	<1	<1	<1	<1	1	<1	1	<1	<1	<1	<1	1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1
Molybdenum (Mo)	mg/kg	0.05	-	2	1	1	5	1	3	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	<1
Nickel (Ni)	mg/kg	0.2	800	33	32	23	21	25	25	26	31	36	14	24	23	24	16	17	21	30	19	24	33	32	29
Selenium (Se)	mg/kg	0.2	700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium (Th)	mg/kg	0.2	-	<20	20	<20	<20	<20	<20	<20	<20	<20	20	<20	<20	<20	<20	20	<20	20	<20	<20	<20	<20	<20
Uranium (U)	mg/kg	0.05	-	<10	10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10
Vanadium (V)	mg/kg	1	-	6	39	16	8	14	44	17	37	18	22	19	11	19	11	10	11	11	9	7	16	6	44
Zinc (Zn)	mg/kg	2	30,000	116	131	74	172	62	48	57	59	209	48	299	444	54	39	113	37	100	87	188	27	49	129

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreatio

Table B4: Multi-Element Test Results for Waste Rock

			RGS Sample ID >	18	49	193	175	112	85	142	23	181	89	69	104	126	70	190	101	143	97	134	92	20	26
			Strategic Sample ID-->	258165	258181	258205	258236	258238	258248	258263	258273	258367	258374	258617	258629	258667	258671	258923	258927	258944	259035	259037	259074	259167	259168
			Sample Digestion Method-->	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS
Major Elements																									
Aluminium (Al)	%	0.01	-	1.51	2.31	0.86	1.15	0.72	0.82	1.14	3.90	1.10	0.55	1.53	1.14	1.09	0.83	0.79	0.71	0.93	1.04	0.66	0.69	1.13	1.03
Calcium (Ca)	%	0.01		2.88	1.88	1.03	1.12	1.35	1.53	1.23	2.68	1.09	1.51	1.64	1.37	1.30	1.63	1.04	1.41	1.23	1.43	1.25	1.50	2.82	2.56
Iron (Fe)	%	0.01	-	5.34	9.26	2.20	4.42	3.81	1.92	3.03	10.10	2.89	3.82	3.65	3.53	2.51	3.25	2.77	2.21	2.72	2.58	2.60	3.78	2.67	2.64
Potassium (K)	%	0.01	-	0.50	0.75	0.45	0.69	0.52	0.60	0.46	0.47	0.50	0.38	0.48	0.42	0.70	0.52	0.38	0.49	0.58	0.66	0.40	0.44	0.71	0.67
Magnesium (Mg)	%	0.01	-	1.50	1.80	0.52	0.64	0.44	0.46	0.73	3.02	0.59	0.58	0.87	0.76	0.49	0.71	0.67	0.52	0.57	0.52	0.53	0.78	0.69	0.62
Sodium (Na)	%	0.01	-	0.02	0.02	0.07	0.08	0.04	0.02	0.06	0.01	0.05	0.02	0.05	0.02	0.03	0.04	0.04	0.03	0.02	0.04	0.04	0.03	0.02	0.02
Trace Elements																									
Antimony (Sb)	mg/kg	0.01	-	3	5	<2	4	6	9	<2	<2	2	10	<2	<2	4	3	<2	<2	<2	14	5	5	<2	<2
Arsenic (As)	mg/kg	0.1	300	42	72	12	68	81	48	10	18	10	57	11	25	33	27	7	14	16	35	20	23	10	17
Boron (B)	mg/kg	10	20,000	<10	10	<10	10	<10	10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10
Cadmium (Cd)	mg/kg	0.01	100	1.6	35.2	2.9	1.2	1.2	8.0	0.9	1.5	1.5	5.0	<0.5	<0.5	3.4	0.6	<0.5	2.0	1.5	1.1	<0.5	4.6	3.2	2.7
Chromium (Cr) - hexavalent	mg/kg	1	240	34	26	21	21	20	9	24	28	16	8	28	23	19	15	21	14	10	13	13	13	10	11
Cobalt (Co)	mg/kg	0.1	300	31	37	6	22	26	10	8	46	8	20	14	19	7	10	6	5	7	14	8	15	7	11
Copper (Cu)	mg/kg	0.2	20,000	18	134	21	73	58	47	17	77	18	66	36	51	48	17	6	9	11	35	17	35	16	29
Lead (Pb)	mg/kg	0.2	600	199	1,500	393	79	311	266	56	60	75	219	29	15	434	46	23	60	64	66	26	318	96	99
Manganese (Mn)	mg/kg	5	9,000	1,685	1,390	586	916	987	1,125	646	1,730	645	963	535	469	688	763	353	584	800	508	399	643	797	766
Mercury (Hg)	mg/kg	0.01	400	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1
Molybdenum (Mo)	mg/kg	0.05	-	2	1	1	1	1	<1	1	<1	<1	<1	1	1	1	1	1	1	1	<1	1	1	<1	<1
Nickel (Ni)	mg/kg	0.2	800	27	41	18	44	44	20	23	45	14	37	30	40	19	24	23	14	19	25	21	25	24	30
Selenium (Se)	mg/kg	0.2	700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium (Th)	mg/kg	0.2	-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Uranium (U)	mg/kg	0.05	-	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10
Vanadium (V)	mg/kg	1	-	31	131	9	13	7	7	14	236	8	6	19	17	10	9	10	7	6	7	5	6	9	9
Zinc (Zn)	mg/kg	2	30,000	165	2,230	195	95	79	440	144	214	110	329	72	44	206	56	62	132	135	80	51	202	256	198

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreatio

Table B4: Multi-Element Test Results for Waste Rock

			RGS Sample ID >	59	153	57	16	33	63	96	76	118	184	135	154	173	99	200	138	27	46	52	79	42	19	66
			Strategic Sample ID-->	259176	259209	259255	259262	259263	259290	259304	259325	259559	259604	259723	259748	259819	259935	260144	260145	260174	260247	260605	260608	260614	260619	260631
			Sample Digestion Method-->	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS
Major Elements																										
Aluminium (Al)	%	0.01	-	0.87	2.06	2.21	2.88	2.87	1.69	0.81	0.73	2.33	0.39	1.87	2.06	1.05	0.76	1.82	0.76	2.31	0.94	0.50	0.91	1.26	2.64	0.80
Calcium (Ca)	%	0.01		1.74	1.18	1.75	3.06	2.15	1.69	1.44	1.58	1.32	1.08	1.24	1.18	1.12	1.41	1.00	1.24	2.43	1.91	1.82	1.56	1.99	2.82	1.66
Iron (Fe)	%	0.01	-	2.81	4.53	3.44	6.48	5.68	2.96	2.55	2.53	3.86	2.19	3.09	3.27	3.93	3.63	2.14	2.44	2.61	2.50	2.18	3.40	3.51	7.32	3.83
Potassium (K)	%	0.01	-	0.63	0.64	0.59	0.79	0.59	0.78	0.56	0.48	0.43	0.26	0.40	0.50	0.45	0.43	0.89	0.43	1.25	0.45	0.28	0.61	0.72	0.58	0.57
Magnesium (Mg)	%	0.01	-	0.56	1.12	0.94	1.81	1.72	0.75	0.62	0.62	1.17	0.35	0.96	0.99	0.79	0.81	0.49	0.54	0.86	0.50	0.57	0.52	0.90	2.17	0.63
Sodium (Na)	%	0.01	-	0.01	0.06	0.06	0.03	0.04	0.03	0.02	0.03	0.05	0.02	0.09	0.05	0.05	0.04	0.04	0.04	0.01	0.03	0.01	0.02	0.02	0.02	0.02
Trace Elements																										
Antimony (Sb)	mg/kg	0.01	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	2	<2	2	<2	2	3	2	5	2	<2	11
Arsenic (As)	mg/kg	0.1	300	28	4	<2	14	2	9	19	48	<2	27	<2	<2	29	43	16	15	13	26	22	91	19	19	91
Boron (B)	mg/kg	10	20,000	<10	<10	<10	20	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	10	<10	20	<10	<10	<10	<10	<10	<10
Cadmium (Cd)	mg/kg	0.01	100	0.9	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	9.4	<0.5	8.1	<0.5	<0.5	1.1	<0.5	0.9	2.3	2.1	15.4	0.6	0.6	2.6	10.5	27.1
Chromium (Cr) - hexavalent	mg/kg	1	240	11	40	46	31	52	21	9	14	47	18	45	44	23	17	9	5	71	9	8	10	10	33	7
Cobalt (Co)	mg/kg	0.1	300	13	29	9	28	23	12	9	10	14	7	8	8	12	10	5	5	6	5	4	16	11	26	12
Copper (Cu)	mg/kg	0.2	20,000	39	77	19	39	47	35	28	45	15	159	5	8	31	26	13	8	22	32	6	18	25	35	147
Lead (Pb)	mg/kg	0.2	600	36	12	35	25	15	65	29	500	9	1,425	17	20	62	22	43	58	321	839	27	68	148	585	779
Manganese (Mn)	mg/kg	5	9,000	696	489	496	1,195	730	556	405	448	326	589	373	356	655	480	366	491	684	606	1,060	1,080	1,140	1,700	1,030
Mercury (Hg)	mg/kg	0.01	400	<1	<1	1	1	<1	1	<1	<1	<1	<1	<1	1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Molybdenum (Mo)	mg/kg	0.05	-	<1	1	2	<1	1	1	1	1	1	2	2	1	2	1	1	<1	1	<1	1	1	1	1	1
Nickel (Ni)	mg/kg	0.2	800	23	66	35	41	44	30	16	23	39	18	28	29	29	22	14	10	17	21	5	15	18	23	23
Selenium (Se)	mg/kg	0.2	700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium (Th)	mg/kg	0.2	-	<20	<20	<20	<20	<20	<20	<20	<20	20	<20	<20	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Uranium (U)	mg/kg	0.05	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10
Vanadium (V)	mg/kg	1	-	8	31	41	131	100	17	6	4	43	4	39	38	13	11	10	6	24	9	9	14	15	56	11
Zinc (Zn)	mg/kg	2	30,000	67	78	71	84	85	78	73	725	59	379	85	80	137	52	83	169	91	618	39	39	197	750	1,470

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreational use.

Table B4: Multi-Element Test Results for Waste Rock

		RGS Sample ID >	179	114	87	165	129	60	32	119	164	77	24	41	169	80	106	145	37	91	22	13	78	58	163	28
		Strategic Sample ID-->	260712	260748	260767	30081	30092	30131	30170	30341	30344	30402	30424	30602	30604	30695	30708	30936	30968	32009	32024	32058	32059	32084	32102	32142
		Sample Digestion Method-->	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid	4-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS	Waste Rock BVS
Major Elements																											
Aluminium (Al)	%	0.01	-	1.02	1.11	0.61	1.57	1.79	0.49	0.56	2.14	1.74	2.96	1.44	2.01	2.78	1.08	0.47	1.87	0.71	2.36	3.41	1.25	1.94	1.03	1.95	1.38
Calcium (Ca)	%	0.01		1.11	1.34	1.52	1.14	1.27	1.74	2.17	1.32	1.15	1.56	2.66	2.00	1.12	1.55	1.36	1.21	2.04	1.50	2.70	3.48	1.56	1.74	1.15	2.41
Iron (Fe)	%	0.01	-	2.59	2.19	3.08	3.18	3.56	2.27	3.42	3.91	3.03	5.34	2.66	2.74	4.51	2.57	2.97	2.72	1.80	3.56	5.11	3.30	3.72	2.25	3.83	3.24
Potassium (K)	%	0.01	-	0.60	0.69	0.33	0.41	0.52	0.39	0.44	0.48	0.42	1.01	0.89	0.52	1.26	0.53	0.31	0.54	0.46	0.61	1.80	0.72	0.61	0.56	0.80	0.81
Magnesium (Mg)	%	0.01	-	0.47	0.40	0.86	0.78	0.86	0.47	0.71	1.05	0.88	1.55	0.71	0.79	1.43	0.56	0.70	0.66	0.30	0.86	2.07	1.09	1.02	0.64	1.07	0.69
Sodium (Na)	%	0.01	-	0.04	<0.01	0.04	0.03	0.03	0.02	0.03	0.04	0.05	0.05	0.03	0.08	0.09	0.04	0.04	0.05	0.03	0.08	0.04	0.04	0.06	0.04	0.05	0.03
Trace Elements																											
Antimony (Sb)	mg/kg	0.01	-	3	3	2	<2	<2	5	8	<2	2	<2	3	<2	2	2	2	<2	<2	<2	<2	<2	<2	<2	2	19
Arsenic (As)	mg/kg	0.1	300	32	67	28	8	15	43	37	8	3	6	19	<2	<2	8	17	3	14	11	<2	17	9	17	7	47
Boron (B)	mg/kg	10	20,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10
Cadmium (Cd)	mg/kg	0.01	100	24	10.7	<0.5	<0.5	<0.5	13.0	13.6	<0.5	<0.5	<0.5	4.0	<0.5	<0.5	0.7	1.2	<0.5	7.2	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	8.7
Chromium (Cr) - hexavalent	mg/kg	1	240	10	10	11	28	27	13	7	37	34	60	12	42	67	13	19	28	13	37	139	16	38	18	33	14
Cobalt (Co)	mg/kg	0.1	300	6	5	12	11	13	6	14	11	10	21	7	10	21	7	7	10	4	11	14	7	11	6	10	13
Copper (Cu)	mg/kg	0.2	20,000	60	27	11	21	18	24	67	14	10	35	21	7	18	28	13	20	17	24	5	7	26	7	7	67
Lead (Pb)	mg/kg	0.2	600	2,230	228	15	19	20	258	489	12	11	23	144	9	11	91	48	12	258	21	4	21	18	47	20	448
Manganese (Mn)	mg/kg	5	9,000	404	520	544	391	606	765	967	579	397	569	1,210	363	448	766	881	340	530	446	557	833	438	517	467	1,200
Mercury (Hg)	mg/kg	0.01	400	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Molybdenum (Mo)	mg/kg	0.05	-	1	<1	<1	1	<1	1	1	<1	1	2	<1	1	1	<1	9	<1	<1	1	<1	2	6	1	1	1
Nickel (Ni)	mg/kg	0.2	800	13	13	27	32	36	17	27	37	31	40	20	16	37	22	22	20	6	30	44	10	28	22	33	48
Selenium (Se)	mg/kg	0.2	700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium (Th)	mg/kg	0.2	-	<20	<20	<20	20	20	<20	<20	20	<20	<20	20	20	20	20	<20	20	<20	<20	<20	20	20	<20	20	<20
Uranium (U)	mg/kg	0.05	-	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	10	10	<10	<10	<10	<10	<10	<10
Vanadium (V)	mg/kg	1	-	9	10	8	20	22	5	5	29	27	68	15	32	77	12	6	21	9	31	166	18	35	9	31	13
Zinc (Zn)	mg/kg	2	30,000	1,530	562	31	53	46	657	673	58	52	96	210	36	67	53	95	41	379	64	93	53	63	64	75	438

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreational use.

Table B5: Multi-Element Test Results for Tailings

		RGS Sample ID >		1 (2019)	2021057_022	2021057_023
		Strategic Sample ID-->		Strategic Woolgar Tailings	PSM Woolgar Gold-106 slurry tailings	PSM Woolgar Gold-106 cakes tailings
		Sample Description-->		Tailing Sample 1	Tailings Sample 2	Tailings Sample 3
		Sample Digestion Method-->		2-acid	2-acid	2-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Tailings Sample 1	Tailings Sample 2	Tailings Sample 3
Major Elements						
Aluminium (Al)	%	0.01	-	0.63	0.32	0.38
Calcium (Ca)	%	0.01	-	0.54	0.66	0.69
Iron (Fe)	%	0.01	-	1.74	2.94	2.93
Potassium (K)	%	0.01	-	0.34	-	-
Magnesium (Mg)	%	0.01	-	0.22	0.28	0.28
Sodium (Na)	%	0.01	-	0.04		
Trace Elements						
Arsenic (As)	mg/kg	0.1	300	49.2	78.8	79.1
Boron (B)	mg/kg	10	20,000	<10	<10	<10
Cadmium (Cd)	mg/kg	0.01	100	5.55	11.15	10.55
Chromium (Cr) - hexavalent	mg/kg	1	240	410	100	99
Cobalt (Co)	mg/kg	0.1	300	8.7	9.1	9.1
Copper (Cu)	mg/kg	0.2	20,000	68.6	46.4	45.4
Mercury (Hg)	mg/kg	0.01	400	0.05	0.09	0.10
Manganese (Mn)	mg/kg	5	9,000	277	554	548
Molybdenum (Mo)	mg/kg	0.05	-	22.5	10.0	10.3
Nickel (Ni)	mg/kg	0.2	800	206	67	67
Lead (Pb)	mg/kg	0.2	600	431	460	487
Antimony (Sb)	mg/kg	0.05	-	1.91	2.74	2.91
Selenium (Se)	mg/kg	0.2	700	<0.2	0.2	0.2
Thorium (Th)	mg/kg	0.2	-	7.4	10.1	10.3
Uranium (U)	mg/kg	0.05	-	2.39	3.28	3.58
Vanadium (V)	mg/kg	1	-	8	5	6
Zinc (Zn)	mg/kg	2	30,000	312	628	569

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreational use.

Table B6: Multi-Element Test Results for Water Extracts for PSM Woolgar Tailings

		RGS Sample Number →		2021057_022	2021057_023
		ALS Laboratory ID →		BR22011570_01	BR22011570_02
Parameters	Limit of Reporting	Aquatic Ecosystems (freshwater)[1]	Livestock Drinking Water[2]	PSM Woolgar Gold-106 slurry Tailings Sample 2	PSM Woolgar Gold-106 cakes Tailingds Sample 3
pH	0.01 pH unit	6 to 9	-	8.7	8.8
Electrical Conductivity	1 µS/cm	<1,000#	3,580^	1,040	1,680
Trace Metals/Metalloids	All units mg/L				
Aluminium (Al)	0.02	0.055	5	<0.02	<0.02
Antimony (Sb)	0.002	-	-	0.004	0.004
Arsenic (As) - trivalent	0.002	0.024 **	0.5	<0.002	<0.002
Boron (B)	0.2	0.37	5	<0.2	<0.2
Cadmium (Cd)	0.002	0.0002	0.01	<0.002	<0.002
Chromium (Cr) - total	0.002	0.001 (hex)*	1 (total)	<0.002	<0.002
Cobalt (Co)	0.002	-	1	<0.002	0.004
Copper (Cu)	0.002	0.0014	1	0.002	<0.002
Iron (Fe)	0.2	-	-	<0.2	0.4
Lead (Pb)	0.002	0.0034	0.1	<0.002	<0.002
Manganese (Mn)	0.002	1.90	-	0.008	0.012
Mercury (Hg)	0.0001	0.0006	0.002	<0.0001	<0.0001
Molybdenum (Mo)	0.002	-	0.15	0.006	0.012
Nickel (Ni)	0.002	0.011	1	<0.002	<0.002
Selenium (Se)	0.02	0.011	0.02	<0.02	<0.02
Thorium (Th)	0.002	-	-	<0.002	<0.002
Uranium (U)	0.002	-	0.2	<0.002	<0.002
Vanadium (V)	0.02	-	-	<0.02	<0.02
Zinc (Zn)	0.01	0.008	20	<0.01	<0.01
Cyanide	All units mg/L				
Weak Acid Dissociable Cyanide (WAD CN)	0.2	-	-	<0.2	<0.2

Notes:

* Cr (VI) = hexavalent. ** 0.013 mg/Lfor pentavalent Arsenic (V).

for still water bodies only, moving rivers at low flow rates should not exceed 2,200 µS/cm

^calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water.

Notes: < indicates concentration less than the laboratory limit of reporting. Shaded cells are greater than applied guideline values.

1. ANZG (2018). Trigger values for freshwater aquatic ecosystems (95% species protection level)

2. ANZG (2018). Recommended guideline limits for Livestock Drinking Water.

Table B7: Multi-Element Test Results for Spent Heap Leach Residue

		RGS Sample ID >		2021057_C001	2021057_C002
		Strategic Sample ID-->		HLBRT-1_25mm	HLBRT-2_12.5mm
		Sample Digestion Method-->		2-acid	2-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Spent Heap Leach Residue Sample 1	Spent Heap Leach Residue Sample 2
Major Elements					
Aluminium (Al)	%	0.01	-	0.37	0.36
Calcium (Ca)	%	0.01	-	0.23	0.28
Iron (Fe)	%	0.01	-	2.42	2.32
Potassium (K)	%	0.01	-	0.36	0.29
Magnesium (Mg)	%	0.01	-	0.07	0.09
Sodium (Na)	%	0.01	-	0.03	0.02
Trace Elements					
Arsenic (As)	mg/kg	0.1	300	142	111
Boron (B)	mg/kg	10	20,000	<10	<10
Cadmium (Cd)	mg/kg	0.01	100	2.79	3.39
Chromium (Cr) - hexavalent	mg/kg	1	240	35	27
Cobalt (Co)	mg/kg	0.1	300	11.2	15.5
Copper (Cu)	mg/kg	0.2	20,000	26.1	30.3
Mercury (Hg)	mg/kg	0.01	400	0.04	0.13
Manganese (Mn)	mg/kg	5	9,000	611	1,040
Molybdenum (Mo)	mg/kg	0.05	-	0.9	0.7
Nickel (Ni)	mg/kg	0.2	800	22	29
Lead (Pb)	mg/kg	0.2	600	460	390
Antimony (Sb)	mg/kg	0.05	-	1.51	1.81
Selenium (Se)	mg/kg	0.2	700	0.4	0.2
Thorium (Th)	mg/kg	0.2	-	4.7	5.2
Uranium (U)	mg/kg	0.05	-	1.48	2.07
Vanadium (V)	mg/kg	1	-	4	3
Zinc (Zn)	mg/kg	2	30,000	193	274

Notes:

< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreational use.

Table B8: Multi-Element Test Results for Low Grade Ore and High Grade Ore

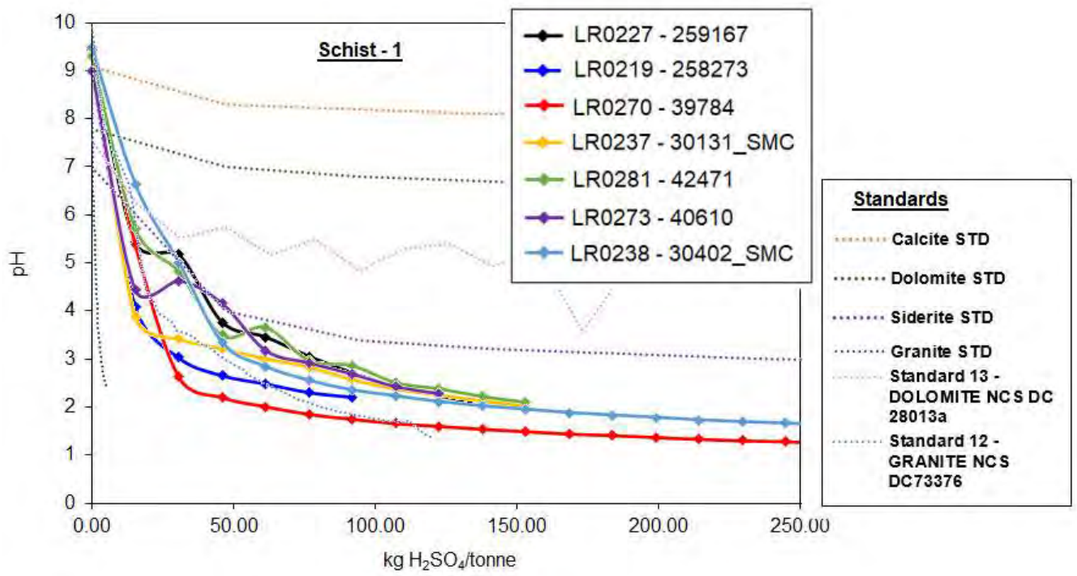
			RGS Sample ID-->	-	2021057_021
			Strategic Sample ID-->	1046C LDO324 34-58.6	1046G LD0324
			Sample Digestion Method-->	2-acid	2-acid
Parameters	Unit	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HIL C)	Low grade ore	High grade ore
Major Elements					
Aluminium (Al)	%	0.01	-	0.50	0.42
Calcium (Ca)	%	0.01	-	0.81	0.41
Iron (Fe)	%	0.01	-	2.72	3.23
Potassium (K)	%	0.01	-	-	0.26
Magnesium (Mg)	%	0.01	-	0.45	0.33
Sodium (Na)	%	0.01	-	0.01	0.01
Major Elements					
Arsenic (As)	ppm	0.1	300	33.6	83.9
Boron (B)	ppm	10	20,000	<10	<10
Cadmium (Cd)	ppm	0.01	100	1.92	4.52
Chromium (Cr) - hexavalent	ppm	1	240	7	9
Cobalt (Co)	ppm	0.1	300	13.3	12.9
Copper (Cu)	ppm	0.2	20,000	59.8	53.8
Mercury (Hg)	ppm	0.01	400	0.02	0.06
Manganese (Mn)	ppm	5	9,000	711	313
Molybdenum (Mo)	ppm	0.05	-	3.63	0.51
Nickel (Ni)	ppm	0.2	800	23.5	27.2
Lead (Pb)	ppm	0.2	600	94.5	203
Antimony (Sb)	ppm	0.05	-	3.78	4.73
Selenium (Se)	ppm	0.2	700	<0.2	<0.2
Thorium (Th)	ppm	0.2	-	10.7	14.6
Uranium (U)	ppm	0.05	-	4.39	5.07
Vanadium (V)	ppm	1	-	6	5
Zinc (Zn)	ppm	2	30,000	151	264

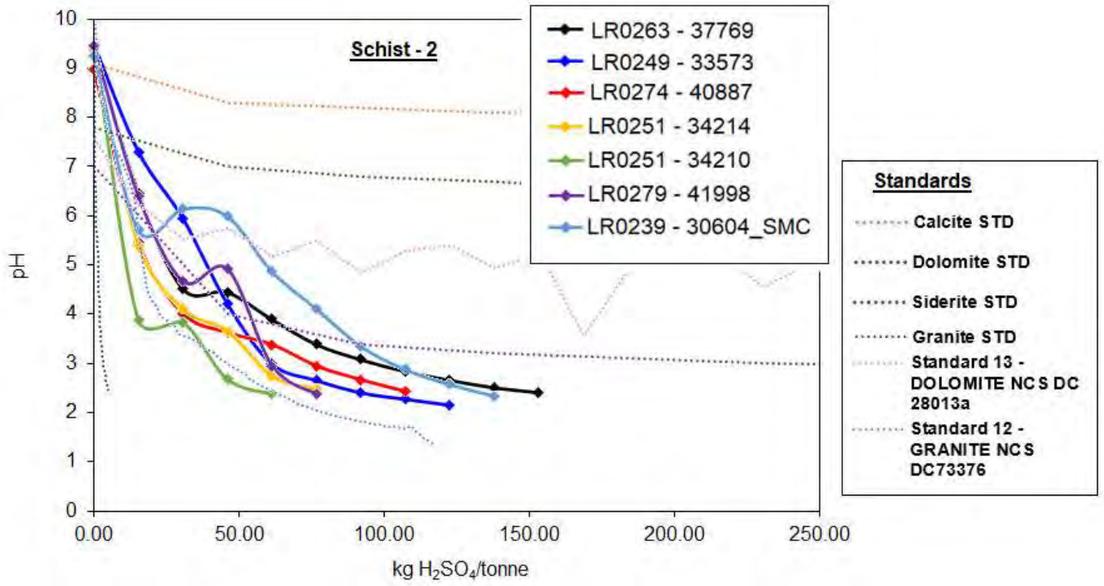
Notes:

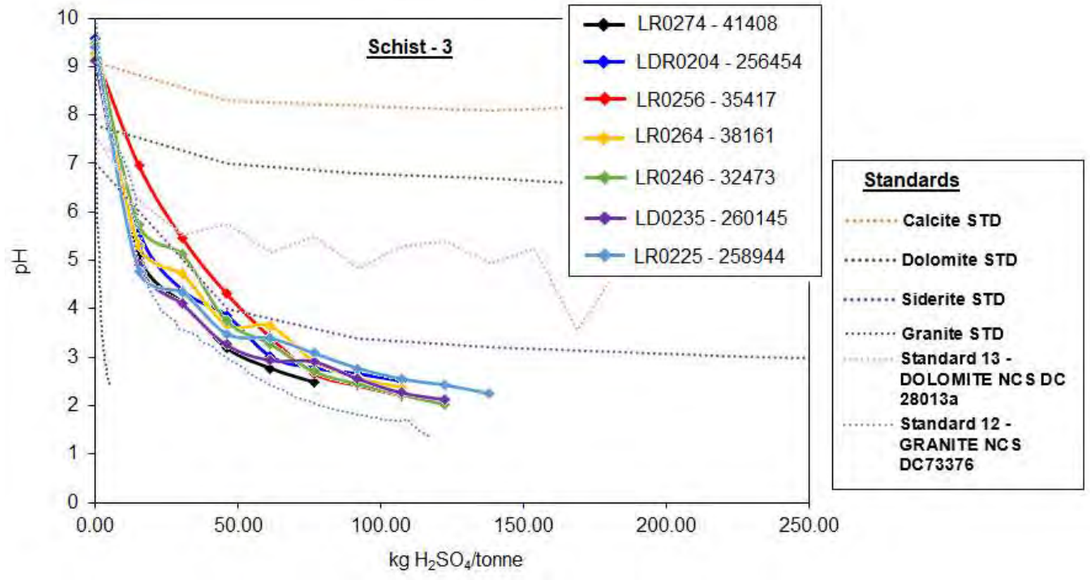
< indicates less than the laboratory limit of reporting. Shaded cells exceed applied guideline limit.

** Guideline level for Cr(VI) = 300 mg/kg. Guideline level for Cr(III) = 24 % of total Cr.

1. National Environmental Protection Council (NEPC) 2013. National Environmental Protection (Assessment of Site Contamination) Measure. Health-Based Investigation Level - HIL(C); public open spaces - recreational use.







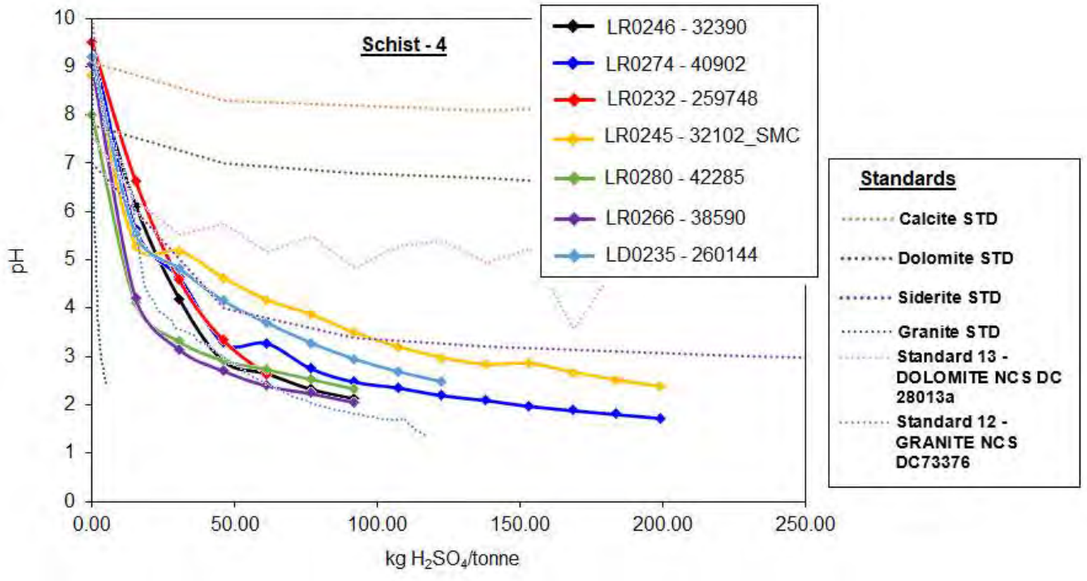


Figure B1: ABCC test results for 28 schist samples, BVS pit

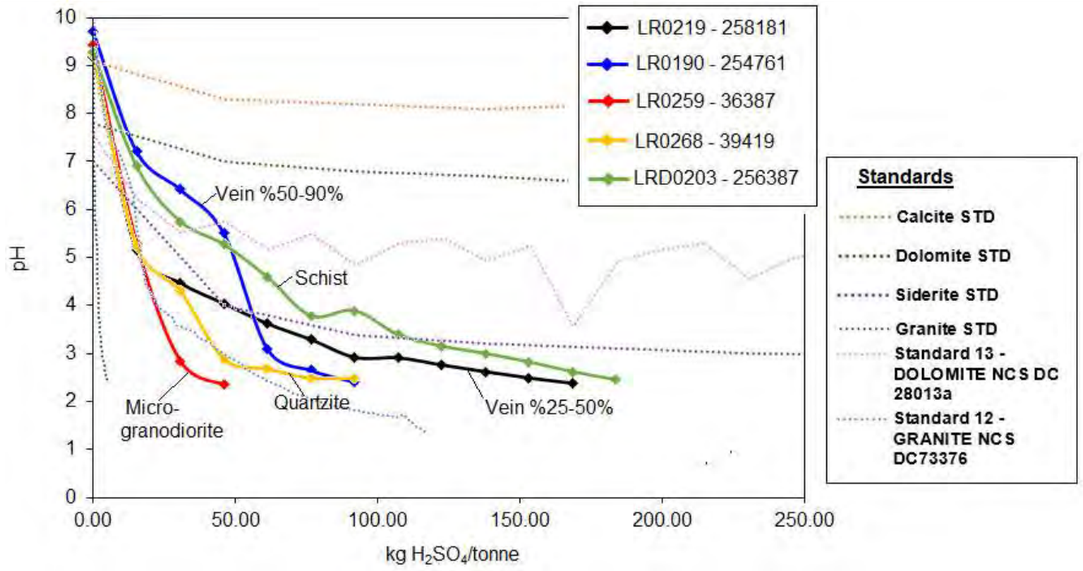


Figure B2: ABCC test results for 5 micro-granodiorite, quartzite, and vein samples from BVS pit

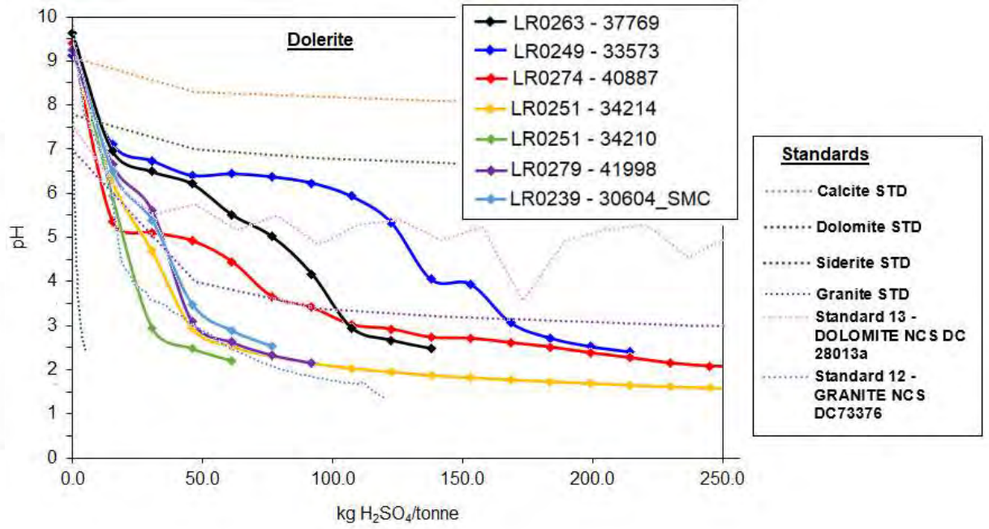


Figure B3: ABCC test results for dolerite samples from BVS pit

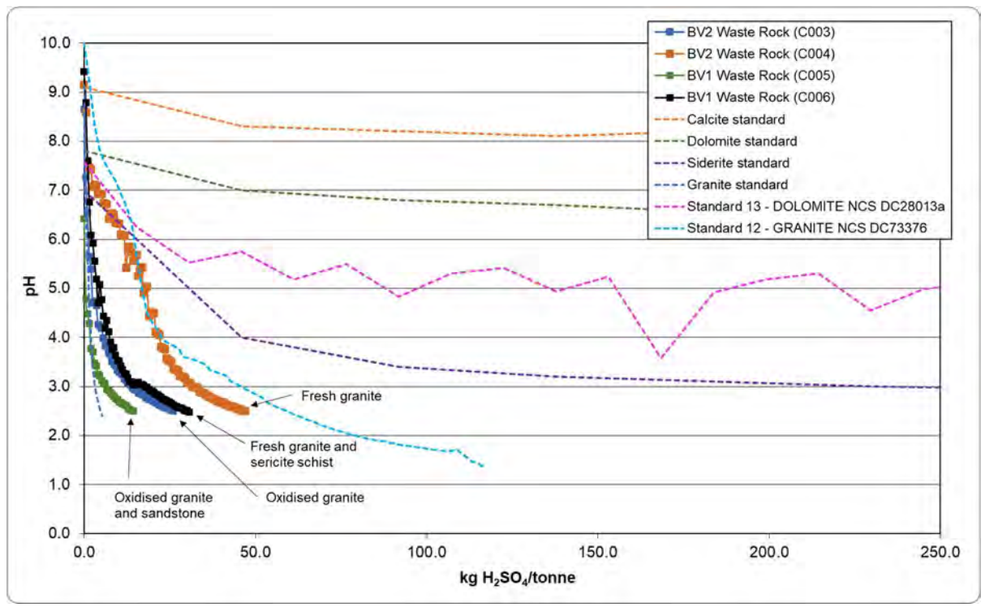


Figure B4: ABCC test results for composite waste rock samples from BV1 and BV2 pits

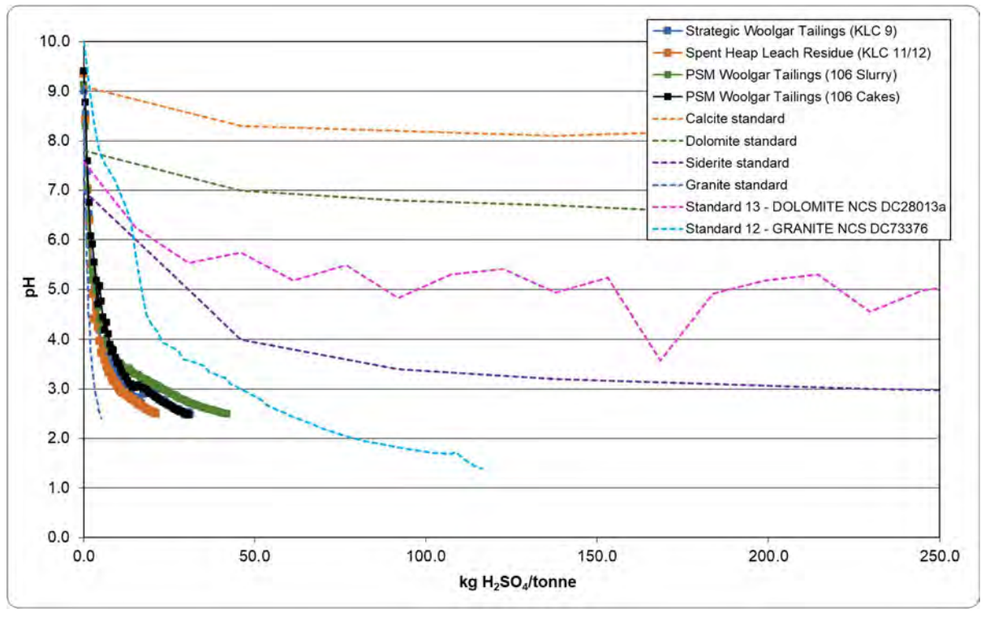


Figure B5: ABCC test results for tailings/spent heap leach residue samples

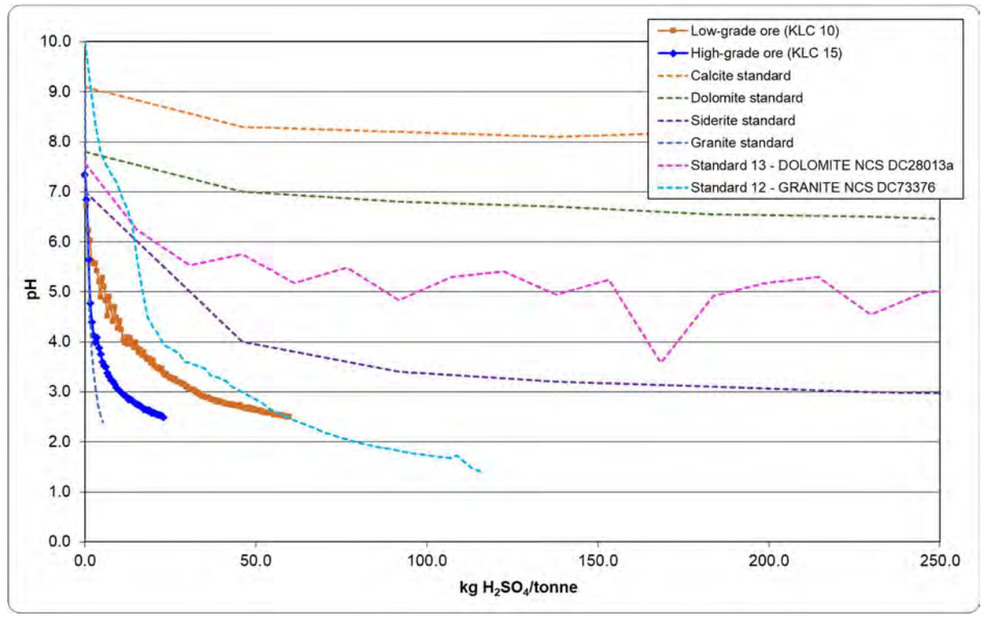


Figure B6: ABCC test results for ore samples

Attachment C

ALS and Trilab static geochemistry and physical data (Certificate of Analyses)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1931710**	Page	: 1 of 22
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services EB
Address	: PO Box 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61-7-3243 7222
Project	: 2019009	Date Samples Received	: 26-Nov-2019 17:05
Order number	: ----	Date Analysis Commenced	: 04-Dec-2019
C-O-C number	: ----	Issue Date	: 05-Dec-2019 16:23
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 99		
No. of samples analysed	: 99		

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

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 EB1931710/ EB1931711 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**
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	253742	253970	253978	253990	253991
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-001	EB1931710-002	EB1931710-003	EB1931710-004	EB1931710-005
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**55.2**	**83.5**	**45.1**	**55.9**	**73.4**
ANC as CaCO3	----	0.1	% CaCO3	**5.6**	**8.5**	**4.6**	**5.7**	**7.5**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	254009	254015	254187	254206	254207
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-006	EB1931710-007	EB1931710-008	EB1931710-009	EB1931710-010
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**72.7**	**53.5**	**63.2**	**51.6**	**48.1**
ANC as CaCO3	----	0.1	% CaCO3	**7.4**	**5.4**	**6.4**	**5.3**	**4.9**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**254208**	**254235**	**254242**	**254369**	**254383**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931710-011**	**EB1931710-012**	**EB1931710-013**	**EB1931710-014**	**EB1931710-015**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**61.3**	**56.1**	**71.1**	**71.0**	**69.2**
ANC as CaCO3	----	0.1	% CaCO3	**6.2**	**5.7**	**7.2**	**7.2**	**7.0**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	254401	254416	254761	255049	255174
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-016	EB1931710-017	EB1931710-018	EB1931710-019	EB1931710-020
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**56.2**	**54.7**	**55.5**	**48.2**	**52.3**
ANC as CaCO3	----	0.1	% CaCO3	**5.7**	**5.6**	**5.6**	**4.9**	**5.3**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**255189**	**255405**	**255602**	**255712**	**256327**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931710-021**	**EB1931710-022**	**EB1931710-023**	**EB1931710-024**	**EB1931710-025**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**69.2**	**51.6**	**53.7**	**55.6**	**72.2**
ANC as CaCO3	----	0.1	% CaCO3	**7.0**	**5.3**	**5.5**	**5.7**	**7.4**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**256328**	**256387**	**256449**	**256454**	**257903**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931710-026**	**EB1931710-027**	**EB1931710-028**	**EB1931710-029**	**EB1931710-030**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**73.5**	**62.4**	**90.4**	**61.8**	**52.6**
ANC as CaCO3	----	0.1	% CaCO3	**7.5**	**6.4**	**9.2**	**6.3**	**5.4**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**257919**	**257926**	**257928**	**258144**	**258165**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931710-031**	**EB1931710-032**	**EB1931710-033**	**EB1931710-034**	**EB1931710-035**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**80.3**	**95.4**	**65.4**	**62.0**	**106**
ANC as CaCO3	----	0.1	% CaCO3	**8.2**	**9.7**	**6.7**	**6.3**	**10.9**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**258181**	**258205**	**258236**	**258238**	**258248**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931710-036**	**EB1931710-037**	**EB1931710-038**	**EB1931710-039**	**EB1931710-040**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**87.8**	**47.3**	**50.9**	**51.8**	**58.3**
ANC as CaCO3	----	0.1	% CaCO3	**9.0**	**4.8**	**5.2**	**5.3**	**5.9**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**258263**	**258273**	**258367**	**258374**	**258617**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931710-041**	**EB1931710-042**	**EB1931710-043**	**EB1931710-044**	**EB1931710-045**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**56.6**	**104**	**52.1**	**62.1**	**59.8**
ANC as CaCO3	----	0.1	% CaCO3	**5.8**	**10.6**	**5.3**	**6.3**	**6.1**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**258629**	**258667**	**258671**	**258923**	**258927**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931710-046**	**EB1931710-047**	**EB1931710-048**	**EB1931710-049**	**EB1931710-050**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**53.4**	**53.7**	**66.4**	**51.4**	**59.8**
ANC as CaCO3	----	0.1	% CaCO3	**5.4**	**5.5**	**6.8**	**5.2**	**6.1**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	258944	259035	259037	259074	259167
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-051	EB1931710-052	EB1931710-053	EB1931710-054	EB1931710-055
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**57.4**	**59.9**	**53.1**	**65.5**	**101**
ANC as CaCO3	----	0.1	% CaCO3	**5.8**	**6.1**	**5.4**	**6.7**	**10.3**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	259168	259176	259209	259255	259262
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-056	EB1931710-057	EB1931710-058	EB1931710-059	EB1931710-060
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**89.6**	**71.4**	**57.4**	**60.1**	**118**
ANC as CaCO3	----	0.1	% CaCO3	**9.1**	**7.3**	**5.8**	**6.1**	**12.0**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	259263	259290	259304	259325	259559
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-061	EB1931710-062	EB1931710-063	EB1931710-064	EB1931710-065
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**76.5**	**64.1**	**57.7**	**68.9**	**51.0**
ANC as CaCO3	----	0.1	% CaCO3	**7.8**	**6.5**	**5.9**	**7.0**	**5.2**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**259604**	**259723**	**259748**	**259819**	**259935**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931710-066**	**EB1931710-067**	**EB1931710-068**	**EB1931710-069**	**EB1931710-070**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**42.0**	**48.5**	**43.7**	**56.5**	**69.7**
ANC as CaCO3	----	0.1	% CaCO3	**4.3**	**5.0**	**4.5**	**5.8**	**7.1**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	260144	260145	260174	260247	260605
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-071	EB1931710-072	EB1931710-073	EB1931710-074	EB1931710-075
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**49.1**	**54.1**	**100**	**61.5**	**72.0**
ANC as CaCO3	----	0.1	% CaCO3	**5.0**	**5.5**	**10.2**	**6.3**	**7.3**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	260608	260614	260619	260631	260712
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-076	EB1931710-077	EB1931710-078	EB1931710-079	EB1931710-080
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**62.5**	**82.0**	**104**	**68.4**	**49.8**
ANC as CaCO3	----	0.1	% CaCO3	**6.4**	**8.4**	**10.6**	**7.0**	**5.1**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	260748	260767	30081_SMC	30092_SMC	30131_SMC
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-081	EB1931710-082	EB1931710-083	EB1931710-084	EB1931710-085
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**50.6**	**70.7**	**46.1**	**51.4**	**65.8**
ANC as CaCO3	----	0.1	% CaCO3	**5.2**	**7.2**	**4.7**	**5.2**	**6.7**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	30170_SMC	30341_SMC	30344_SMC	30402_SMC	30424_SMC
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-086	EB1931710-087	EB1931710-088	EB1931710-089	EB1931710-090
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**76.9**	**49.3**	**43.9**	**59.8**	**92.8**
ANC as CaCO3	----	0.1	% CaCO3	**7.8**	**5.0**	**4.5**	**6.1**	**9.5**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	30602_SMC	30604_SMC	30695_SMC	30708_SMC	30736_SMC
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931710-091	EB1931710-092	EB1931710-093	EB1931710-094	EB1931710-095
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**61.8**	**47.6**	**61.8**	**63.3**	**43.5**
ANC as CaCO3	----	0.1	% CaCO3	**6.3**	**4.8**	**6.3**	**6.4**	**4.4**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	30968_SMC	32009_SMC	32024_SMC	32058_SMC	----
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	----
Compound	CAS Number	LOR	Unit	EB1931710-096	EB1931710-097	EB1931710-098	EB1931710-099	--------
				Result	Result	Result	Result	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**65.6**	**54.7**	**86.1**	**121**	**----**
ANC as CaCO3	----	0.1	% CaCO3	**6.7**	**5.6**	**8.8**	**12.4**	**----**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1931711**	Page	: 1 of 22
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services EB
Address	: PO Box 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61-7-3243 7222
Project	: 2019009	Date Samples Received	: 26-Nov-2019 17:07
Order number	: ----	Date Analysis Commenced	: 06-Dec-2019
C-O-C number	: ----	Issue Date	: 09-Dec-2019 12:33
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 99		
No. of samples analysed	: 97		

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

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 EB1931710/ EB1931711 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**
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	32059_SMC	32084_SMC	32102_SMC	32142_SMC	32390
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-001	EB1931711-002	EB1931711-003	EB1931711-004	EB1931711-005
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**50.1**	**57.2**	**78.4**	**83.3**	**41.1**
ANC as CaCO3	----	0.1	% CaCO3	**5.1**	**5.8**	**8.0**	**8.5**	**4.2**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	32398	32434	32450	32473	32517
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-006	EB1931711-007	EB1931711-008	EB1931711-009	EB1931711-010
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**55.3**	**47.2**	**51.4**	**40.0**	**66.8**
ANC as CaCO3	----	0.1	% CaCO3	**5.6**	**4.8**	**5.2**	**4.1**	**6.8**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	32523	32706	32842	33143	33266
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-011	EB1931711-012	EB1931711-013	EB1931711-014	EB1931711-015
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**44.3**	**45.9**	**41.1**	**176**	**56.0**
ANC as CaCO3	----	0.1	% CaCO3	**4.5**	**4.7**	**4.2**	**18.0**	**5.7**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**3**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	33567	33571	33573	33863	33967
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-016	EB1931711-017	EB1931711-018	EB1931711-019	EB1931711-020
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**162**	**165**	**148**	**52.0**	**119**
ANC as CaCO3	----	0.1	% CaCO3	**16.5**	**16.8**	**15.1**	**5.3**	**12.1**
Fizz Rating	----	0	Fizz Unit	**3**	**3**	**3**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**34109**	**34119**	**34210**	**34214**	**34256**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931711-021**	**EB1931711-022**	**EB1931711-023**	**EB1931711-024**	**EB1931711-025**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**42.7**	**51.5**	**55.0**	**139**	**64.7**
ANC as CaCO3	----	0.1	% CaCO3	**4.4**	**5.2**	**5.6**	**14.2**	**6.6**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**3**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	34257	35085	35396	35417	35468
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-026	EB1931711-027	EB1931711-028	EB1931711-029	EB1931711-030
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**51.4**	**134**	**59.3**	**49.4**	**40.9**
ANC as CaCO3	----	0.1	% CaCO3	**5.2**	**13.7**	**6.0**	**5.0**	**4.2**
Fizz Rating	----	0	Fizz Unit	**2**	**3**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**35675**	**35833**	**36264**	**36387**	**36388**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931711-031**	**EB1931711-032**	**EB1931711-033**	**EB1931711-034**	**EB1931711-035**
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**37.8**	**54.4**	**52.7**	**38.7**	**46.4**
ANC as CaCO3	----	0.1	% CaCO3	**3.8**	**5.5**	**5.4**	**3.9**	**4.7**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	36431	36446	37556	37769	37822
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-036	EB1931711-037	EB1931711-038	EB1931711-039	EB1931711-040
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**93.3**	**35.6**	**76.2**	**181**	**36.0**
ANC as CaCO3	----	0.1	% CaCO3	**9.5**	**3.6**	**7.8**	**18.5**	**3.7**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**3**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	37823	37843	37851	37861	38114
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-041	EB1931711-042	EB1931711-043	EB1931711-044	EB1931711-045
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**36.1**	**56.6**	**44.5**	**43.2**	**43.0**
ANC as CaCO3	----	0.1	% CaCO3	**3.7**	**5.8**	**4.5**	**4.4**	**4.4**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	38132	38137	38161	38356	38377
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-046	EB1931711-047	EB1931711-048	EB1931711-049	EB1931711-050
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**62.9**	**45.8**	**52.9**	**46.3**	**62.8**
ANC as CaCO3	----	0.1	% CaCO3	**6.4**	**4.7**	**5.4**	**4.7**	**6.4**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	38389	38399	38424	38590	38619
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-051	EB1931711-052	EB1931711-053	EB1931711-054	EB1931711-055
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**53.7**	**58.1**	**69.7**	**30.4**	**44.0**
ANC as CaCO3	----	0.1	% CaCO3	**5.5**	**5.9**	**7.1**	**3.1**	**4.5**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	38667	38826	38843	38858	38894
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-056	EB1931711-057	EB1931711-058	EB1931711-059	EB1931711-060
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**52.7**	**144**	**47.8**	**48.9**	**45.9**
ANC as CaCO3	----	0.1	% CaCO3	**5.4**	**14.7**	**4.9**	**5.0**	**4.7**
Fizz Rating	----	0	Fizz Unit	**2**	**3**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	39278	39287	39337	39351	39403
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-061	EB1931711-062	EB1931711-063	EB1931711-064	EB1931711-065
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**114**	**49.3**	**36.7**	**74.6**	**68.6**
ANC as CaCO3	----	0.1	% CaCO3	**11.6**	**5.0**	**3.7**	**7.6**	**7.0**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	39407	39419	39429	39784	39854
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-066	EB1931711-067	EB1931711-068	EB1931711-069	EB1931711-070
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**34.6**	**42.2**	**56.6**	**47.2**	**40.5**
ANC as CaCO3	----	0.1	% CaCO3	**3.5**	**4.3**	**5.8**	**4.8**	**4.1**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	40610	40685	40855	40856	40876
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-071	EB1931711-072	EB1931711-075	EB1931711-076	EB1931711-077
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**68.2**	**53.2**	**101**	**134**	**122**
ANC as CaCO3	----	0.1	% CaCO3	**7.0**	**5.4**	**10.3**	**13.7**	**12.4**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**3**	**3**	**3**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	40887	40902	40910	40916	40978
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-078	EB1931711-079	EB1931711-080	EB1931711-081	EB1931711-082
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**156**	**46.3**	**49.0**	**37.9**	**40.5**
ANC as CaCO3	----	0.1	% CaCO3	**16.0**	**4.7**	**5.0**	**3.9**	**4.1**
Fizz Rating	----	0	Fizz Unit	**3**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	41012	41048	41096	41162	41998
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-083	EB1931711-084	EB1931711-085	EB1931711-086	EB1931711-087
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**39.1**	**40.7**	**43.2**	**38.1**	**59.4**
ANC as CaCO3	----	0.1	% CaCO3	**4.0**	**4.2**	**4.4**	**3.9**	**6.0**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	42045	42252	42256	42285	42302
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-088	EB1931711-089	EB1931711-090	EB1931711-091	EB1931711-092
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**44.7**	**76.2**	**39.0**	**35.0**	**34.6**
ANC as CaCO3	----	0.1	% CaCO3	**4.6**	**7.8**	**4.0**	**3.6**	**3.5**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	42471	42658	42716	42977	43141
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1931711-093	EB1931711-094	EB1931711-096	EB1931711-097	EB1931711-098
				Result	Result	Result	Result	Result
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**57.8**	**54.8**	**119**	**37.5**	**37.3**
ANC as CaCO3	----	0.1	% CaCO3	**5.9**	**5.6**	**12.1**	**3.8**	**3.8**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**3**	**2**	**2**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**43142**	**43323**	**----**	**----**	**----**
			Client sampling date / time	26-Nov-2019 00:00	26-Nov-2019 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1931711-099**	**EB1931711-100**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**46.5**	**44.3**	**----**	**----**	**----**
ANC as CaCO3	----	0.1	% CaCO3	**4.7**	**4.5**	**----**	**----**	**----**
Fizz Rating	----	0	Fizz Unit	**2**	**2**	**----**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1932792**	Page	: 1 of 5
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR GREG MADDOCKS	Contact	: Customer Services EB
Address	: PO Box 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61-7-3243 7222
Project	: 2019009 Strategic Woolgar	Date Samples Received	: 06-Dec-2019 08:35
Order number	: ----	Date Analysis Commenced	: 10-Dec-2019
C-O-C number	: ----	Issue Date	: 12-Dec-2019 14:24
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 14		
No. of samples analysed	: 14		

Accreditation No. 825
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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 Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

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

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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.

- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	RGS01 LD0317 39 45	RGS02 LD0317 53.97 58.69	RGS04 LD017 111 117.2	RGS05 LD0318 169 175	RGS06 LD0319 49 54
				Client sampling date / time	05-Dec-2019 00:00	05-Dec-2019 00:00	05-Dec-2019 00:00	05-Dec-2019 00:00	05-Dec-2019 00:00
					EB1932792-001	EB1932792-002	EB1932792-003	EB1932792-004	EB1932792-005
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**9.0**	**9.0**	**9.2**	**9.6**	**9.6**
EA009: Nett Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		**-45.7**	**-109**	**-37.2**	**-27.8**	**-73.4**
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		**352**	**272**	**262**	**157**	**204**
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		**50.0**	**119**	**58.0**	**33.9**	**75.2**
ANC as CaCO3	----	0.1	% CaCO3		**5.1**	**12.1**	**5.9**	**3.4**	**7.7**
Fizz Rating	----	0	Fizz Unit		**2**	**2**	**2**	**2**	**2**
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		**0.14**	**0.32**	**0.68**	**0.20**	**0.06**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	RGS07 LD0320 43.5 49.59	RGS08 LD0320 170 176.06	RGS09 LD0321 38.73 46	RGS10 LD0317 226 231.42	RGS11 LD0318 42.32 47
				Client sampling date / time	05-Dec-2019 00:00	05-Dec-2019 00:00	05-Dec-2019 00:00	05-Dec-2019 00:00	05-Dec-2019 00:00
					EB1932792-006	EB1932792-007	EB1932792-008	EB1932792-009	EB1932792-010
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**9.5**	**8.8**	**9.4**	**9.5**	**9.2**
EA009: Nett Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		**-10.0**	**-72.0**	**-25.0**	**-47.0**	**-14.7**
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		**154**	**593**	**214**	**200**	**258**
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		**15.5**	**106**	**38.2**	**49.5**	**36.7**
ANC as CaCO3	----	0.1	% CaCO3		**1.6**	**10.8**	**3.9**	**5.0**	**3.7**
Fizz Rating	----	0	Fizz Unit		**1**	**2**	**2**	**2**	**2**
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		**0.18**	**1.11**	**0.43**	**0.08**	**0.72**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	RGS12 LD0318 93.7 96.58	RGS13 LD0320 107.51 113	RGS14 LD0321 179 185.69	RGS16 LD0324 176.43 180.64	----
			Client sampling date / time	05-Dec-2019 00:00	05-Dec-2019 00:00	05-Dec-2019 00:00	05-Dec-2019 00:00	----
Compound	CAS Number	LOR	Unit	EB1932792-011	EB1932792-012	EB1932792-013	EB1932792-014	--------
				Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.9	9.5	9.4	9.5	----
EA009: Nett Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	11.4	-33.3	-11.6	-52.8	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	415	166	188	209	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	43.4	35.1	18.0	55.6	----
ANC as CaCO3	----	0.1	% CaCO3	4.4	3.6	1.8	5.7	----
Fizz Rating	----	0	Fizz Unit	2	2	1	2	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	1.79	0.06	0.21	0.09	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1934009**	Page	: 1 of 4
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: LAURA JACKSON	Contact	: Carsten Emrich
Address	: PO Box 3091 SUNNYBANK SOUTH QLD, AUSTRALIA 4109	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 2019009 Strategic Woolgar	Date Samples Received	: 17-Dec-2019 17:52
Order number	: ----	Date Analysis Commenced	: 30-Dec-2019
C-O-C number	: ----	Issue Date	: 02-Jan-2020 11:10
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 8		
No. of samples analysed	: 8		

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Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)			Client sample ID	RGS01	RGS02	RGS06	RGS08	RGS09
			Client sampling date / time	17-Dec-2019 00:00	17-Dec-2019 00:00	17-Dec-2019 00:00	17-Dec-2019 00:00	17-Dec-2019 00:00
Compound	CAS Number	LOR	Unit	EB1934009-001	EB1934009-002	EB1934009-003	EB1934009-004	EB1934009-005
				Result	Result	Result	Result	Result
EA011A: Net Acid Generation - Sequential								
NAG at pH 4.5 (total)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
NAG at pH 7.0 (total)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
EA011S: pH OX (Stage 1)								
pH OX (Stage 1)	----	0.1	pH Unit	**9.9**	**10.4**	**9.9**	**8.9**	**9.3**
NAG at pH 4.5 (Stage 1)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
NAG at pH 7.0 (Stage 1)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.129**	**0.301**	**0.055**	**0.802**	**0.371**

Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)				Client sample ID	RGS11	RGS12	RGS16	----	----
				Client sampling date / time	17-Dec-2019 00:00	17-Dec-2019 00:00	17-Dec-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1934009-006	EB1934009-007	EB1934009-008	--------	--------
					Result	Result	Result	----	----
EA011A: Net Acid Generation - Sequential									
NAG at pH 4.5 (total)	----	0.1	kg H2SO4/t		<0.1	<0.1	<0.1	----	----
NAG at pH 7.0 (total)	----	0.1	kg H2SO4/t		<0.1	<0.1	<0.1	----	----
EA011S: pH OX (Stage 1)									
pH OX (Stage 1)	----	0.1	pH Unit		**9.3**	**8.9**	**10.2**	----	----
NAG at pH 4.5 (Stage 1)	----	0.1	kg H2SO4/t		<0.1	<0.1	<0.1	----	----
NAG at pH 7.0 (Stage 1)	----	0.1	kg H2SO4/t		<0.1	<0.1	<0.1	----	----
EA026 : Chromium Reducible Sulfur									
Chromium Reducible Sulphur	----	0.005	%		**0.554**	**1.36**	**0.037**	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2002955**	Page	: 1 of 3
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR GREG MADDOCKS	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	: 2019009 Strategic	Date Samples Received	: 04-Feb-2020 16:27
Order number	: ----	Date Analysis Commenced	: 11-Feb-2020
C-O-C number	: ----	Issue Date	: 20-Feb-2020 15:41
Sampler	: VERONICA CANALES		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 2		
No. of samples analysed	: 2		

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Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Merrin Avery	Supervisor - Inorganic	Newcastle - Inorganics, Mayfield West, NSW
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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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.
- ALS is not NATA accredited for the analysis of Exchangeable Aluminium and Exchange Acidity in soils when performed under ALS Method ED005.
- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Strategic Tailings	pH and EC of DI water	----	----	----
			Client sampling date / time	04-Feb-2020 00:00	10-Feb-2020 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2002955-001	EB2002955-002	--------	--------	--------
				Result	Result	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**9.0**	**6.8**	----	----	----
EA009: Nett Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-6.0**	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**132**	<1	----	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**26.8**	----	----	----	----
ANC as CaCO3	----	0.1	% CaCO3	**2.7**	----	----	----	----
Fizz Rating	----	0	Fizz Unit	**1**	----	----	----	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.554**	----	----	----	----
EA031: pH (saturated paste)								
ø pH (Saturated Paste)	----	0.1	pH Unit	**8.1**	----	----	----	----
EA032: Electrical Conductivity (saturated paste)								
ø Electrical Conductivity (Saturated Paste)	----	1	µS/cm	**440**	----	----	----	----
ED006: Exchangeable Cations on Alkaline Soils								
ø Exchangeable Calcium	----	0.2	meq/100g	**1.1**	----	----	----	----
ø Exchangeable Magnesium	----	0.2	meq/100g	**0.6**	----	----	----	----
ø Exchangeable Potassium	----	0.2	meq/100g	**0.6**	----	----	----	----
ø Exchangeable Sodium	----	0.2	meq/100g	<0.2	----	----	----	----
ø Cation Exchange Capacity	----	0.2	meq/100g	**2.2**	----	----	----	----
ø Exchangeable Sodium Percent	----	0.2	%	<0.2	----	----	----	----
ø Calcium/Magnesium Ratio	----	0.2	-	**1.9**	----	----	----	----
ø Magnesium/Potassium Ratio	----	0.2	-	**1.0**	----	----	----	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.68**	----	----	----	----
EK040T: Fluoride Total								
Fluoride	16984-48-8	40	mg/kg	**1170**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2018430**	Page	: 1 of 4
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR GREG MADDOCKS	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	: 2019009 Strategic Woolgar	Date Samples Received	: 08-Jul-2020 10:24
Order number	: ----	Date Analysis Commenced	: 15-Jul-2020
C-O-C number	: ----	Issue Date	: 28-Jul-2020 12:34
Sampler	: LEXI K NG		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

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- Analytical Results

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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
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.

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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.

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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.

- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.
- EA046 ABCC: NATA Acreditation does not cover the performance of this service.

Analytical Results

Sub-Matrix: ROCK (Matrix: SOIL)				Client sample ID	1046C LDO324 34-58.6m Low Grade Ore	----	----	----	----
				Client sampling date / time	22-Jun-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB2018430-001	--------	--------	--------	--------
					Result	----	----	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**8.0**	----	----	----	----
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		**-11.1**	----	----	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		**187**	----	----	----	----
EA011: Net Acid Generation									
pH (OX)	----	0.1	pH Unit		**8.1**	----	----	----	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t		<0.1	----	----	----	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t		<0.1	----	----	----	----
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		**35.6**	----	----	----	----
ANC as CaCO3	----	0.1	% CaCO3		**3.6**	----	----	----	----
Fizz Rating	----	0	Fizz Unit		**2**	----	----	----	----
EA026 : Chromium Reducible Sulfur									
Chromium Reducible Sulphur	----	0.005	%		**0.658**	----	----	----	----
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		**0.80**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	pH and EC of DI Water	----	----	----	----
				Client sampling date / time	22-Jun-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB2018430-002	--------	--------	--------	--------
					Result	----	----	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**5.6**	----	----	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		<1	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2127866**	Page	: 1 of 2
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Customer Services EB
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61-7-3243 7222
Project	: 2021057 Big Vein South	Date Samples Received	: 30-Sep-2021 16:35
Order number	: ----	Date Analysis Commenced	: 05-Oct-2021
C-O-C number	: ----	Issue Date	: 08-Oct-2021 12:40
Sampler	: PRIYA RAJENDRAN		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
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Signatories

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

General Comments

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- 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**)			Sample ID	**2021057_C001 HLBRT-1_25mm**	**2021057_C002 HLBRT-2_12.5mm**	**pH and EC of DI water**	**----**	**----**
			Sampling date / time	30-Sep-2021 00:00	30-Sep-2021 00:00	30-Sep-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2127866-001**	**EB2127866-002**	**EB2127866-003**	**--------**	**--------**
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.8**	**9.1**	**5.7**	**----**	**----**
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**22.6**	**10.2**	**----**	**----**	**----**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**267**	**158**	<1	**----**	**----**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**11.4**	**13.7**	**----**	**----**	**----**
ANC as CaCO3	----	0.1	% CaCO3	**1.2**	**1.4**	**----**	**----**	**----**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**----**	**----**	**----**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**1.11**	**0.78**	**----**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2128757**	Page	: 1 of 7
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Customer Services EB
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61-7-3243 7222
Project	: 2021057 Big Vein South	Date Samples Received	: 11-Oct-2021 14:43
Order number	: ----	Date Analysis Commenced	: 13-Oct-2021
C-O-C number	: ----	Issue Date	: 15-Oct-2021 14:10
Sampler	: ASITHA JAYASINGHE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 19		
No. of samples analysed	: 19		

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Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- 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)			Sample ID	2021057_003 521323 LR0428 3	2021057_004 521336 LR0428 16	2021057_005 521362 LR0428 40	2021057_006 521597 LR0434 6	2021057_007 521621 LR0434 28
			Sampling date / time	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EB2128757-001	EB2128757-002	EB2128757-003	EB2128757-004	EB2128757-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**9.7**	**9.1**	**9.7**	**9.4**	**9.7**
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-7.7**	**-9.3**	**-19.3**	**-7.1**	**-46.1**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**145**	**69**	**70**	**236**	**81**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**8.3**	**9.3**	**23.3**	**8.0**	**59.0**
ANC as CaCO3	----	0.1	% CaCO3	**0.8**	**0.9**	**2.4**	**0.8**	**6.0**
Fizz Rating	----	0	Fizz Unit	**0**	**0**	**1**	**0**	**2**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.02**	<0.01	**0.13**	**0.03**	**0.42**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	2021057_008 521638 LR0434 45	2021057_009 521646 LR0434 52	2021057_010 518397 LR0411R 2	2021057_011 518398 LR0411R 3	2021057_012 518417 LR0411R 21
			Sampling date / time	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EB2128757-006	EB2128757-007	EB2128757-008	EB2128757-009	EB2128757-010
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	9.8	9.8	5.6	5.6	8.1
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-20.5	-21.9	-3.1	-2.1	-7.1
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	71	70	12	12	19
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	22.3	25.3	3.1	2.1	7.1
ANC as CaCO3	----	0.1	% CaCO3	2.3	2.6	0.3	0.2	0.7
Fizz Rating	----	0	Fizz Unit	1	1	0	0	0
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.06	0.11	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	2021057_013 518430 LR0411R 33	2021057_014 518445 LR0411R 47	2021057_015 518463 LR0411R 64	2021057_016 518608 LR0417 6	2021057_017 518622 LR0417 19
			Sampling date / time	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EB2128757-011	EB2128757-012	EB2128757-013	EB2128757-014	EB2128757-015
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**9.5**	**9.6**	**9.5**	**6.3**	**8.4**
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-10.2**	**-18.7**	**-174**	**-1.5**	**-9.7**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**65**	**72**	**68**	**19**	**21**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**12.3**	**19.9**	**180**	**1.8**	**9.7**
ANC as CaCO3	----	0.1	% CaCO3	**1.2**	**2.0**	**18.4**	**0.2**	**1.0**
Fizz Rating	----	0	Fizz Unit	**1**	**1**	**3**	**0**	**1**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.07**	**0.04**	**0.20**	**0.01**	<0.01

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	2021057_018 518652 LR0417 48	2021057_019 518669 LR0417 64	2021057_020 518684 LR0417 78	----	----
			Sampling date / time	08-Oct-2021 00:00	08-Oct-2021 00:00	08-Oct-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	EB2128757-016	EB2128757-017	EB2128757-018	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**9.6**	**9.5**	**9.7**	**----**	**----**
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-21.8**	**-34.2**	**-42.9**	**----**	**----**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**66**	**71**	**66**	**----**	**----**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**23.6**	**41.8**	**46.0**	**----**	**----**
ANC as CaCO3	----	0.1	% CaCO3	**2.4**	**4.3**	**4.7**	**----**	**----**
Fizz Rating	----	0	Fizz Unit	**1**	**2**	**2**	**----**	**----**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.06**	**0.25**	**0.10**	**----**	**----**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **SOIL**)			Sample ID	**DI Water for EC PH**	**----**	**----**	**----**	**----**
			Sampling date / time	11-Oct-2021 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2128757-019**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.9**	**----**	**----**	**----**	**----**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	<1	**----**	**----**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2128814**	Page	: 1 of 2
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Customer Services EB
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61-7-3243 7222
Project	: 2021057 Big Vein South	Date Samples Received	: 11-Oct-2021 13:49
Order number	: ----	Date Analysis Commenced	: 18-Oct-2021
C-O-C number	: ----	Issue Date	: 18-Oct-2021 15:35
Sampler	: PRIYA RAJENDRAN		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 2		
No. of samples analysed	: 2		

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Signatories

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Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**2021057_C001 HLBRT-1_25mm**	**2021057_C002 HLBRT-2_12.5mm**	**----**	**----**	**----**
			Sampling date / time	11-Oct-2021 00:00	11-Oct-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2128814-001**	**EB2128814-002**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.752**	**0.629**	**----**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2129686**	Page	: 1 of 5
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Customer Services EB
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61-7-3243 7222
Project	: 2021057 Big Vein South	Date Samples Received	: 19-Oct-2021 09:00
Order number	: ----	Date Analysis Commenced	: 22-Oct-2021
C-O-C number	: ----	Issue Date	: 25-Oct-2021 11:59
Sampler	: VERONICA CANALES		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 7		
No. of samples analysed	: 7		

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- General Comments
- Analytical Results

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Signatories

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Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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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.

Analytical Results

Sub-Matrix: **ROCK** (Matrix: **SOIL**)			Sample ID	**2021057_C001**	**----**	**----**	**----**	**----**
			Sampling date / time	18-Oct-2021 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2129686-001**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**2.6**	**----**	**----**	**----**	**----**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**13.6**	**----**	**----**	**----**	**----**
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**17.1**	**----**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	2021057_C002	2021057_005	2021057_007	2021057_009	2021057_015
			Sampling date / time	18-Oct-2021 00:00	18-Oct-2021 00:00	18-Oct-2021 00:00	18-Oct-2021 00:00	18-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EB2129686-002	EB2129686-003	EB2129686-004	EB2129686-005	EB2129686-006
				Result	Result	Result	Result	Result
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**3.0**	**10.2**	**10.6**	**10.5**	**11.1**
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**6.7**	<0.1	<0.1	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**10.0**	<0.1	<0.1	<0.1	<0.1
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**----**	**0.119**	**0.400**	**0.104**	**0.184**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	2021057_019	----	----	----	----
			Sampling date / time	18-Oct-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2129686-007	--------	--------	--------	--------
				Result	----	----	----	----
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**10.4**	----	----	----	----
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	%	**0.214**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2129569**	Page	: 1 of 3
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Customer Services EB
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61-7-3243 7222
Project	: 2021057 Big Vein South	Date Samples Received	: 18-Oct-2021 21:54
Order number	: ----	Date Analysis Commenced	: 21-Oct-2021
C-O-C number	: ----	Issue Date	: 03-Nov-2021 10:09
Sampler	: VERONICA CANALES		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 7		
No. of samples analysed	: 1		

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

General Comments

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

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~ = Indicates an estimated value.

- Particular samples have been crushed prior to preparation and analysis as per client request on the Chain of Custody. Please refer to SRN for further details.
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: ROCK (Matrix: SOIL)			Sample ID	2021057_021 HGO	----	----	----	----
			Sampling date / time	18-Oct-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2129569-001	--------	--------	--------	--------
				Result	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**7.0**	----	----	----	----
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	**42.0**	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**799**	----	----	----	----
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	**2.6**	----	----	----	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	**30.5**	----	----	----	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	**35.8**	----	----	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**18.9**	----	----	----	----
ANC as CaCO3	----	0.1	% CaCO3	**1.9**	----	----	----	----
Fizz Rating	----	0	Fizz Unit	**1**	----	----	----	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**1.66**	----	----	----	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**1.99**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2200723**	Page	: 1 of 6
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Customer Services EB
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61-7-3243 7222
Project	: 2021057 Big Vein South	Date Samples Received	: 12-Jan-2022 14:52
Order number	: ----	Date Analysis Commenced	: 17-Jan-2022
C-O-C number	: ----	Issue Date	: 28-Jan-2022 13:19
Sampler	: VERONICA CANALES		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 5		
No. of samples analysed	: 5		

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ISO/IEC 17025 - Testing

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Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

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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.

- Bromine and Iodine results from the EG020 method code should be regarded as semi-quantitative only.
- 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**)

Compound	CAS Number	LOR	Unit	Sample ID	PSM Woolgar Gold-106 slurry 2021057_022	PSM Woolgar Gold-106 cakes 2021057_023	Spent heap leach residue 2021057_024	Strategic Woolgar Tailings 1	----
				Sampling date / time	12-Jan-2022 00:00	12-Jan-2022 00:00	12-Jan-2022 00:00	12-Jan-2022 00:00	----
					EB2200723-001	EB2200723-002	EB2200723-003	EB2200723-004	--------
					Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**8.7**	**8.8**	----	----	----
EA009: Net Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		**24.7**	**24.9**	----	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		**1040**	**1680**	----	----	----
EA011: Net Acid Generation									
pH (OX)	----	0.1	pH Unit		**2.6**	**2.7**	----	**8.2**	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t		**14.4**	**11.2**	----	<0.1	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t		**18.2**	**16.0**	----	<0.1	----
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		**23.6**	**23.4**	----	----	----
ANC as CaCO3	----	0.1	% CaCO3		**2.4**	**2.4**	----	----	----
Fizz Rating	----	0	Fizz Unit		**1**	**1**	----	----	----
EA026 : Chromium Reducible Sulfur									
Chromium Reducible Sulphur	----	0.005	%		**1.25**	**1.14**	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**0.9**	**0.3**	----	----	----
ED040S: Soluble Major Anions									
Silica	7631-86-9	1	mg/kg		**5**	**6**	----	----	----
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		**1.58**	**1.58**	----	----	----
EG005(ED093)S : Soluble Metals by ICPAES									
Boron	7440-42-8	1	mg/kg		<1	<1	----	----	----
Iron	7439-89-6	1	mg/kg		<1	**2**	----	----	----
EG020S: Soluble Metals by ICPMS									
Arsenic	7440-38-2	0.01	mg/kg		<0.01	<0.01	----	----	----
Cerium	7440-45-1	0.01	mg/kg		<0.01	<0.01	----	----	----
Germanium	7440-56-4	0.01	mg/kg		<0.01	<0.01	----	----	----
Selenium	7782-49-2	0.1	mg/kg		<0.1	<0.1	----	----	----
Silver	7440-22-4	0.01	mg/kg		<0.01	<0.01	----	----	----
Barium	7440-39-3	0.01	mg/kg		**0.10**	**0.11**	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Sample ID	PSM Woolgar Gold-106 slurry 2021057_022	PSM Woolgar Gold-106 cakes 2021057_023	Spent heap leach residue 2021057_024	Strategic Woolgar Tailings 1	----
				Sampling date / time	12-Jan-2022 00:00	12-Jan-2022 00:00	12-Jan-2022 00:00	12-Jan-2022 00:00	----
					EB2200723-001	EB2200723-002	EB2200723-003	EB2200723-004	--------
					Result	Result	Result	Result	----
EG020S: Soluble Metals by ICPMS - Continued									
Caesium	7440-46-2	0.01	mg/kg		<0.01	<0.01	----	----	----
Mercury	7439-97-6	0.01	mg/kg		<0.01	<0.01	----	----	----
Niobium	7440-03-1	0.01	mg/kg		<0.01	<0.01	----	----	----
Thallium	7440-28-0	0.01	mg/kg		<0.01	<0.01	----	----	----
Beryllium	7440-41-7	0.01	mg/kg		<0.01	<0.01	----	----	----
Bromine	7726-95-6	1	mg/kg		<1	<1	----	----	----
Cadmium	7440-43-9	0.01	mg/kg		<0.01	<0.01	----	----	----
Dysprosium	7429-91-6	0.01	mg/kg		<0.01	<0.01	----	----	----
Palladium	7440-05-3	0.01	mg/kg		<0.01	<0.01	----	----	----
Bismuth	7440-69-9	0.01	mg/kg		<0.01	<0.01	----	----	----
Cobalt	7440-48-4	0.01	mg/kg		<0.01	**0.02**	----	----	----
Erbium	7440-52-0	0.01	mg/kg		<0.01	<0.01	----	----	----
Iodine	7553-56-2	1	mg/kg		<1	<1	----	----	----
Platinum	7440-06-4	0.01	mg/kg		<0.01	<0.01	----	----	----
Chromium	7440-47-3	0.01	mg/kg		<0.01	<0.01	----	----	----
Europium	7440-53-1	0.01	mg/kg		<0.01	<0.01	----	----	----
Rhenium	7440-15-5	0.01	mg/kg		<0.01	<0.01	----	----	----
Thorium	7440-29-1	0.01	mg/kg		<0.01	<0.01	----	----	----
Copper	7440-50-8	0.01	mg/kg		**0.01**	<0.01	----	----	----
Gadolinium	7440-54-2	0.01	mg/kg		<0.01	<0.01	----	----	----
Gallium	7440-55-3	0.01	mg/kg		<0.01	<0.01	----	----	----
Manganese	7439-96-5	0.01	mg/kg		**0.04**	**0.06**	----	----	----
Hafnium	7440-58-6	0.1	mg/kg		<0.1	<0.1	----	----	----
Molybdenum	7439-98-7	0.01	mg/kg		**0.03**	**0.06**	----	----	----
Holmium	7440-60-0	0.01	mg/kg		<0.01	<0.01	----	----	----
Nickel	7440-02-0	0.01	mg/kg		<0.01	<0.01	----	----	----
Indium	7440-74-6	0.01	mg/kg		<0.01	<0.01	----	----	----
Lead	7439-92-1	0.01	mg/kg		<0.01	<0.01	----	----	----
Antimony	7440-36-0	0.01	mg/kg		**0.02**	**0.02**	----	----	----
Lanthanum	7439-91-0	0.01	mg/kg		<0.01	<0.01	----	----	----
Lutetium	7439-94-3	0.01	mg/kg		<0.01	<0.01	----	----	----
Uranium	7440-61-1	0.01	mg/kg		<0.01	<0.01	----	----	----
Neodymium	7440-00-8	0.01	mg/kg		<0.01	<0.01	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Sample ID	PSM Woolgar Gold-106 slurry 2021057_022	PSM Woolgar Gold-106 cakes 2021057_023	Spent heap leach residue 2021057_024	Strategic Woolgar Tailings 1	----
				Sampling date / time	12-Jan-2022 00:00	12-Jan-2022 00:00	12-Jan-2022 00:00	12-Jan-2022 00:00	----
					EB2200723-001	EB2200723-002	EB2200723-003	EB2200723-004	--------
					Result	Result	Result	Result	----
EG020S: Soluble Metals by ICPMS - Continued									
Zinc	7440-66-6	0.05	mg/kg		<0.05	<0.05	----	----	----
Lithium	7439-93-2	0.01	mg/kg		**122**	**305**	----	----	----
Praseodymium	7440-10-0	0.01	mg/kg		<0.01	<0.01	----	----	----
Rubidium	7440-17-7	0.01	mg/kg		**0.03**	**0.07**	----	----	----
Vanadium	7440-62-2	0.1	mg/kg		<0.1	<0.1	----	----	----
Aluminium	7429-90-5	0.1	mg/kg		<0.1	<0.1	----	----	----
Samarium	7440-19-9	0.01	mg/kg		<0.01	<0.01	----	----	----
Tellurium	22541-49-7	0.05	mg/kg		<0.05	<0.05	----	----	----
Terbium	7440-27-9	0.01	mg/kg		<0.01	<0.01	----	----	----
Thorium	7440-29-1	0.01	mg/kg		<0.01	<0.01	----	----	----
Thulium	7440-30-4	0.01	mg/kg		<0.01	<0.01	----	----	----
Titanium	7440-32-6	0.1	mg/kg		<0.1	<0.1	----	----	----
Ytterbium	7440-64-4	0.01	mg/kg		<0.01	<0.01	----	----	----
Yttrium	7440-65-5	0.01	mg/kg		<0.01	<0.01	----	----	----
Zirconium	7440-67-7	0.05	mg/kg		<0.05	<0.05	----	----	----
EG035S: Soluble Mercury by FIMS									
Mercury	7439-97-6	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser									
Weak Acid Dissociable Cyanide	----	1	mg/kg		<1	<1	<1	<1	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **SOIL**)			Sample ID	**DI Water for pH & EC**	**----**	**----**	**----**	**----**
			Sampling date / time	12-Jan-2022 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2200723-005**	**--------**	**--------**	**--------**	**--------**
				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	**----**	**----**	**----**	**----**

Trilab
Soil Rock Calibration

Brisbane
346A Bilsen Road,
Geebung
QLD 4034
Ph: +61 7 3265 5656

Perth
2 Kimmer Place,
Queens Park
WA 6107
Ph: +61 8 9258 8323

POROSITY & DENSITY TEST REPORT

Test Method: AS 4133 2.1.1, 1.1.1

Client	RGS Environmental Pty Ltd	**Report No.**	22020004-P&D
		Workorder No.	0009495
Address	PO Box 3091, Sunnybank South QLD 4109	**Test Date**	05/02/2022
		Report Date	08/02/2022
Project	2021057 - Big Vein South		

Sample No.	22020004						
Client ID	2 - 2021057_KL C 10						
Depth (m)	Not Supplied						
Moisture Content (%)	0.4						
Dry Density (t/m^3)	2.62						
Porosity (%)	1.8						

Sample No.							
Client ID							
Depth (m)							
Moisture Content (%)							
Dry Density (t/m^3)							
Porosity (%)							

Sample No.							
Client ID							
Depth (m)							
Moisture Content (%)							
Dry Density (t/m^3)							
Porosity (%)							

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 the International System of Units (SI). References are traceable to National Measurement Institutes or laboratories accredited to ISO/IEC 17025 by a signatory to the ILAC MRA.

Tested at Trilab Brisbane Laboratory

Authorised Signatory

C. Channon

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Laboratory No. 9926

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.
Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.
Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

Trilab
Soil Rock Calibration

Brisbane
346A Bilsen Road,
Geebung
QLD 4034
Ph: +61 7 3265 5656

Perth
2 Kimmer Place,
Queens Park
WA 6107
Ph: +61 8 9258 8323

SOIL PARTICLE DENSITY TEST REPORT

Test Method: AS 1289 3.5.1

Client	RGS Environmental Pty Ltd	**Report No.**	22020003A-SG
		Workorder No.	0009495
Address	PO Box 3091, Sunnybank South QLD 4109	**Report Date**	17/02/2022

Project 2021057 - Big Vein South

Sample No.	22020003	22020005	22020006	22020007	22020008		
Test Date	3/02/2022	3/02/2022	3/02/2022	3/02/2022	3/02/2022		
Client ID	1 - 2021057_KLC 9	3 - 2021057_KLC 15	4 - 2021057_KLC 11	5 - 2021057_106 Slurry	6 - 2021057_106	-	-
Depth (m)	Not Supplied	Not Supplied	Not Supplied	Not Supplied	Not Supplied	-	-
Soil Particle Density (t/m³) (-2.36mm)	2.71	2.82	2.72	2.83	2.76		
Soil Particle Density (t/m³) (+2.36mm)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
Total Soil Particle Density (t/m³)	2.71	2.82	2.72	2.83	2.76		

Sample No.							
Test Date							
Client ID	-	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-	-
Soil Particle Density (t/m³) (-2.36mm)							
Soil Particle Density (t/m³) (+2.36mm)							
Total Soil Particle Density (t/m³)							

NOTES/REMARKS: This report replaces 22020003-SG issued on the 4/2/2022

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 the International System of Units (SI).References are traceable to National Measurement Institutes or laboratories accredited to ISO/IEC 17025 by a signatory to the ILAC MRA.

Tested at Trilab Brisbane Laboratory

Authorised Signatory

Joshua Hawley

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Laboratory No. 9926

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

Australian Laboratory Services Pty. Ltd.

32 Shand Street
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Phone: +61 (7) 3243 7222 Fax: +61 (7) 3243 7218
www.alsglobal.com/geochemistry

ALS Brisbane is a NATA Accredited Testing Laboratory. Corporate Accreditation No: 825, Corporate Site No: 818.

To: **ALS ENVIRONMENTAL**
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 18-FEB-2020
Account: ALSENV

CERTIFICATE BR20033782

Project: EB2002955

P.O. No.: RGS Environmental 2019009

This report is for 1 Pulp sample submitted to our lab in Brisbane, QLD, Australia on 13-FEB-2020.

The following have access to data associated with this certificate:

SUB RESULTS -BRIS		

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
LOG-22	Sample login - Rcd w/o BarCode
WEI-21b	Weight - Pulp
LEV-01	Waste Disposal Levy

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION
ME-MS41	Ultra Trace Aqua Regia ICP-MS

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:

Shaun Kenny, Brisbane Laboratory Manager

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To: **ALS ENVIRONMENTAL**
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 18-FEB-2020
Account: ALSENV

Project: EB2002955

CERTIFICATE OF ANALYSIS BR20033782

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Ag	Al	As	Au	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu
	Units	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
	LOD	0.01	0.01	0.1	0.02	10	10	0.05	0.01	0.01	0.01	0.02	0.1	1	0.05	0.2
Strategic Tailings		0.66	0.63	49.2	0.17	<10	30	0.86	0.42	0.54	5.55	33.1	8.7	410	0.85	68.6

***** See Appendix Page for comments regarding this certificate *****

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32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 18-FEB-2020
Account: ALSENV

Project: EB2002955

CERTIFICATE OF ANALYSIS BR20033782

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Fe	Ga	Ge	Hf	Hg	In	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni
	Units	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm	%	ppm	ppm
	LOD	0.01	0.05	0.05	0.02	0.01	0.005	0.01	0.2	0.1	0.01	5	0.05	0.01	0.05	0.2
Strategic Tailings		1.74	1.96	0.05	0.07	0.05	0.019	0.34	15.7	2.2	0.22	277	22.5	0.04	0.10	206

***** See Appendix Page for comments regarding this certificate *****

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To: **ALS ENVIRONMENTAL**
32 SHAND STREET
STAFFORD QLD 4053

Project: EB2002955

CERTIFICATE OF ANALYSIS BR20033782

Sample Description	Method Analyte Units LOD	ME-MS41 P ppm 10	ME-MS41 Pb ppm 0.2	ME-MS41 Rb ppm 0.1	ME-MS41 Re ppm 0.001	ME-MS41 S % 0.01	ME-MS41 Sb ppm 0.05	ME-MS41 Sc ppm 0.1	ME-MS41 Se ppm 0.2	ME-MS41 Sn ppm 0.2	ME-MS41 Sr ppm 0.2	ME-MS41 Ta ppm 0.01	ME-MS41 Te ppm 0.01	ME-MS41 Th ppm 0.2	ME-MS41 Ti % 0.005	ME-MS41 Tl ppm 0.02
Strategic Tailings		330	431	24.8	0.005	0.61	1.91	1.2	<0.2	0.7	20.1	<0.01	0.39	7.4	0.008	0.18

***** See Appendix Page for comments regarding this certificate *****

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STAFFORD QLD 4053

Finalized Date: 18-FEB-2020
Account: ALSENV

Project: EB2002955

CERTIFICATE OF ANALYSIS BR20033782

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	WEI-21b
	Analyte	U	V	W	Y	Zn	Zr	Pulp Wt
	Units	ppm	ppm	ppm	ppm	ppm	ppm	g
	LOD	0.05	1	0.05	0.05	2	0.5	1
Strategic Tailings		2.39	8	0.95	4.10	312	3.1	9

***** See Appendix Page for comments regarding this certificate *****

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To: **ALS ENVIRONMENTAL**
32 SHAND STREET
STAFFORD QLD 4053

Page: Appendix 1
Total # Appendix Pages: 1
Finalized Date: 18-FEB-2020
Account: ALSENV

Project: EB2002955

CERTIFICATE OF ANALYSIS BR20033782

CERTIFICATE COMMENTS

ANALYTICAL COMMENTS

Applies to Method: ME-MS41

Gold determinations by this method are semi-quantitative due to the small sample weight used (0.5g).

ACCREDITATION COMMENTS

Applies to Method: ME-MS41

NATA Accreditation covers the performance of this service but does not cover the performance of ALS Brisbane Sample Preparation. Corporate Accreditation No: 825, Corporate Site No: 818. The Technical Signatory is David Jones,ICPMS Supervising Chemist

LABORATORY ADDRESSES

Applies to Method: LEV-01 LOG-22 ME-MS41 WEI-21b

Processed at ALS Brisbane located at 32 Shand Street, Stafford, Brisbane, QLD, Australia. Processed at ALS Brisbane Sample Preparation at 116 Delta Street, Geebung, QLD 4034, Australia

Australian Laboratory Services Pty. Ltd.

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To: **ALS ENVIRONMENTAL**
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 23-JUL-2020
Account: ALSENV

CERTIFICATE BR20150627

Project: EB2018430

P.O. No.: MS41

This report is for 1 Pulp sample submitted to our lab in Brisbane, QLD, Australia on 17-JUL-2020.

The following have access to data associated with this certificate:

SUB RESULTS -BRIS

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
LOG-22	Sample login - Rcd w/o BarCode
LEV-01	Waste Disposal Levy

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION
ME-MS41	Ultra Trace Aqua Regia ICP-MS

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:

Shaun Kenny, Brisbane Laboratory Manager

Australian Laboratory Services Pty. Ltd.

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To: **ALS ENVIRONMENTAL**
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 23-JUL-2020
Account: ALSENV

Project: EB2018430

CERTIFICATE OF ANALYSIS BR20150627

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe
	Units	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%
	LOD	0.01	0.01	0.1	10	10	0.05	0.01	0.01	0.01	0.02	0.1	1	0.05	0.2	0.01
1046C LD0324 34-58.6m Low		0.85	0.50	33.6	<10	30	0.80	0.30	0.81	1.92	39.9	13.3	7	1.06	59.8	2.72

***** See Appendix Page for comments regarding this certificate *****

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To: **ALS ENVIRONMENTAL**
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 23-JUL-2020
Account: ALSENV

Project: EB2018430

CERTIFICATE OF ANALYSIS BR20150627

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Ga	Ge	Hf	Hg	In	La	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Rb
	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm	ppm	ppm
	LOD	0.05	0.05	0.02	0.01	0.005	0.2	0.1	0.01	5	0.05	0.01	0.2	10	0.2	0.1
1046C LD0324 34-58.6m Low		1.85	0.07	0.16	0.02	0.019	19.6	3.4	0.45	711	3.63	0.01	23.5	330	94.5	24.2

***** See Appendix Page for comments regarding this certificate *****

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To: **ALS ENVIRONMENTAL**
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 23-JUL-2020
Account: ALSENV

Project: EB2018430

CERTIFICATE OF ANALYSIS BR20150627

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn
	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
	LOD	0.05	0.1	0.2	0.2	0.2	0.01	0.01	0.2	0.005	0.02	0.05	1	0.05	0.05	2
1046C LD0324 34-58.6m Low		3.78	2.0	<0.2	0.2	16.3	0.01	0.04	10.7	<0.005	0.23	4.39	6	0.17	6.78	151

***** See Appendix Page for comments regarding this certificate *****

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To: **ALS ENVIRONMENTAL**
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 23-JUL-2020
Account: ALSENV

Project: EB2018430

CERTIFICATE OF ANALYSIS BR20150627

CERTIFICATE COMMENTS

ACCREDITATION COMMENTS

NATA Accreditation covers the performance of this service but does not cover the performance of ALS Brisbane Sample Preparation. Corporate Accreditation No: 825, Corporate Site No: 818. The Technical Signatory is David Jones,ICPMS Supervising Chemist

Applies to Method: ME-MS41

LABORATORY ADDRESSES

Processed at ALS Brisbane located at 32 Shand Street, Stafford, Brisbane, QLD, Australia. Processed at ALS Brisbane Sample Preparation at 116 Delta Street, Geebung, QLD 4034, Australia

Applies to Method: LEV-01 LOG-22 ME-MS41

Australian Laboratory Services Pty. Ltd.
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To: ALS ENVIRONMENTAL
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 27-OCT-2021
Account: ALSENV

CERTIFICATE BR21281947

Project: EB2129569
P.O. No.: ME-MS41
This report is for 7 samples of Pulp submitted to our lab in Brisbane, QLD, Australia on 19-OCT-2021.
The following have access to data associated with this certificate:

SUB RESULTS -BRIS		

SAMPLE PREPARATION

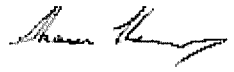
ALS CODE	DESCRIPTION
LOG-22	Sample login - Rcd w/o BarCode
LEV-01	Waste Disposal Levy

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
ME-MS41	Ultra Trace Aqua Regia ICP-MS	

This is the Final Report and supersedes any preliminary report with this certificate number.Results apply to samples as submitted.All pages of this report have been checked and approved for release.
***** See Appendix Page for comments regarding this certificate *****

Signature:



Shaun Kenny, Brisbane Laboratory Manager

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To: ALS ENVIRONMENTAL
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 27-OCT-2021
Account: ALSENV

Project: EB2129569

CERTIFICATE OF ANALYSIS BR21281947

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Ag	Al	As	Au	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu
	Units	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
	LOD	0.01	0.01	0.1	0.02	10	10	0.05	0.01	0.01	0.01	0.02	0.1	1	0.05	0.2
2021057_C003		0.05	2.09	3.9	0.02	<10	110	0.93	0.14	0.15	0.26	78.2	19.2	41	4.03	47.5
2021057_C004		0.12	1.98	37.5	<0.02	<10	70	1.07	0.12	1.03	0.35	78.3	14.5	46	5.37	25.0
2021057_C005		0.01	0.33	1.2	<0.02	<10	20	0.21	0.04	0.03	0.02	16.90	2.3	12	0.81	4.1
2021057_C006		0.05	1.62	48.4	<0.02	<10	50	1.26	0.08	0.70	0.10	81.3	10.6	33	3.48	12.6
2021057_021		1.59	0.42	83.9	0.92	<10	20	1.36	0.09	0.41	4.52	42.0	12.9	9	1.53	53.8
2021057_C001		2.71	0.37	142.0	0.72	<10	20	1.30	0.23	0.23	2.79	33.2	11.2	35	1.11	26.1
2021057_C002		4.15	0.36	111.0	0.38	<10	20	1.72	0.26	0.28	3.39	38.1	15.5	27	1.08	30.3

***** See Appendix Page for comments regarding this certificate *****

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To: ALS ENVIRONMENTAL
32 SHAND STREET
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Project: EB2129569

CERTIFICATE OF ANALYSIS BR21281947

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Fe	Ga	Ge	Hf	Hg	In	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni
	Units	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm	%	ppm	ppm
	LOD	0.01	0.05	0.05	0.02	0.01	0.005	0.01	0.2	0.1	0.01	5	0.05	0.01	0.05	0.2
2021057_C003		4.33	8.40	0.13	0.40	0.10	0.037	0.83	37.5	22.8	0.99	562	1.39	0.09	0.10	36.3
2021057_C004		4.11	8.75	0.12	0.08	0.11	0.034	0.70	38.3	29.4	1.13	482	1.52	0.03	0.18	31.7
2021057_C005		0.79	1.38	<0.05	0.08	<0.01	0.005	0.07	8.4	2.1	0.07	179	0.96	0.01	0.05	6.8
2021057_C006		3.35	7.17	0.08	0.19	0.09	0.016	0.31	40.3	14.5	0.79	488	3.30	0.03	0.08	22.0
2021057_021		3.23	1.46	0.05	0.09	0.06	0.021	0.26	20.8	2.9	0.33	313	0.51	0.01	<0.05	27.2
2021057_C001		2.42	1.47	0.05	0.15	0.04	0.020	0.36	16.4	2.4	0.07	611	0.90	0.03	<0.05	21.7
2021057_C002		2.32	1.16	0.05	0.16	0.13	0.025	0.29	18.6	2.9	0.09	1040	0.72	0.02	<0.05	29.1

***** See Appendix Page for comments regarding this certificate *****

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To: ALS ENVIRONMENTAL
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 27-OCT-2021
Account: ALSENV

Project: EB2129569

CERTIFICATE OF ANALYSIS BR21281947

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	P	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl
	Units	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm
	LOD	10	0.2	0.1	0.001	0.01	0.05	0.1	0.2	0.2	0.2	0.01	0.01	0.2	0.005	0.02
2021057_C003		480	17.6	67.0	<0.001	0.01	0.16	5.2	0.3	1.1	9.0	<0.01	0.02	14.2	0.073	0.45
2021057_C004		350	33.5	62.3	0.001	0.24	0.35	4.6	0.2	1.3	16.1	<0.01	0.02	13.7	0.108	0.49
2021057_C005		110	3.6	6.5	<0.001	0.01	0.11	1.1	<0.2	0.3	1.8	<0.01	<0.01	3.5	0.006	0.07
2021057_C006		370	17.3	28.2	0.002	0.09	5.26	3.6	0.2	0.6	12.2	<0.01	0.01	15.9	0.035	0.28
2021057_021		280	203	19.7	<0.001	1.83	4.73	1.9	<0.2	0.2	13.7	<0.01	0.06	14.6	<0.005	0.20
2021057_C001		270	460	22.6	<0.001	1.11	1.51	1.6	0.4	0.6	35.1	<0.01	1.57	4.7	<0.005	0.26
2021057_C002		290	390	19.7	<0.001	0.79	1.81	2.1	0.2	0.5	38.3	<0.01	1.63	5.2	<0.005	0.28

***** See Appendix Page for comments regarding this certificate *****

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To: ALS ENVIRONMENTAL
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 27-OCT-2021
Account: ALSENV

Project: EB2129569

CERTIFICATE OF ANALYSIS BR21281947

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	U	V	W	Y	Zn	Zr
	Units	ppm	ppm	ppm	ppm	ppm	ppm
	LOD	0.05	1	0.05	0.05	2	0.5
2021057_C003		2.33	41	0.12	12.65	166	17.9
2021057_C004		2.93	40	0.15	10.65	232	3.1
2021057_C005		0.39	7	0.24	2.32	11	3.3
2021057_C006		2.59	32	0.19	15.15	62	7.2
2021057_021		5.07	5	0.14	6.62	264	3.7
2021057_C001		1.48	4	0.29	5.58	193	5.8
2021057_C002		2.07	3	0.22	7.51	274	6.4

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Account: ALSENV

Project: EB2129569

CERTIFICATE OF ANALYSIS BR21281947

CERTIFICATE COMMENTS

ANALYTICAL COMMENTS

Applies to Method: ME-MS41

Gold determinations by this method are semi-quantitative due to the small sample weight used (0.5g).

ACCREDITATION COMMENTS

Applies to Method: ME-MS41

NATA Accreditation covers the performance of this service but does not cover the performance of ALS Brisbane Sample Preparation. Corporate Accreditation No: 825, Corporate Site No: 818. The Technical Signatory is David Jones,ICPMS Supervising Chemist

LABORATORY ADDRESSES

Applies to Method: LEV-01 LOG-22 ME-MS41

Processed at ALS Brisbane located at 32 Shand Street, Stafford, Brisbane, QLD, Australia. Processed at ALS Brisbane Sample Preparation at 23 Pineapple Street, Zillmere, QLD, 4034, Australia

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To: ALS ENVIRONMENTAL
32 SHAND STREET
STAFFORD QLD 4053

Finalized Date: 28-JAN-2022
Account: ALSENV

CERTIFICATE BR22011570

Project: EB2200723
P.O. No.: ME-MS41
This report is for 2 samples of Pulp submitted to our lab in Brisbane, QLD, Australia on 17-JAN-2022.
The following have access to data associated with this certificate:

SUB RESULTS -BRIS		

SAMPLE PREPARATION

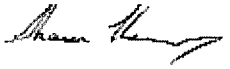
ALS CODE	DESCRIPTION
LOG-22	Sample login - Rcd w/o BarCode
LEV-01	Waste Disposal Levy

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
ME-MS41	Ultra Trace Aqua Regia ICP-MS	

This is the Final Report and supersedes any preliminary report with this certificate number.Results apply to samples as submitted.All pages of this report have been checked and approved for release.
***** See Appendix Page for comments regarding this certificate *****

Signature:



Shaun Kenny, Brisbane Laboratory Manager

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Finalized Date: 28-JAN-2022
Account: ALSENV

Project: EB2200723

CERTIFICATE OF ANALYSIS BR22011570

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Ag	Al	As	Au	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu
	Units	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
	LOD	0.01	0.01	0.1	0.02	10	10	0.05	0.01	0.01	0.01	0.02	0.1	1	0.05	0.2
PSM Woolgar Gold - 106 Slurr 2021057_022		1.00	0.32	78.8	0.10	<10	20	0.65	0.19	0.66	11.15	29.5	9.1	100	0.87	46.4
PSM Woolgar Gold - 106 Cakes 2021057_023		1.07	0.38	79.1	0.16	<10	20	0.71	0.21	0.69	10.55	32.4	9.1	99	0.98	45.4

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Project: EB2200723

CERTIFICATE OF ANALYSIS BR22011570

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Fe	Ga	Ge	Hf	Hg	In	La	Li	Mg	Mn	Mo	Nb	Ni	P	Pb
	Units	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
	LOD	0.01	0.05	0.05	0.02	0.01	0.005	0.2	0.1	0.01	5	0.05	0.05	0.2	10	0.2
PSM Woolgar Gold - 106 Slurr 2021057_022		2.94	1.09	0.06	0.07	0.09	0.024	14.2	175.5	0.28	554	10.00	<0.05	67.3	320	460
PSM Woolgar Gold - 106 Cakes 2021057_023		2.93	1.23	<0.05	0.08	0.10	0.022	15.7	470	0.28	548	10.25	<0.05	67.3	340	487

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Finalized Date: 28-JAN-2022
Account: ALSENV

Project: EB2200723

CERTIFICATE OF ANALYSIS BR22011570

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Rb	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W
	Units	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
	LOD	0.1	0.01	0.05	0.1	0.2	0.2	0.2	0.01	0.01	0.2	0.005	0.02	0.05	1	0.05
PSM Woolgar Gold - 106 Slurr 2021057_022		15.4	1.50	2.74	1.4	0.2	0.3	13.2	<0.01	0.14	10.1	<0.005	0.13	3.28	5	0.24
PSM Woolgar Gold - 106 Cakes 2021057_023		19.2	1.52	2.91	1.5	0.2	0.3	15.5	<0.01	0.15	10.3	<0.005	0.16	3.58	6	0.24

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CERTIFICATE OF ANALYSIS BR22011570

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41
	Analyte	Y	Zn	Zr
	Units	ppm	ppm	ppm
	LOD	0.05	2	0.5
PSM Woolgar Gold - 106 Slurr 2021057_022		4.71	628	2.8
PSM Woolgar Gold - 106 Cakes 2021057_023		5.05	569	3.0

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Finalized Date: 28-JAN-2022
Account: ALSENV

Project: EB2200723

CERTIFICATE OF ANALYSIS BR22011570

CERTIFICATE COMMENTS

ANALYTICAL COMMENTS

Applies to Method: ME-MS41

Gold determinations by this method are semi-quantitative due to the small sample weight used (0.5g).

ACCREDITATION COMMENTS

Applies to Method: ME-MS41

NATA Accreditation covers the performance of this service but does not cover the performance of ALS Brisbane Sample Preparation. Corporate Accreditation No: 825, Corporate Site No: 818. The Technical Signatory is David Jones,ICPMS Supervising Chemist

LABORATORY ADDRESSES

Applies to Method: LEV-01 LOG-22 ME-MS41

Processed at ALS Brisbane located at 32 Shand Street, Stafford, Brisbane, QLD, Australia. Processed at ALS Brisbane Sample Preparation at 23 Pineapple Street, Zillmere, QLD, 4034, Australia

Attachment D

RGS kinetic leach summary tables and trends

KLC 1 Waste Rock (Free Leach)

Weight (kg)	10.00	Total S (%)	0.14	ANC	50.0	Porosity	-	Density (kg/L)	-						
pH (1:5)	9.00	Scr (%)	0.129	NAPP	-46.0	Volume (L)	-	Rock/Water Ratio	7.14						
EC (µS/cm)	352	MPA	4.0	ANC:MPA	12.7	Pore Volume (L)	1.35	Surface Area	-						

Date			04-Feb-20	03-Mar-20	08-Apr-20	06-May-20	02-Jun-20	07-Jul-20	04-Aug-20	01-Sep-20	07-Oct-20	03-Nov-20	01-Dec-20	08-Jan-21	02-Feb-21
Number of Weeks			0	4	9	13	17	22	26	30	35	39	43	48	52
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12	13
ALS Laboratory Number			EB2002870001	EB2005928001	EB2009977001	EB2012199001	EB2014656001	EB2017856001	EB2020387001	EB2022964001	EB2026216001	EB2028814001	EB2031669001	EB2100143011	EB2102717001
Volume On (L)			1.4	1.4	1.9	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Volume Off (L)			0.381	0.754	0.573	0.882	0.906	0.926	0.946	0.467	0.505	0.570	0.605	0.209	0.750
Cum. Volume (L)			0.38	1.14	1.71	2.59	3.50	4.42	5.37	5.84	6.34	6.91	7.52	7.72	8.47
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.3	0.8	1.3	1.9	2.6	3.3	4.0	4.3	4.7	5.1	5.6	5.7	6.3
pH (RGS Measurement)	6 to 9	-	7.67	7.48	7.98	8.03	7.25	7.58	8.15	7.44	7.76	7.73	7.96	8.12	7.37
pH (ALS Measurement)			7.16	6.88	7.41	7.26	7.71	7.05	7.69	7.54	7.21	7.73	7.69	8.06	7.28
pH (deionised water used in test)		-	5.20	5.71	6.01	6.35	6.75	6.73	6.48	6.23	6.59	6.03	6.70	5.86	5.96
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	1,325	1,509	927	945	819	778	620	677	611	674	686	983	499
EC (ALS Measurement) (µS/cm)			1,430	1,560	990	993	901	799	793	812	625	696	687	1,050	554
Acidity (mg/L as $CaCO_3$)*	-	-	1.0	4.0	5.0	1.0	4.0	1.0	1.0	2.0	2.0	2.0	3.0	1.0	5.0
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	30	34	33	41	41	41	42	43	36	64	65	116	36
Total Alkalinity (mg/L as CaCO)*	-	-	30	34	33	41	41	41	42	43	36	64	65	116	36

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]	(All units mg/L)										
Calcium	Ca	1	-	1000	82	102	47	54	47	40	38	43	31	36	37	66	31
Potassium	K	1	-	-	25	26	17	15	14	13	12	13	11	15	14	21	11
Magnesium	Mg	1	-	-	30	44	23	27	25	25	22	27	19	22	24	42	19
Sodium	Na	1	-	-	152	184	106	107	97	88	75	84	62	64	64	98	45
Chloride	Cl	1	-	-	110	122	53	53	57	42	38	34	26	23	20	29	13
Fluoride	F	0.1	-	2	0.3	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.7	0.3
Sulfate	SO	1	-	1,000	490	600	349	336	314	256	248	301	224	238	248	397	194
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**	(All units mg/L)										
Aluminium	Al	0.01	0.055	5	0.02	<0.01	0.10	<0.01	<0.01	<0.01	0.01	<0.01	0.01	0.02	0.02	0.04	0.02
Arsenic	As	0.001	0.024 (tri)*	0.5	0.002	0.004	0.004	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.007	0.002
Boron	B	0.05	0.37	5	0.06	0.13	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.08	<0.05
Cadmium	Cd	0.0001	0.0002	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
Cobalt	Co	0.001	-	1	0.003	<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	0.001 (hex)*	1 (total)	<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
Copper	Cu	0.001	0.0014	1	0.013	0.002	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	0.001	0.002	0.001
Iron	Fe	0.05	-	-	0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<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
Manganese	Mn	0.001	1.9	-	0.198	0.063	0.023	0.007	0.002	0.004	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	0.001	-	0.15	0.011	0.014	0.006	0.004	0.004	0.005	0.005	0.004	0.004	0.006	0.007	0.011	0.004
Nickel	Ni	0.001	0.011	1	0.009	0.002	<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	0.0034	0.1	<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	-	-	0.004	0.016	0.012	0.010	0.009	0.008	0.007	0.010	0.010	0.015	0.013	0.021	0.009
Selenium	Se	0.01	0.011	0.02	<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
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
Uranium	U	0.001	-	-	0.001	0.006	0.005	0.008	0.010	0.013	0.012	0.010	0.007	0.011	0.012	0.020	0.006
Vanadium	V	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
Zinc	Zn	0.005	0.008	-	0.038	0.020	0.032	<0.005	0.006	0.005	0.007	0.014	0.007	0.009	0.010	0.012	0.009

Calculations**	Elements													
SO_4 Release Rate	SO	19	45	20	30	28	24	23	14	11	14	15	8	15
Cumulative SO Release	Cum SO	19	64	84	114	142	166	189	203	215	228	243	251	266
Ca Release Rate	Ca	3.1	7.7	2.7	4.8	4.3	3.7	3.6	2.0	1.6	2.1	2.2	1.4	2.3
Cumulative Ca Release	Cum Ca	3.1	10.8	13.5	18.3	22.5	26.2	29.8	31.8	33.4	35.5	37.7	39.1	41.4
Mg Release Rate	Mg	1.1	3.3	1.3	2.4	2.3	2.3	2.1	1.3	1.0	1.3	1.5	0.9	1.4
Cumulative Mg Release	Cum Mg	1.1	4.5	5.8	8.2	10.4	12.7	14.8	16.1	17.0	18.3	19.7	20.6	22.1
Residual ANC (%)	Res. ANC	100.0	99.9	99.9	99.8	99.8	99.8	99.7	99.7	99.7	99.7	99.7	99.6	99.6
Residual Sulfur (%)	Res. S	99.6	98.5	98.0	97.3	96.6	96.0	95.5	95.2	94.9	94.6	94.2	94.0	93.7
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)	1.6	1.4	1.7	1.4	1.5	1.3	1.4	1.4	1.5	1.4	1.4	1.2	1.3

Notes:

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines. Recommended guideline limits for 1. freshwater aquatic ecosystems (95 % species protection) and 2. livestock drinking water.

< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 2 Waste Rock (Free Leach)

Weight (kg)	10.00	Total S (%)	0.32	ANC	119.0	Porosity	-	Density (kg/L)	-				
pH (1:5)	9.00	Scr (%)	0.301	NAPP	-109.8	Volume (L)	-	Rock/Water Ratio	7.14				
EC (µS/cm)	272	MPA	9.2	ANC:MPA	12.9	Pore Volume (L)	1.35	Surface Area	-				

Date			04-Feb-20	03-Mar-20	08-Apr-20	06-May-20	02-Jun-20	07-Jul-20	04-Aug-20	01-Sep-20	07-Oct-20	03-Nov-20	01-Dec-20	08-Jan-21	02-Feb-21
Number of Weeks			0	4	9	13	17	22	26	30	35	39	43	48	52
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12	13
ALS Laboratory Number			EB2002870002	EB2005928002	EB2009977002	EB2012199002	EB2014656002	EB2017856002	EB2020387002	EB2022964002	EB2026216002	EB2028814002	EB2031669002	EB2100143013	EB2102717002
Volume On (L)			1.4	1.4	1.9	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Volume Off (L)			0.443	0.299	0.573	0.882	0.603	0.467	0.488	0.482	0.946	0.462	0.371	0.314	0.298
Cum. Volume (L)			0.44	0.74	1.32	2.20	2.80	3.27	3.76	4.24	5.18	5.65	6.02	6.33	6.63
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.3	0.5	1.0	1.6	2.1	2.4	2.8	3.1	3.8	4.2	4.5	4.7	4.9
pH (RGS Measurement)	6 to 9	-	7.70	7.72	7.98	8.03	7.81	7.72	8.07	7.60	7.88	7.80	8.05	7.65	7.71
pH (ALS Measurement)			7.83	7.08	7.65	7.69	7.81	7.23	7.72	7.77	7.71	7.74	7.71	7.82	7.72
pH (deionised water used in test)		-	5.20	5.71	6.01	6.35	6.75	6.73	6.48	6.23	6.59	6.03	6.70	5.86	5.96
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	1,385	548	524	390	324	304	269	300	417	331	365	379	381
EC (ALS Measurement) (µS/cm)			1,470	575	557	394	356	305	346	354	430	353	359	396	429
Acidity (mg/L as $CaCO_3$)*	-	-	2.0	3.0	3.0	<1	2.0	1.0	1.0	2.0	1.0	2.0	2.0	2.0	3.0
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	119	35	38	49	47	45	52	44	63	45	44	44	51
Total Alkalinity (mg/L as CaCO)*	-	-	119	35	38	49	47	45	52	44	63	45	44	44	51

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]											
					(All units mg/L)										
Calcium	Ca	1	-	1000	185	44	45	38	34	30	32	35	44	33	34	39	44
Potassium	K	1	-	-	23	12	10	8	6	5	5	5	6	6	6	4	5
Magnesium	Mg	1	-	-	36	14	15	12	12	12	12	14	18	14	15	18	19
Sodium	Na	1	-	-	81	48	35	22	17	14	11	14	14	11	11	10	9
Chloride	Cl	1	-	-	41	18	11	7	6	4	4	5	4	3	4	3	3
Fluoride	F*	0.1	-	2	0.4	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
Sulfate	SO	1	-	1,000	582	193	184	142	110	100	105	119	139	116	124	142	147
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**											
					(All units mg/L)										
Aluminium	Al	0.01	0.055	5	<0.01	0.04	0.02	0.03	0.03	0.04	0.04	0.06	0.05	0.14	0.06	0.07	0.06
Arsenic	As	0.001	0.024 (tri)*	0.5	0.002	0.010	0.009	0.007	0.006	0.005	0.004	0.003	0.003	0.003	0.003	0.006	0.002
Boron	B	0.05	0.37	5	0.10	0.16	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	Cd	0.0001	0.0002	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
Cobalt	Co	0.001	-	1	0.036	<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	0.001 (hex)*	1 (total)	<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
Copper	Cu	0.001	0.0014	1	0.007	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	-	-	0.30	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<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
Manganese	Mn	0.001	1.9	-	1.020	0.056	0.049	0.048	0.026	0.012	0.003	0.001	0.001	0.031	<0.001	<0.001	<0.001
Molybdenum	Mo	0.001	-	0.15	0.002	0.002	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	0.011	1	0.044	0.002	<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	0.0034	0.1	<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	-	-	0.004	0.012	0.010	0.006	0.006	0.005	0.004	0.003	0.005	0.004	0.005	0.005	0.004
Selenium	Se	0.01	0.011	0.02	<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
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
Uranium	U	0.001	-	-	0.014	0.004	0.005	0.004	0.004	0.005	0.005	0.004	0.006	0.004	0.004	0.004	0.004
Vanadium	V	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
Zinc	Zn	0.005	0.008	-	0.017	0.006	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.018	0.007	0.011	0.011

Calculations**	Elements													
SO_4 Release Rate	SO*		26	6	11	13	7	5	5	6	13	5	5	4	4
Cumulative SO Release	Cum SO		26	32	42	55	61	66	71	77	90	95	100	104	109
Ca Release Rate	Ca		8.2	1.3	2.6	3.4	2.1	1.4	1.6	1.7	4.2	1.5	1.3	1.2	1.3
Cumulative Ca Release	Cum Ca		8.2	9.5	12.1	15.4	17.5	18.9	20.5	22.1	26.3	27.8	29.1	30.3	31.6
Mg Release Rate	Mg		1.6	0.4	0.9	1.1	0.7	0.6	0.6	0.7	1.7	0.6	0.6	0.6	0.6
Cumulative Mg Release	Cum Mg		1.6	2.0	2.9	3.9	4.7	5.2	5.8	6.5	8.2	8.8	9.4	9.9	10.5
Residual ANC (%)	Res. ANC		100.0	100.0	100.0	100.0	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
Residual Sulfur (%)	Res. S		99.7	99.7	99.6	99.4	99.4	99.3	99.3	99.2	99.1	99.0	99.0	98.9	98.9
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)		1.0	1.2	1.1	1.0	0.9	0.8	0.8	0.9	0.8	0.9	0.9	0.9	0.8

Notes:

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< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 3 Waste Rock (Free Leach)

Weight (kg)	10.00	Total S (%)	0.06	ANC	75.2	Porosity	-	Density (kg/L)	-				
pH (1:5)	9.60	Scr (%)	0.055	NAPP	-73.5	Volume (L)	-	Rock/Water Ratio	7.14				
EC (µS/cm)	204	MPA	1.7	ANC:MPA	44.6	Pore Volume (L)	1.35	Surface Area	-				

Date			04-Feb-20	03-Mar-20	07-Apr-20	06-May-20	02-Jun-20	07-Jul-20	04-Aug-20	01-Sep-20	07-Oct-20	03-Nov-20	01-Dec-20	05-Jan-21	02-Feb-21
Number of Weeks			0	4	9	13	17	22	26	30	35	39	43	48	52
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12	13
ALS Laboratory Number			EB2002870003	EB2005928003	EB2009977003	EB2012199003	EB2014656003	EB2017856003	EB2020387003	EB2022964003	EB2026216003	EB2028814003	EB2031669003	EB2100143003	EB2102717003
Volume On (L)			1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Volume Off (L)			0.890	0.934	0.960	0.928	0.889	0.904	0.884	0.999	0.449	1.066	1.072	0.964	1.361
Cum. Volume (L)			0.89	1.82	2.78	3.71	4.60	5.51	6.39	7.39	7.84	8.90	9.98	10.94	12.30
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.7	1.4	2.1	2.7	3.4	4.1	4.7	5.5	5.8	6.6	7.4	8.1	9.1
pH (RGS Measurement)	6 to 9	-	9.21	9.09	9.35	9.15	8.88	9.08	9.13	8.48	8.19	8.14	8.42	8.79	8.40
pH (ALS Measurement)			8.73	8.58	9.08	8.68	8.75	8.84	8.31	8.05	7.84	7.99	7.85	8.46	7.87
pH (deionised water used in test)		-	5.20	5.71	6.43	6.35	6.75	6.73	6.48	6.23	6.59	6.03	6.70	6.06	5.96
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	292	232	170	168	157	117	116	137	163	186	189	162	131
EC (ALS Measurement) (µS/cm)			316	240	177	170	173	115	144	162	159	193	182	146	140
Acidity (mg/L as $CaCO_3$)*	-	-	6.0	<1	1.0	<1	<1	<1	<1	<1	<1	1.0	<1	<1	<1
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	17	14	18	10	9	20	2	<1	<1	<1	<1	1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	61	55	42	55	54	38	46	61	57	68	68	46	51
Total Alkalinity (mg/L as CaCO)*	-	-	78	69	59	65	63	58	48	61	57	68	68	47	51

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]	(All units mg/L)												
Calcium	Ca	1	-	1000	4	3	2	3	3	3	3	4	5	5	5	5	6
Potassium	K	1	-	-	3	2	1	1	1	1	1	2	2	2	2	2	2
Magnesium	Mg	1	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium	Na	1	-	-	58	53	35	38	35	25	26	32	30	35	35	26	24
Chloride	Cl	1	-	-	12	6	2	2	3	1	2	2	1	<1	2	<1	<1
Fluoride	F*	0.1	-	2	0.9	0.8	0.6	0.4	0.4	0.3	0.2	0.3	0.3	0.4	0.3	0.2	0.2
Sulfate	SO	1	-	1,000	46	36	25	25	22	15	15	18	20	27	24	20	17
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**	(All units mg/L)												
Aluminium	Al	0.01	0.055	5	0.19	0.10	0.14	0.07	0.06	0.06	0.06	0.04	0.05	0.06	0.06	0.06	0.04
Arsenic	As	0.001	0.024 (tri)*	0.5	0.006	0.017	0.017	0.017	0.017	0.012	0.014	0.016	0.015	0.022	0.022	0.016	0.013
Boron	B	0.05	0.37	5	0.09	0.18	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.06
Cadmium	Cd	0.0001	0.0002	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
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	<0.001	<0.001
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<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
Copper	Cu	0.001	0.0014	1	0.002	<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	-	-	0.09	<0.05	0.10	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<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
Manganese	Mn	0.001	1.9	-	0.007	0.005	0.008	0.008	0.004	0.007	0.004	0.003	0.007	0.001	0.001	0.002	0.002
Molybdenum	Mo	0.001	-	0.15	0.003	0.004	0.002	0.002	0.003	0.005	0.006	0.005	0.006	0.005	0.006	0.004	0.004
Nickel	Ni	0.001	0.011	1	<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	0.0034	0.1	<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	-	-	0.002	0.012	0.008	0.008	0.008	0.004	0.005	0.006	0.013	0.008	0.007	0.011	0.013
Selenium	Se	0.01	0.011	0.02	<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
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
Uranium	U	0.001	-	-	<0.001	0.005	0.005	0.005	0.007	0.007	0.007	0.006	0.006	0.007	0.007	0.004	0.004
Vanadium	V	0.01	-	-	0.06	0.06	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02
Zinc	Zn	0.005	0.008	-	<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

Calculations**	Elements													
SO_4 Release Rate	SO*	4	3	2	2	2	1	1	2	1	3	3	2	2
Cumulative SO Release	Cum SO	4	7	10	12	14	15	17	19	20	22	25	27	29
Ca Release Rate	Ca	0.4	0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.2	0.5	0.5	0.5	0.8
Cumulative Ca Release	Cum Ca	0.4	0.6	0.8	1.1	1.4	1.6	1.9	2.3	2.5	3.1	3.6	4.1	4.9
Mg Release Rate	Mg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1
Cumulative Mg Release	Cum Mg	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6
Residual ANC (%)	Res. ANC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Residual Sulfur (%)	Res. S	99.8	99.6	99.5	99.3	99.2	99.1	99.1	99.0	98.9	98.8	98.6	98.5	98.4
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)	4.0	3.9	3.7	2.7	2.4	1.6	1.6	1.6	1.4	1.9	1.7	1.4	1.0

Notes:

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< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 4 Waste Rock (Free Leach)

Weight (kg)	10.00	Total S (%)	1.11	ANC	106.0	Porosity	-	Density (kg/L)	-						
pH (1:5)	8.80	Scr (%)	0.802	NAPP	-81.4	Volume (L)	-	Rock/Water Ratio	7.14						
EC (µS/cm)	593.0	MPA	24.6	ANC:MPA	4.3	Pore Volume (L)	1.35	Surface Area	-						

Date			04-Feb-20	03-Mar-20	07-Apr-20	06-May-20	02-Jun-20	07-Jul-20	08-Jul-20	01-Sep-20	07-Oct-20	03-Nov-20	01-Dec-20	05-Jan-21	02-Feb-21
Number of Weeks			0	4	9	13	17	22	22	30	35	39	43	48	52
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12	13
ALS Laboratory Number			EB2002870004	EB2005928004	EB2009977004	EB2012199004	EB2014656004	EB2017856004	EB2020387004	EB2022964004	EB2026216004	EB2028814004	EB2031669004	EB2100143004	EB2102717004
Volume On (L)			1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Volume Off (L)			0.474	0.888	0.884	0.916	0.920	1.074	1.084	1.071	0.933	1.012	1.025	1.064	1.072
Cum. Volume (L)			0.47	1.36	2.25	3.16	4.08	5.16	6.24	7.31	8.24	9.26	10.28	11.35	12.42
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.4	1.0	1.7	2.3	3.0	3.8	4.6	5.4	6.1	6.9	7.6	8.4	9.2
pH (RGS Measurement)	6 to 9	-	7.80	7.62	7.92	7.99	8.03	8.31	8.36	7.71	7.86	7.83	8.12	8.37	8.13
pH (ALS Measurement)			7.2	6.85	7.42	7.39	7.63	7.00	7.59	7.58	7.12	7.49	7.63	8.31	7.54
pH (deionised water used in test)		-	5.20	5.71	6.43	6.35	6.75	6.73	6.48	6.23	6.59	6.03	6.70	5.86	5.96
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	797	721	393	417	318	296	303	305	265	257	304	410	232
EC (ALS Measurement) (µS/cm)			847	751	411	437	356	293	382	356	265	274	297	401	259
Acidity (mg/L as $CaCO_3$)*	-	-	1.0	2.0	2.0	<1	2.0	<1	<1	1.0	1.0	2.0	2.0	<1	2.0
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	32	28	20	27	26	37	45	30	18	30	35	59	26
Total Alkalinity (mg/L as CaCO)*	-	-	32	28	20	27	26	37	45	30	18	30	35	60	26

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]											
					(All units mg/L)										
Calcium	Ca	1	-	1000	42	38	20	23	18	16	20	20	13	14	15	22	12
Potassium	K	1	-	-	20	16	10	8	7	6	7	7	5	6	6	8	5
Magnesium	Mg	1	-	-	26	29	15	17	16	15	18	20	14	14	18	27	16
Sodium	Na	1	-	-	71	68	31	27	23	18	20	19	13	12	13	13	10
Chloride	Cl	1	-	-	42	32	11	10	10	6	7	6	4	4	4	3	2
Fluoride	F*	0.1	-	2	0.3	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	<0.1
Sulfate	SO	1	-	1,000	275	277	146	162	126	112	128	137	92	87	100	125	84
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**											
					(All units mg/L)										
Aluminium	Al	0.01	0.055	5	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.04	0.02	0.02	0.02	0.01	0.02
Arsenic	As	0.001	0.024 (tri)*	0.5	0.013	0.050	0.038	0.024	0.020	0.017	0.017	0.015	0.011	0.013	0.014	0.013	0.010
Boron	B	0.05	0.37	5	0.08	0.16	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	Cd	0.0001	0.0002	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
Cobalt	Co	0.001	-	1	0.002	<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	0.001 (hex)*	1 (total)	<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
Copper	Cu	0.001	0.0014	1	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	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<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
Manganese	Mn	0.001	1.9	-	0.178	0.059	0.018	0.007	0.004	0.002	0.001	0.001	0.001	<0.001	0.001	0.002	<0.001
Molybdenum	Mo	0.001	-	0.15	0.001	0.002	<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	0.011	1	0.008	0.003	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	0.0034	0.1	<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	-	-	0.012	0.020	0.015	0.011	0.009	0.007	0.008	0.007	0.005	0.008	0.008	0.008	0.007
Selenium	Se	0.01	0.011	0.02	<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
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
Uranium	U	0.001	-	-	0.005	0.014	0.009	0.013	0.016	0.020	0.024	0.016	0.008	0.012	0.014	0.012	0.012
Vanadium	V	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
Zinc	Zn	0.005	0.008	-	0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Calculations**	Elements													
SO_4 Release Rate	SO*	13	25	13	15	12	12	14	15	9	9	10	13	9
Cumulative SO Release	Cum SO	13	38	51	65	77	89	103	118	126	135	145	158	167
Ca Release Rate	Ca	2.0	3.4	1.8	2.1	1.7	1.7	2.2	2.1	1.2	1.4	1.5	2.3	1.3
Cumulative Ca Release	Cum Ca	2.0	5.4	7.1	9.2	10.9	12.6	14.8	16.9	18.1	19.6	21.1	23.4	24.7
Mg Release Rate	Mg	1.2	2.6	1.3	1.6	1.5	1.6	2.0	2.1	1.3	1.4	1.8	2.9	1.7
Cumulative Mg Release	Cum Mg	1.2	3.8	5.1	6.7	8.2	9.8	11.7	13.9	15.2	16.6	18.4	21.3	23.0
Residual ANC (%)	Res. ANC	100.0	100.0	100.0	100.0	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
Residual Sulfur (%)*	Res. S	100.0	99.9	99.8	99.8	99.8	99.7	99.7	99.6	99.6	99.6	99.6	99.5	99.5
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)	1.4	1.3	1.4	1.3	1.2	1.1	1.1	1.1	1.1	1.0	0.9	0.8	0.9

Notes:

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< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 5 Waste Rock (Free Leach)

Weight (kg)	10.00	Total S (%)	0.43	ANC	38.2	Porosity	-	Density (kg/L)	-						
pH (1:5)	9.40	Scr (%)	0.371	NAPP	-26.8	Volume (L)	-	Rock/Water Ratio	7.14						
EC (µS/cm)	214	MPA	11.4	ANC:MPA	3.4	Pore Volume (L)	1.35	Surface Area	-						

Date			04-Feb-20	03-Mar-20	07-Apr-20	06-May-20	02-Jun-20	07-Jul-20	04-Aug-20	01-Sep-20	07-Oct-20	03-Nov-20	01-Dec-20	05-Jan-21	02-Feb-21
Number of Weeks			0	4	9	13	17	22	26	30	35	39	43	48	52
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12	13
ALS Laboratory Number			EB2002870005	EB2005928005	EB2009977005	EB2012199005	EB2014656005	EB2017856005	EB2020387005	EB2022964005	EB2026216005	EB2028814005	EB2031669005	EB2100143005	EB2102717005
Volume On (L)			1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Volume Off (L)			0.383	0.360	0.908	0.664	0.595	0.595	0.989	0.872	0.825	0.895	0.821	0.756	0.858
Cum. Volume (L)			0.38	0.74	1.65	2.32	2.91	3.51	4.49	5.37	6.19	7.09	7.91	8.66	9.52
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.3	0.6	1.2	1.7	2.2	2.6	3.3	4.0	4.6	5.2	5.9	6.4	7.1
pH (RGS Measurement)	6 to 9	-	7.60	7.48	7.76	7.78	7.58	7.58	8.22	7.78	7.91	7.80	8.04	8.06	7.85
pH (ALS Measurement)			7.24	6.87	7.48	7.33	7.62	7.10	7.64	7.65	7.38	7.61	7.64	7.90	7.35
pH (deionised water used in test)		-	5.20	5.71	6.43	6.35	6.75	6.75	6.48	6.23	6.59	6.03	6.70	6.06	5.96
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	695	681	502	608	392	392	333	307	298	279	297	326	277
EC (ALS Measurement) (µS/cm)			754	709	544	646	434	429	423	362	305	290	290	310	308
Acidity (mg/L as $CaCO_3$)*	-	-	1.0	4.0	2.0	1.0	1.0	1.0	1.0	<1	1.0	2.0	2.0	<1	2.0
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	36	26	27	26	27	68	34	34	30	34	35	30	20
Total Alkalinity (mg/L as CaCO)*	-	-	36	26	27	26	27	68	34	34	30	34	35	30	20

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]	(All units mg/L)										
Calcium	Ca	1	-	1000	39	35	24	30	19	20	18	18	15	13	13	15	11
Potassium	K	1	-	-	18	15	11	10	7	8	7	7	6	7	6	6	5
Magnesium	Mg	1	-	-	23	26	19	26	18	22	20	20	16	16	18	20	21
Sodium	Na	1	-	-	62	65	41	48	33	33	26	23	16	14	13	13	10
Chloride	Cl	1	-	-	34	36	21	23	16	12	11	8	4	5	4	3	2
Fluoride	F◆	0.1	-	2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	<0.1
Sulfate	SO	1	-	1,000	235	240	174	213	146	153	134	126	99	87	97	104	112
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**	(All units mg/L)										
Aluminium	Al	0.01	0.055	5	0.02	<0.01	0.01	<0.01	0.01	0.01	0.02	0.03	0.03	0.03	0.03	0.04	0.02
Arsenic	As	0.001	0.024 (tri)*	0.5	0.014	0.050	0.042	0.029	0.022	0.020	0.017	0.017	0.017	0.015	0.013	0.012	0.006
Boron	B	0.05	0.37	5	0.06	0.06	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	Cd	0.0001	0.0002	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
Cobalt	Co	0.001	-	1	0.002	<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	0.001 (hex)*	1 (total)	<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
Copper	Cu	0.001	0.0014	1	0.002	<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	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<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
Manganese	Mn	0.001	1.9	-	0.156	0.024	0.018	0.009	0.002	<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
Nickel	Ni	0.001	0.011	1	0.008	0.002	<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	0.0034	0.1	<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	-	-	0.013	0.027	0.016	0.012	0.010	0.009	0.008	0.008	0.008	0.008	0.007	0.006	0.004
Selenium	Se	0.01	0.011	0.02	<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
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
Uranium	U	0.001	-	-	0.004	0.009	0.010	0.010	0.012	0.026	0.020	0.012	0.009	0.009	0.008	0.006	0.004
Vanadium	V	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
Zinc	Zn	0.005	0.008	-	0.010	0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006

Calculations**	Elements													
SO_4 Release Rate	SO◆	9	9	16	14	9	9	13	11	8	8	8	8	10
Cumulative SO Release	Cum SO	9	18	33	48	56	65	79	90	98	106	114	121	131
Ca Release Rate	Ca	1.5	1.3	2.2	2.0	1.1	1.2	1.8	1.6	1.2	1.2	1.1	1.1	0.9
Cumulative Ca Release	Cum Ca	1.5	2.8	4.9	6.9	8.1	9.2	11.0	12.6	13.8	15.0	16.1	17.2	18.1
Mg Release Rate	Mg	0.9	0.9	1.7	1.7	1.1	1.3	2.0	1.7	1.3	1.4	1.5	1.5	1.8
Cumulative Mg Release	Cum Mg	0.9	1.8	3.5	5.3	6.3	7.6	9.6	11.4	12.7	14.1	15.6	17.1	18.9
Residual ANC (%)	Res. ANC	100.0	100.0	99.9	99.9	99.9	99.9	99.8	99.8	99.8	99.8	99.7	99.7	99.7
Residual Sulfur (%)	Res. S	99.9	99.9	99.7	99.6	99.6	99.5	99.4	99.3	99.2	99.2	99.1	99.1	99.0
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)	1.3	1.3	1.3	1.2	1.3	1.1	1.1	1.0	1.0	0.9	0.9	0.9	1.0

Notes:

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< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 6 Waste Rock (Free Leach)

Weight (kg)	8.90	Total S (%)	0.72	ANC	36.7	Porosity	-	Density (kg/L)	-				
pH (1:5)	9.20	Scr (%)	0.554	NAPP	-19.7	Volume (L)	-	Rock/Water Ratio	6.36				
EC (µS/cm)	258	MPA	16.97	ANC:MPA	2.2	Pore Volume (L)	1.35	Surface Area	-				

Date			04-Feb-20	03-Mar-20	07-Apr-20	03-May-20	02-Jun-20	07-Jul-20	04-Aug-20	01-Sep-20	07-Oct-20	03-Nov-20	02-Dec-20	05-Jan-21	02-Feb-21
Number of Weeks			0	4	9	13	17	22	26	30	35	39	43	48	52
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12	13
ALS Laboratory Number			EB2002870006	EB2005928006	EB2009977006	Extrapolated data	EB2014656006	EB2017856006	EB2020387006	EB2022964006	EB2026216006	EB2028814006	EB2031669006	EB2100143006	EB2102717006
Volume On (L)			1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Volume Off (L)			0.927	0.945	0.868	0.951	1.033	1.046	1.052	1.034	1.042	1.016	1.031	1.005	0.989
Cum. Volume (L)			0.93	1.87	2.74	3.65	4.68	5.73	6.78	7.81	8.85	9.87	10.90	11.91	12.89
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.7	1.4	2.0	2.7	3.5	4.2	5.0	5.8	6.6	7.3	8.1	8.8	9.6
pH (RGS Measurement)	6 to 9	-	6.73	7.26	7.44	7.35	7.26	7.81	8.00	7.58	7.56	7.51	7.73	7.82	7.65
pH (ALS Measurement)			6.89	6.68	7.17	7.28	7.38	6.75	7.30	7.30	7.03	7.26	7.33	7.58	7.36
pH (deionised water used in test)		-	5.20	5.71	6.43	6.59	6.75	6.73	6.48	6.23	6.59	6.03	6.70	6.06	5.96
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	940	674	600	534	467	443	340	323	419	381	383	389	324
EC (ALS Measurement) (µS/cm)			1,010	705	649	583	517	437	427	378	428	381	378	378	362
Acidity (mg/L as $CaCO_3$)*	-	-	1.0	2.0	2.0	1.5	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0	3.0
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	28	27	17	20	22	17	13	16	16	21	21	16	22
Total Alkalinity (mg/L as CaCO)*	-	-	28	27	17	20	22	17	13	16	16	21	21	16	22

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]	(All units mg/L)												
Calcium	Ca	1	-	1000	103	78	65	60	55	47	42	43	48	40	38	44	36
Potassium	K	1	-	-	17	10	7	6	5	4	3	4	4	4	4	3	3
Magnesium	Mg	1	-	-	35	29	24	24	23	21	18	18	18	16	18	18	18
Sodium	Na	1	-	-	44	31	19	16	12	10	7	6	5	5	4	4	3
Chloride	Cl	1	-	-	23	14	8	7	6	4	3	2	2	1	1	<1	<1
Fluoride	F*	0.1	-	2	0.10	0.30	0.20	0.20	0.20	0.10	0.10	0.10	0.10	<0.1	<0.1	<0.1	<0.1
Sulfate	SO	1	-	1,000	435	317	280	242	204	198	171	160	181	154	158	156	141
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**	(All units mg/L)												
Aluminium	Al	0.01	0.055	5	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Arsenic	As	0.001	0.024 (tri)*	0.5	<0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Boron	B	0.05	0.37	5	0.08	0.09	0.06	0.003	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	Cd	0.0001	0.0002	0.01	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	Co	0.001	-	1	0.092	<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	0.001 (hex)*	1 (total)	<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
Copper	Cu	0.001	0.0014	1	<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	-	-	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<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
Manganese	Mn	0.001	1.9	-	1.480	0.148	0.076	0.038	0.004	0.003	0.002	0.003	0.005	0.003	0.003	0.006	0.002
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
Nickel	Ni	0.001	0.011	1	0.171	0.002	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	0.0034	0.1	<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	-	-	0.001	0.009	0.007	0.007	0.007	0.005	0.006	0.005	0.006	0.007	0.007	0.006	0.006
Selenium	Se	0.01	0.011	0.02	<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
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
Uranium	U	0.001	-	-	<0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
Vanadium	V	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
Zinc	Zn	0.005	0.008	-	0.059	<0.005	0.018	0.009	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005

Calculations**	Elements													
SO_4 Release Rate	SO*	45	34	27	26	24	23	20	19	21	18	18	18	16
Cumulative SO Release	Cum SO	45	79	106	132	156	179	199	218	239	257	275	293	308
Ca Release Rate	Ca	10.7	8.3	6.3	6.4	6.4	5.5	5.0	5.0	5.6	4.6	4.4	5.0	4.0
Cumulative Ca Release	Cum Ca	10.7	19.0	25.3	31.8	38.1	43.7	48.6	53.6	59.2	63.8	68.2	73.2	77.2
Mg Release Rate	Mg	3.6	3.1	2.3	2.6	2.7	2.5	2.1	2.1	2.1	1.8	2.1	2.0	2.0
Cumulative Mg Release	Cum Mg	3.6	6.7	9.1	11.6	14.3	16.8	18.9	21.0	23.1	24.9	27.0	29.0	31.0
Residual ANC (%)	Res. ANC	99.9	99.8	99.7	99.7	99.6	99.5	99.5	99.4	99.4	99.3	99.2	99.2	99.1
Residual Sulfur (%)	Res. S	99.8	99.6	99.5	99.4	99.3	99.2	99.1	99.0	98.9	98.8	98.7	98.6	98.6
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)	1.1	1.1	1.1	1.0	0.9	1.0	1.0	0.9	1.0	1.0	1.0	0.9	0.9

Notes:

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< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 7 Waste Rock (Free Leach)

Weight (kg)	2.50	Total S (%)	1.79	ANC	43.4	Porosity	-	Density (kg/L)	-				
pH (1:5)	8.90	Scr (%)	1.36	NAPP	-1.7	Volume (L)	-	Rock/Water Ratio	1.79				
EC (µS/cm)	415	MPA	41.7	ANC:MPA	1.0	Pore Volume (L)	1.35	Surface Area	-				

Date			04-Feb-20	03-Mar-20	07-Apr-20	03-May-20	02-Jun-20	07-Jul-20	04-Aug-20	01-Sep-20	07-Oct-20	03-Nov-20	01-Dec-20	05-Jan-21	02-Feb-21
Number of Weeks			0	4	9	13	17	22	26	30	35	39	43	48	52
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12	13
ALS Laboratory Number			EB2002870007	EB2005928007	EB2009977007	Extrapolated data	EB2014656007	EB2017856007	EB2020387007	EB2022964007	EB2026216007	EB2028814007	EB2031669007	EB2100143007	EB2102717007
Volume On (L)			1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Volume Off (L)			0.627	1.016	1.002	1.016	1.030	1.007	1.021	1.019	0.965	1.027	0.979	0.981	1.007
Cum. Volume (L)			0.63	1.64	2.65	3.66	4.69	5.70	6.72	7.74	8.70	9.73	10.71	11.69	12.70
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.5	1.2	2.0	2.7	3.5	4.2	5.0	5.7	6.4	7.2	7.9	8.7	9.4
pH (RGS Measurement)	6 to 9	-	4.84	7.01	7.14	7.16	7.18	7.58	7.83	8.00	7.47	7.36	7.63	7.61	7.59
pH (ALS Measurement)			4.70	6.61	7.01	7.16	7.30	6.67	7.18	7.27	7.03	7.25	7.31	7.57	7.36
pH (deionised water used in test)		-	5.20	5.71	6.43	6.59	6.75	6.73	6.48	6.23	6.59	6.03	6.70	6.06	5.96
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	898	764	589	496	403	379	266	276	430	374	391	461	379
EC (ALS Measurement) (µS/cm)			991	802	639	546	452	376	332	318	441	385	388	449	423
Acidity (mg/L as $CaCO_3$)*	-	-	72.0	2.0	2.0	2.0	1.0	1.0	2.0	1.0	2.0	2.0	2.0	1.0	3.0
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	<1	14	11	13	14	17	31	15	21	18	23	21	21
Total Alkalinity (mg/L as CaCO)*	-	-	<1	14	11	13	14	17	31	15	21	18	23	21	21

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]	(All units mg/L)										
Calcium	Ca	1	-	1000	104	122	85	71	57	48	38	38	56	44	43	54	47
Potassium	K	1	-	-	11	6	4	3	2	2	2	2	2	2	2	2	1
Magnesium	Mg	1	-	-	32	29	21	20	18	16	14	14	18	16	18	21	21
Sodium	Na	1	-	-	29	20	10	8	5	4	2	2	2	2	2	2	2
Chloride	Cl	1	-	-	14	8	4	3	2	<1	<1	<1	<1	<1	<1	<1	<1
Fluoride	F*	0.1	-	2	0.1	0.3	0.2	0.2	0.2	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	SO	1	-	1,000	468	407	290	240	190	181	137	138	189	161	167	197	177
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**	(All units mg/L)										
Aluminium	Al	0.01	0.055	5	0.18	<0.01	0.16	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	As	0.001	0.024 (tri)*	0.5	<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
Boron	B	0.05	0.37	5	0.06	<0.05	0.10	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	Cd	0.0001	0.0002	0.01	0.0055	0.0001	0.0003	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Cobalt	Co	0.001	-	1	0.070	0.002	0.006	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<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
Copper	Cu	0.001	0.0014	1	0.012	<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	-	-	28.20	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<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
Manganese	Mn	0.001	1.9	-	1.940	0.530	0.677	0.490	0.302	0.302	0.302	0.302	0.302	0.302	0.302	0.302	0.302
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
Nickel	Ni	0.001	0.011	1	0.487	0.020	0.043	0.022	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Lead	Pb	0.001	0.0034	0.1	<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	-	-	0.002	0.021	0.016	0.016	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Selenium	Se	0.01	0.011	0.02	<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
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
Uranium	U	0.001	-	-	0.006	<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	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	Zn	0.005	0.008	-	0.450	0.011	0.056	0.032	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Calculations**	**Elements**														
SO_4 Release Rate	SO*				117	165	116	98	78	73	56	56	73	66	65	77	71
Cumulative SO Release	Cum SO				117	283	399	497	575	648	704	760	833	899	964	1042	1113
Ca Release Rate	Ca				26.1	49.6	34.1	28.9	23.5	19.3	15.5	15.5	21.6	18.1	16.8	21.2	18.9
Cumulative Ca Release	Cum Ca				26.1	75.7	109.7	138.6	162.1	181.4	196.9	212.4	234.0	252.1	268.9	290.1	309.1
Mg Release Rate	Mg				8.0	11.8	8.4	8.1	7.4	6.4	5.7	5.7	6.9	6.6	7.0	8.2	8.5
Cumulative Mg Release	Cum Mg				8.0	19.8	28.2	36.4	43.8	50.2	55.9	61.6	68.6	75.2	82.2	90.5	98.9
Residual ANC (%)	Res. ANC				99.8	99.4	99.1	98.9	98.7	98.5	98.4	98.2	98.0	97.9	97.7	97.5	97.3
Residual Sulfur (%)	Res. S				99.8	99.5	99.3	99.1	98.9	98.8	98.7	98.6	98.4	98.3	98.2	98.1	97.9
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)				1.2	1.0	1.0	1.0	0.9	1.0	0.9	0.9	0.9	1.0	1.0	0.9	0.9

Notes:

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< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 8 Waste Rock (Free Leach)

Weight (kg)	10.00	Total S (%)	0.09	ANC	55.6	Porosity	-	Density (kg/L)	-						
pH (1:5)	9.50	Scr (%)	0.037	NAPP	-54.5	Volume (L)	-	Rock/Water Ratio	7.15						
EC (µS/cm)	209	MPA	1.1	ANC:MPA	49.1	Pore Volume (L)	1.35	Surface Area	-						

Date			04-Feb-20	03-Mar-20	07-Apr-20	07-May-20	02-Jun-20	07-Jul-20	04-Aug-20	01-Sep-20	07-Oct-20	03-Nov-20	01-Dec-20	05-Jan-21	02-Feb-21
Number of Weeks			0	4	9	13	17	22	26	30	35	39	43	48	52
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12	13
ALS Laboratory Number			EB2002870008	EB2005928008	EB2009977008	EB2012199006	EB2014656008	EB2017856008	EB2020387008	EB2022964008	EB2026216008	EB2028814008	EB2031669008	EB2100143008	EB2102717008
Volume On (L)			1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Volume Off (L)			0.836	0.594	0.638	0.669	0.565	0.441	0.559	0.426	0.779	0.914	0.910	0.455	0.491
Cum. Volume (L)			0.84	1.43	2.07	2.74	3.30	3.74	4.30	4.73	5.51	6.42	7.33	7.79	8.28
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.6	1.1	1.5	2.0	2.4	2.8	3.2	3.5	4.1	4.8	5.4	5.8	6.1
pH (RGS Measurement)	6 to 9	-	7.69	8.05	8.51	8.25	8.32	8.44	8.67	7.98	8.19	7.96	8.15	8.32	8.02
pH (ALS Measurement)			7.15	7.64	8.14	8.03	8.07	7.49	7.82	7.95	7.99	7.99	7.91	8.07	7.86
pH (deionised water used in test)		-	5.20	5.71	6.43	6.10	6.75	6.73	6.48	6.23	6.59	6.03	6.70	6.06	7.86
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	421	691	387	308	284	212	152	177	249	207	207	201	207
EC (ALS Measurement) (µS/cm)			446	719	401	316	319	205	186	210	249	216	200	184	222
Acidity (mg/L as $CaCO_3$)*	-	-	1.0	1.0	1.0	<1	<1	<1	<1	<1	<1	2.0	1.0	<1	2.0
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	33	71	69	77	72	52	38	60	84	77	71	58	76
Total Alkalinity (mg/L as CaCO)*	-	-	33	71	69	77	72	52	38	60	84	77	71	58	76

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]											
					(All units mg/L)										
Calcium	Ca	1	-	1000	12	16	9	9	11	6	5	10	14	13	13	14	18
Potassium	K	1	-	-	7	9	6	5	5	3	2	4	5	5	5	4	5
Magnesium	Mg	1	-	-	3	4	2	2	3	1	1	2	4	3	4	3	5
Sodium	Na	1	-	-	67	130	68	51	52	37	28	30	32	24	22	18	20
Chloride	Cl	1	-	-	30	52	18	9	8	4	4	4	4	3	2	2	2
Fluoride	F	0.1	-	2	0.6	1.7	1.5	1.1	0.8	0.6	0.4	0.5	0.6	0.5	0.5	0.4	0.4
Sulfate	SO	1	-	1,000	106	165	88	64	68	48	37	35	33	27	26	24	28
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**											
					(All units mg/L)										
Aluminium	Al	0.01	0.055	5	0.14	0.04	0.15	0.11	0.06	0.13	0.10	0.06	0.05	0.06	0.07	0.07	0.07
Arsenic	As	0.001	0.024 (tri)*	0.5	0.118	0.360	0.364	0.339	0.201	0.136	0.109	0.132	0.148	0.130	0.110	0.099	0.095
Boron	B	0.05	0.37	5	0.10	0.11	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	Cd	0.0001	0.0002	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
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	<0.001	<0.001
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<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
Copper	Cu	0.001	0.0014	1	0.002	0.002	<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	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<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
Manganese	Mn	0.001	1.9	-	0.044	0.004	0.002	<0.001	<0.001	0.002	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	0.001	-	0.15	0.004	0.017	0.009	0.005	0.004	0.004	0.003	0.004	0.014	0.011	0.013	0.016	0.020
Nickel	Ni	0.001	0.011	1	0.004	0.005	0.003	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	Pb	0.001	0.0034	0.1	<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	-	-	0.006	0.041	0.036	0.027	0.020	0.010	0.008	0.014	0.020	0.017	0.014	0.017	0.017
Selenium	Se	0.01	0.011	0.02	<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
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
Uranium	U	0.001	-	-	0.004	0.043	0.039	0.039	0.043	0.042	0.035	0.034	0.048	0.036	0.036	0.026	0.034
Vanadium	V	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
Zinc	Zn	0.005	0.008	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	0.006	0.006	<0.005	0.005

Calculations**	Elements													
SO_4 Release Rate	SO		9	10	6	4	4	2	2	1	3	2	2	1	1
Cumulative SO Release	Cum SO		9	19	24	29	32	35	37	38	41	43	45	47	48
Ca Release Rate	Ca		1.0	1.0	0.6	0.6	0.6	0.3	0.3	0.4	1.1	1.2	1.2	0.6	0.9
Cumulative Ca Release	Cum Ca		1.0	2.0	2.5	3.1	3.7	4.0	4.3	4.7	5.8	7.0	8.2	8.8	9.7
Mg Release Rate	Mg		0.3	0.2	0.1	0.1	0.2	0.0	0.1	0.1	0.3	0.3	0.4	0.1	0.2
Cumulative Mg Release	Cum Mg		0.3	0.5	0.6	0.7	0.9	1.0	1.0	1.1	1.4	1.7	2.1	2.2	2.4
Residual ANC (%)	Res. ANC		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.9
Residual Sulfur (%)	Res. S		99.7	99.3	99.1	98.9	98.8	98.7	98.6	98.6	98.5	98.4	98.3	98.3	98.2
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)		2.6	3.0	3.0	2.2	1.8	2.6	2.3	1.1	0.7	0.6	0.6	0.5	0.4

Notes:

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines. Recommended guideline limits for 1. freshwater aquatic ecosystems (95 % species protection) and 2. livestock drinking water.

< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 13 BV2 Waste Rock (Free Leach)

Weight (kg)	10.00	Total S (%)	0.07	ANC	22.2	Porosity	-	Density (kg/L)	-				
pH (1:5)	9.75	Scr (%)	0.105	NAPP	-19.0	Volume (L)	-	Rock/Water Ratio	7.15				
EC (µS/cm)	108	MPA	3.2	ANC:MPA	6.9	Pore Volume (L)	2.40	Surface Area	-				

Date			21-Oct-21	09-Dec-21	06-Jan-22	03-Feb-22	03-Mar-22	31-Mar-22	15-Jul-22	17-Oct-22				
Number of Weeks			0	7	11	15	19	23	38	52				
Leach Number			1	2	3	4	5	6	7	8				
ALS Laboratory Number			EB2130149003	EB2135898003	EB2200248003	EB2202793003	EB2205847003	EB2209020003	EB2220718003					
Volume On (L)			2.7	1.0	1.0	1.8	1.4	1.4	2.0					
Volume Off (L)			0.213	0.697	0.411	0.579	0.585	0.581	0.275					
Cum. Volume (L)			0.21	0.91	1.32	1.90	2.49	3.07	3.34					
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.1	0.4	0.6	0.8	1.0	1.3	1.4					
pH (RGS Measurement)	6 to 9	-	8.50	8.79	8.40	8.31	8.38	8.50	8.64					
pH (ALS Measurement)			8.37	8.77	8.16	8.44	8.47	8.62	8.39					
pH (deionised water used in test)		-	7.05	7.27	7.58	5.78	6.55	6.35	6.42					
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	4,000	2,870	2,350	2,380	1,737	1,323	1,662					
EC (ALS Measurement) (µS/cm)			4,610	2,860	2,850	2,410	1,740	1,390	1,630					
Acidity (mg/L as $CaCO_3$)*	-	-	<1	<1	<1	<1	<1	<1	<1					
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1					
Carbonate Alkalinity (mg/L as CaCO)*	-	-	13	65	<1	12	16	45	5					
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	575	521	288	265	293	289	196					
Total Alkalinity (mg/L as CaCO)*	-	-	588	586	288	278	309	334	201					

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]										
					(All units mg/L)									
Calcium	Ca	1	-	1000	74	28	30	27	14	12	13			
Potassium	K	1	-	-	14	10	11	9	7	6	7			
Magnesium	Mg	1	-	-	70	36	27	18	9	7	10			
Sodium	Na	1	-	-	917	620	649	517	356	307	340			
Chloride	Cl	1	-	-	354	131	49	11	3	1	6			
Fluoride	F*	0.1	-	2	16.0	25.4	18.7	16.9	18.5	17.5	16.2			
Sulfate	SO	1	-	1,000	1,370	735	1,030	876	519	301	526			
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**										
					(All units mg/L)									
Aluminium	Al	0.01	0.055	5	<0.01	0.01	<0.01	<0.01	0.01	0.02	0.10			
Arsenic	As	0.001	0.024 (tri)*	0.5	0.038	0.049	0.029	0.022	0.031	0.033	0.033			
Boron	B	0.05	0.37	5	0.07	0.10	0.11	0.10	0.08	0.09	0.08			
Cadmium	Cd	0.0001	0.0002	0.01	0.0004	0.0002	<0.0001	0.0002	0.0002	<0.0001	<0.0001			
Cobalt	Co	0.001	-	1	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Copper	Cu	0.001	0.0014	1	0.006	0.003	0.002	0.001	0.002	0.001	0.002			
Iron	Fe	0.05	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			
Mercury	Hg	0.0001	0.0006	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Manganese	Mn	0.001	1.9	-	0.073	0.003	0.030	0.027	0.010	0.004	0.006			
Molybdenum	Mo	0.001	-	0.15	0.596	0.584	0.627	0.498	0.333	0.208	0.126			
Nickel	Ni	0.001	0.011	1	0.005	0.002	0.002	<0.001	<0.001	<0.001	<0.001			
Lead	Pb	0.001	0.0034	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Antimony	Sb	0.001	-	-	0.014	0.029	0.024	0.015	0.021	0.017	0.012			
Selenium	Se	0.01	0.011	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Thorium	Th	0.001	-	-	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001			
Uranium	U	0.001	-	-	0.030	0.028	0.066	0.062	0.056	0.044	0.051			
Vanadium	V	0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Zinc	Zn	0.005	0.008	-	0.026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			

Calculations**	Elements												
SO_4 Release Rate	SO*		29	51	42	51	30	17	14				
Cumulative SO Release	Cum SO		29	80	123	173	204	221	236				
Ca Release Rate	Ca		1.6	2.0	1.2	1.6	0.8	0.7	0.4				
Cumulative Ca Release	Cum Ca		1.6	3.5	4.8	6.3	7.1	7.8	8.2				
Mg Release Rate	Mg		1.5	2.5	1.1	1.0	0.5	0.4	0.3				
Cumulative Mg Release	Cum Mg		1.5	4.0	5.1	6.1	6.7	7.1	7.4				
Residual ANC (%)	Res. ANC		100.0	99.9	99.9	99.8	99.8	99.8	99.8				
Residual Sulfur (%)	Res. S		98.6	96.2	94.2	91.7	90.3	89.5	88.8				
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)		3.0	3.5	5.8	6.4	7.5	5.3	7.4				

Notes: ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines. Recommended guideline limits for 1. freshwater aquatic ecosystems (95 % species protection) and 2. livestock drinking water.

< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 14 BV1 Waste Rock (Free Leach)

Weight (kg)	10.01	Total S (%)	0.07	ANC	30.1	Porosity	-	Density (kg/L)	-				
pH (1:5)	7.70	Scr (%)	0.06	NAPP	-28.2	Volume (L)	-	Rock/Water Ratio	7.15				
EC (µS/cm)	39	MPA	1.9	ANC:MPA	15.6	Pore Volume (L)	2.25	Surface Area	-				

Date			21-Oct-21	09-Dec-21	06-Jan-22	03-Feb-22	03-Mar-22	31-Mar-22	15-Jul-22	17-Oct-22
Number of Weeks			0	7	11	15	19	23	38	52
Leach Number			1	2	3	4	5	6	7	8
ALS Laboratory Number			EB2130149004	EB2135898004	EB2200248004	EB2202793004	EB2205847004	EB2209020004	EB2220718004	
Volume On (L)			2.9	1.4	1.4	1.8	1.4	1.4	2.0	
Volume Off (L)			0.650	0.849	0.416	0.458	0.677	0.404	0.536	
Cum. Volume (L)			0.65	1.50	1.92	2.37	3.05	3.45	3.99	
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.3	0.7	0.9	1.1	1.4	1.5	1.8	
pH (RGS Measurement)	6 to 9	-	7.95	8.69	8.11	7.64	7.97	8.08	8.19	
pH (ALS Measurement)			8.36	8.54	7.77	7.97	7.90	8.08	7.98	
pH (deionised water used in test)		-	7.05	7.27	7.58	5.78	6.55	6.35	6.42	
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	1,291	669	913	1,145	883	585	666	
EC (ALS Measurement) (µS/cm)			1,350	649	1,100	1,170	903	620	685	
Acidity (mg/L as $CaCO_3$)*	-	-	<1	<1	3.0	5.0	2.0	<1	1.0	
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	
Carbonate Alkalinity (mg/L as CaCO)*	-	-	8.0	18.0	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	377	256	85	76	85	101	88	
Total Alkalinity (mg/L as CaCO)*	-	-	385	274	85	76	85	101	88	

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]	(All units mg/L)												
Calcium	Ca	1	-	1000	70	18	72	76	52	33	36						
Potassium	K	1	-	-	15	10	14	14	12	9	9						
Magnesium	Mg	1	-	-	67	24	54	54	40	23	29						
Sodium	Na	1	-	-	158	102	106	96	68	56	55						
Chloride	Cl	1	-	-	107	13	23	4	1	<1	2						
Fluoride	F*	0.1	-	2	1.5	1.9	2.8	2.7	3.1	4.3	3.0						
Sulfate	SO	1	-	1,000	175	76	501	549	382	190	224						
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**	(All units mg/L)												
Aluminium	Al	0.01	0.055	5	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01						
Arsenic	As	0.001	0.024 (tri)*	0.5	0.028	0.020	0.015	0.016	0.021	0.025	0.029						
Boron	B	0.05	0.37	5	0.07	0.07	0.06	0.06	<0.05	0.05	0.05						
Cadmium	Cd	0.0001	0.0002	0.01	0.0001	<0.0001	<0.0001	0.0002	0.0002	0.0001	0.0001						
Cobalt	Co	0.001	-	1	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Copper	Cu	0.001	0.0014	1	0.007	0.001	0.001	<0.001	0.001	0.001	0.001						
Iron	Fe	0.05	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05						
Mercury	Hg	0.0001	0.0006	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						
Manganese	Mn	0.001	1.9	-	0.107	0.005	0.056	0.050	0.022	0.007	0.007						
Molybdenum	Mo	0.001	-	0.15	0.184	0.189	0.457	0.411	0.375	0.341	0.236						
Nickel	Ni	0.001	0.011	1	0.006	0.001	0.002	<0.001	<0.001	<0.001	<0.001						
Lead	Pb	0.001	0.0034	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Antimony	Sb	0.001	-	-	0.172	0.137	0.136	0.114	0.184	0.163	0.132						
Selenium	Se	0.01	0.011	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Thorium	Th	0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Uranium	U	0.001	-	-	0.008	0.002	0.008	0.008	0.008	0.006	0.009						
Vanadium	V	0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Zinc	Zn	0.005	0.008	-	0.038	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005						

Calculations**	Elements												
SO_4 Release Rate	SO*	11	6	21	25	26	8	12					
Cumulative SO Release	Cum SO	11	18	39	64	90	97	109					
Ca Release Rate	Ca	4.5	1.5	3.0	3.5	3.5	1.3	1.9					
Cumulative Ca Release	Cum Ca	4.5	6.1	9.1	12.5	16.1	17.4	19.3					
Mg Release Rate	Mg	4.4	2.0	2.2	2.5	2.7	0.9	1.6					
Cumulative Mg Release	Cum Mg	4.4	6.4	8.6	11.1	13.8	14.7	16.3					
Residual ANC (%)	Res. ANC	99.9	99.9	99.8	99.7	99.7	99.7	99.6					
Residual Sulfur (%)	Res. S	99.4	99.1	98.1	96.9	95.6	95.2	94.6					
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)	0.4	0.6	1.3	1.4	1.4	1.1	1.1					

Notes: ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines. Recommended guideline limits for 1. freshwater aquatic ecosystems (95 % species protection) and 2. livestock drinking water.

< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 16 PAF/NAF Waste Rock (Free Leach)

Weight (kg)	1.00	Total S (%)	1.60	ANC	56.1	Porosity	-	Density (kg/L)	-				
pH (1:5)	-	Scr (%)	-	NAPP	-7.10	Volume (L)	-	Rock/Water Ratio	0.71				
EC (µS/cm)	-	MPA	49.0	ANC:MPA	1.14	Pore Volume (L)	0.60	Surface Area	-				

Date			21-Oct-21	09-Dec-21	06-Jan-22	03-Feb-22	03-Mar-22	31-Mar-22	15-Jul-22	17-Oct-22				
Number of Weeks			0	7	11	15	19	23	38	52				
Leach Number			1	2	3	4	5	6	7	8				
ALS Laboratory Number			EB2130149006	EB2135898006	EB2200248006	EB2202793006	EB2205847006	EB2209020006	EB2220718006					
Volume On (L)			1.4	1.0	1.0	1.0	1.0	1.0	1.0					
Volume Off (L)			0.879	0.535	0.619	0.553	0.460	0.367	0.396					
Cum. Volume (L)			0.88	1.41	2.03	2.59	3.05	3.41	3.81					
Number of Pore Volumes through the Samples	Water Quality Guidelines		1.5	2.4	3.4	4.3	5.1	5.7	6.4					
pH (RGS Measurement)		-	7.08	8.02	7.37	6.50	7.00	7.99	7.54					
pH (ALS Measurement)	6 to 9		7.7	8.24	6.95	7.26	7.07	7.31	7.32					
pH (deionised water used in test)		-	7.05	7.27	7.58	5.78	6.55	6.35	6.42					
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	1,020	235	276	336	300	254	305					
EC (ALS Measurement) (µS/cm)			1,020	242	338	354	302	292	321					
Acidity (mg/L as $CaCO_3$)*	-	-	3.0	2.0	2.0	2.0	2.0	1.0	1.0					
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1					
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1					
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	98	38	22	22	23	26	21					
Total Alkalinity (mg/L as CaCO)*	-	-	98	38	22	22	23	26	21					

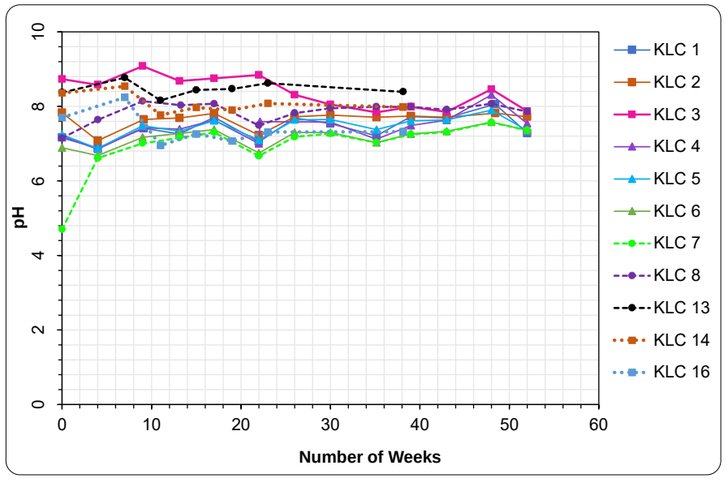
Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]										
					(All units mg/L)									
Calcium	Ca	1	-	1000	80	13	24	23	16	21	18			
Potassium	K	1	-	-	129	19	27	25	26	28	28			
Magnesium	Mg	1	-	-	17	8	11	11	9	11	9			
Sodium	Na	1	-	-	31	9	10	10	9	10	12			
Chloride	Cl	1	-	-	12	8	4	3	2	2	2			
Fluoride	F	0.1	-	2	1.6	0.3	0.5	0.5	0.5	0.5	0.5			
Sulfate	SO	1	-	1,000	334	72	124	124	105	90	106			
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**										
					(All units mg/L)									
Aluminium	Al	0.01	0.055	5	0.01	0.12	0.07	0.09	0.10	0.09	0.04			
Arsenic	As	0.001	0.024 (tri)*	0.5	0.004	0.001	0.002	0.002	0.004	0.001	<0.001			
Boron	B	0.05	0.37	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			
Cadmium	Cd	0.0001	0.0002	0.01	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001			
Cobalt	Co	0.001	-	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Copper	Cu	0.001	0.0014	1	0.001	0.002	<0.001	<0.001	0.001	<0.001	<0.001			
Iron	Fe	0.05	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			
Mercury	Hg	0.0001	0.0006	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Manganese	Mn	0.001	1.9	-	0.069	0.024	0.028	0.025	0.030	0.025	0.039			
Molybdenum	Mo	0.001	-	0.15	0.019	0.002	0.005	0.005	0.005	0.002	0.002			
Nickel	Ni	0.001	0.011	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Lead	Pb	0.001	0.0034	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Antimony	Sb	0.001	-	-	0.006	<0.001	0.003	0.002	<0.001	<0.001	0.001			
Selenium	Se	0.01	0.011	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Thorium	Th	0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Uranium	U	0.001	-	-	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Vanadium	V	0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Zinc	Zn	0.005	0.008	-	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			

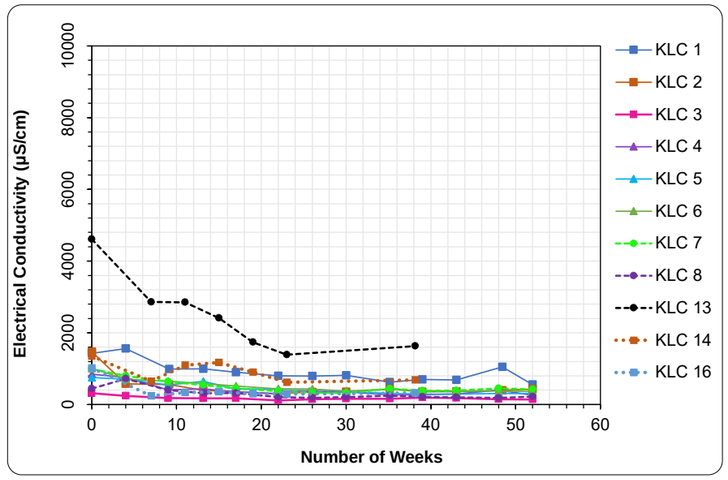
Calculations**	Elements												
SO_4 Release Rate	SO		294	39	77	69	48	33	42				
Cumulative SO Release	Cum SO		294	332	409	478	526	559	601				
Ca Release Rate	Ca		70.4	7.0	14.9	12.7	7.4	7.7	7.1				
Cumulative Ca Release	Cum Ca		70.4	77.4	92.2	105.0	112.3	120.0	127.2				
Mg Release Rate	Mg		15.0	4.3	6.8	6.1	4.1	4.0	3.6				
Cumulative Mg Release	Cum Mg		15.0	19.2	26.1	32.1	36.3	40.3	43.9				
Residual ANC (%)	Res. ANC		99.6	99.5	99.4	99.3	99.2	99.2	99.1				
Residual Sulfur (%)	Res. S		99.4	99.3	99.1	99.0	98.9	98.8	98.7				
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)		1.3	1.1	1.2	1.3	1.4	1.0	1.3				

Notes: ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines. Recommended guideline limits for 1. freshwater aquatic ecosystems (95 % species protection) and 2. livestock drinking water.

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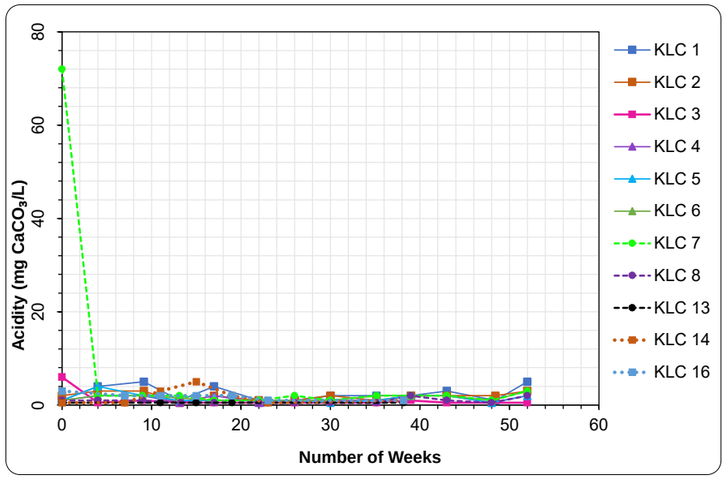
KLC Plots

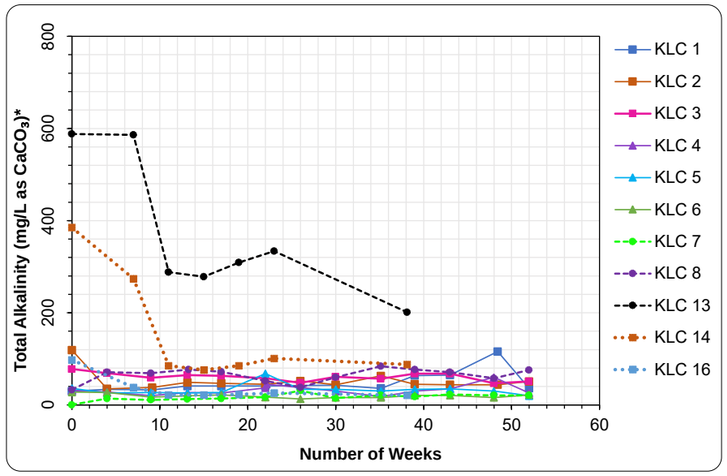


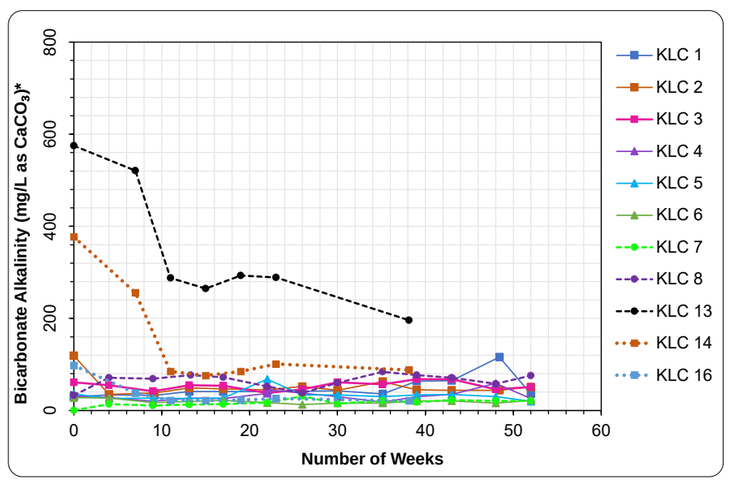


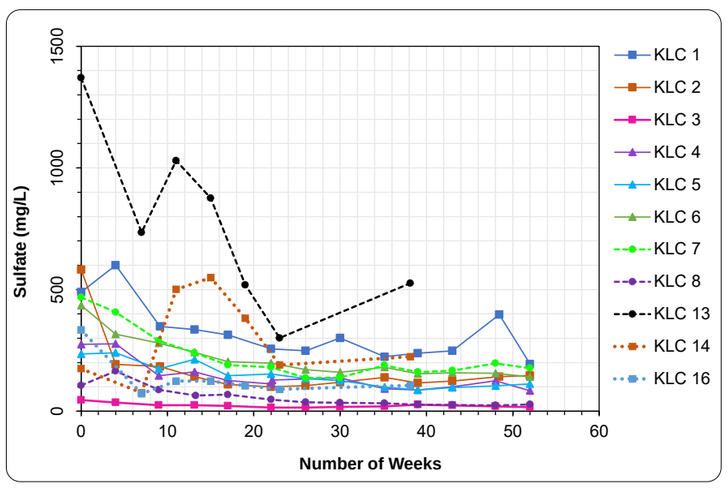
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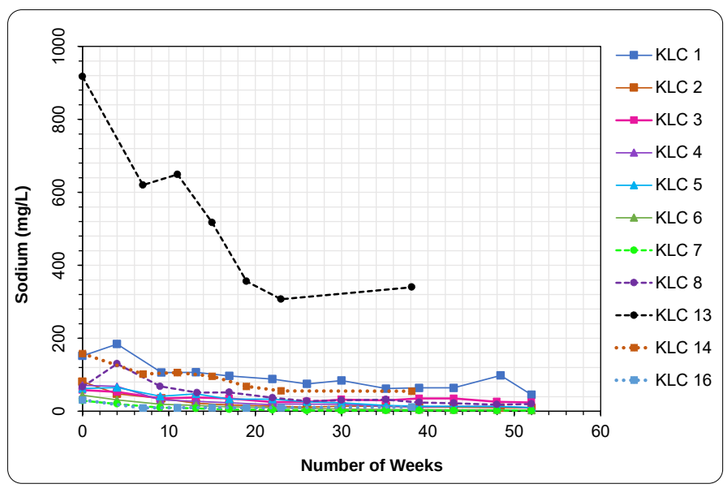
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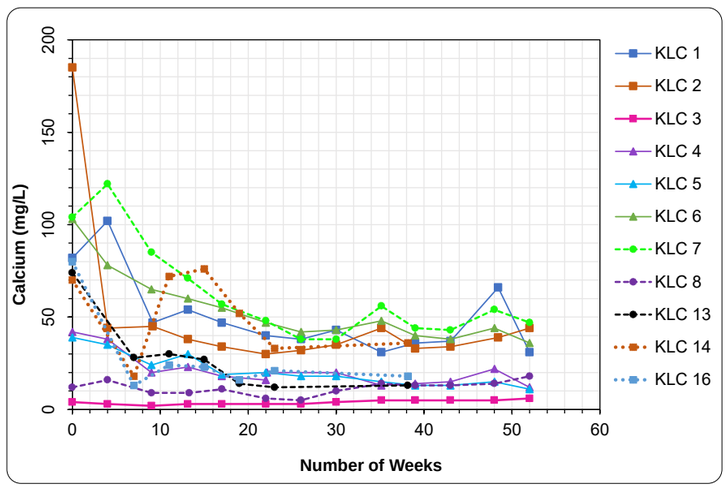




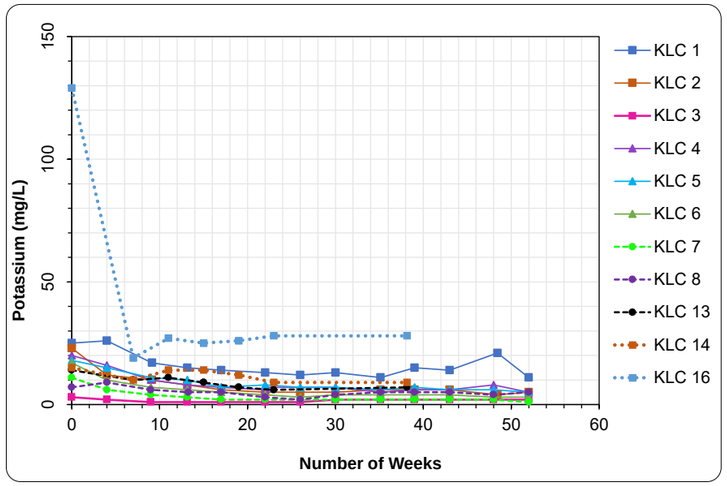


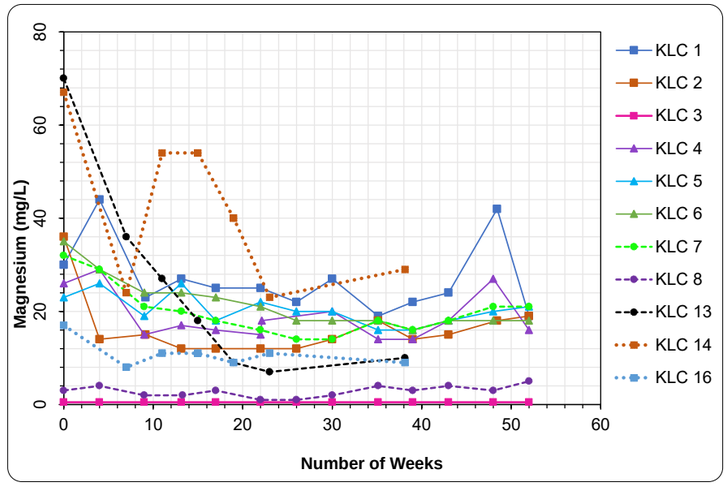






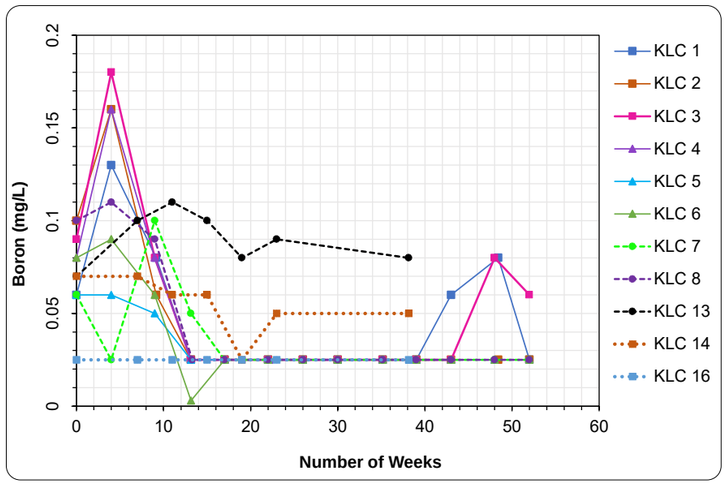
KLC Plots

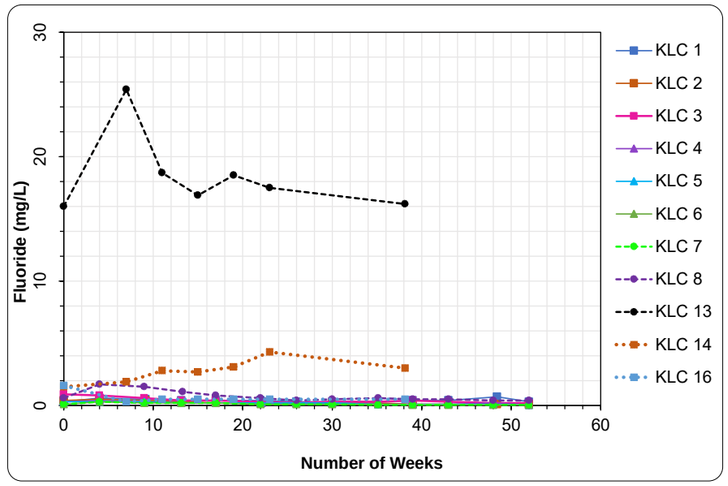


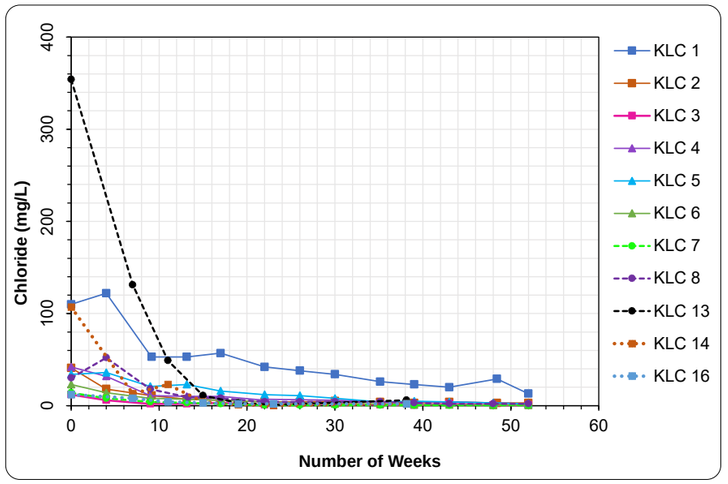


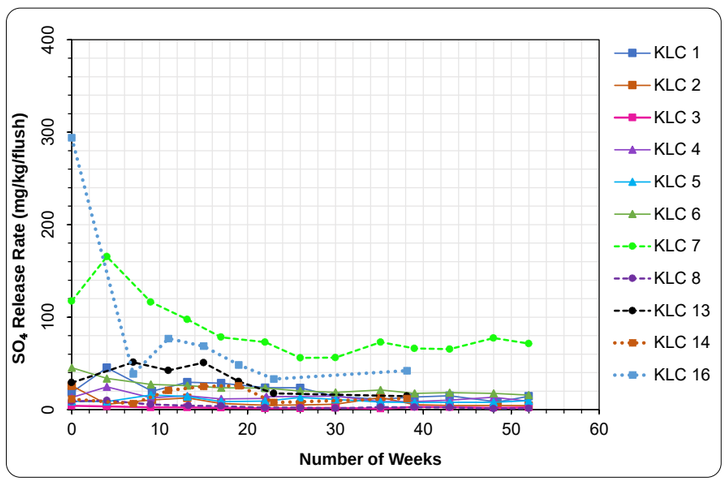
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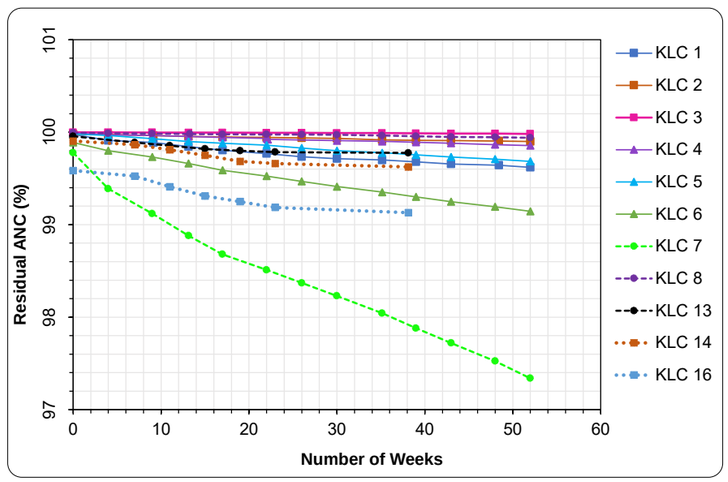
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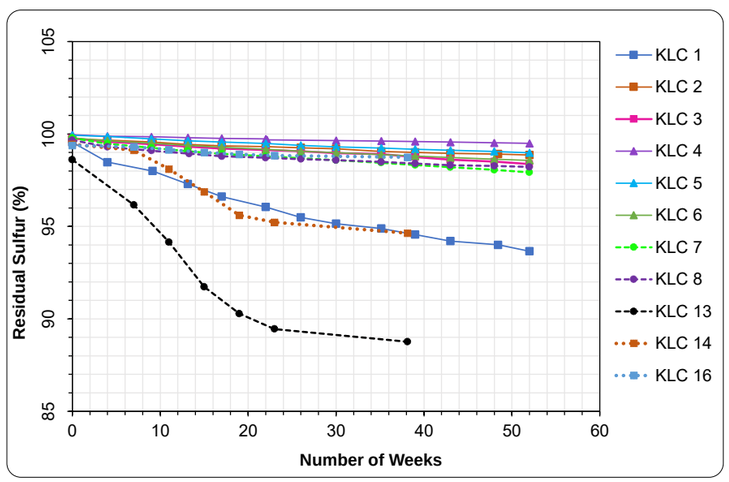




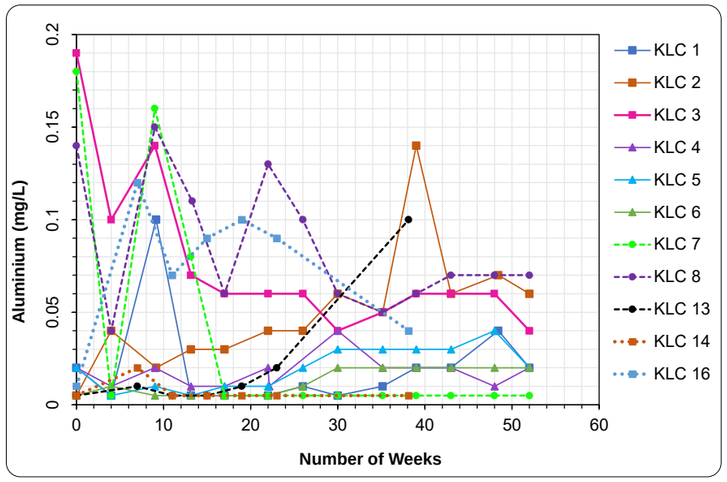


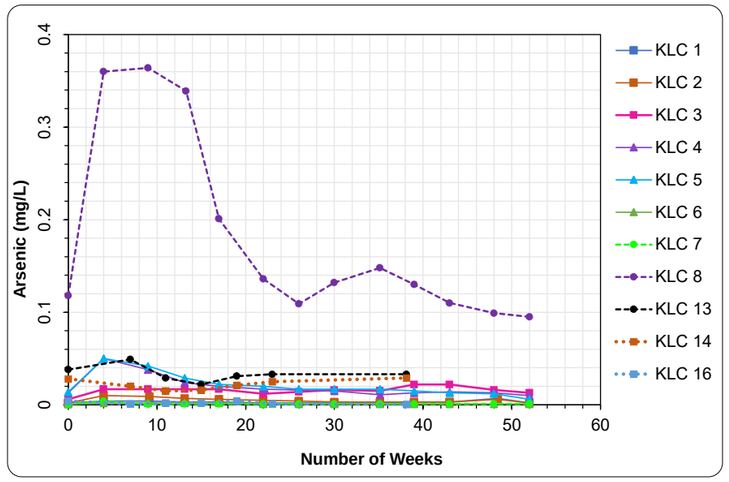






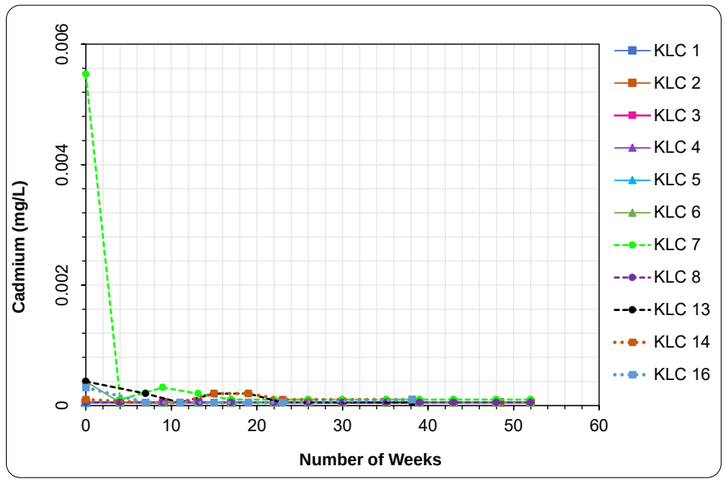
KLC Plots

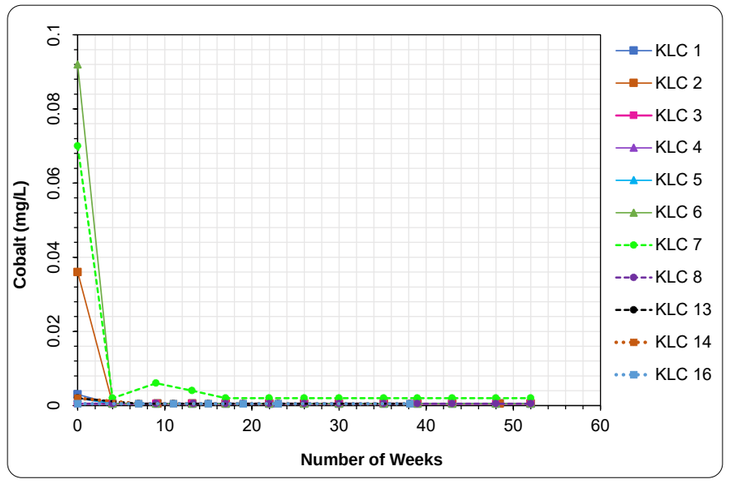


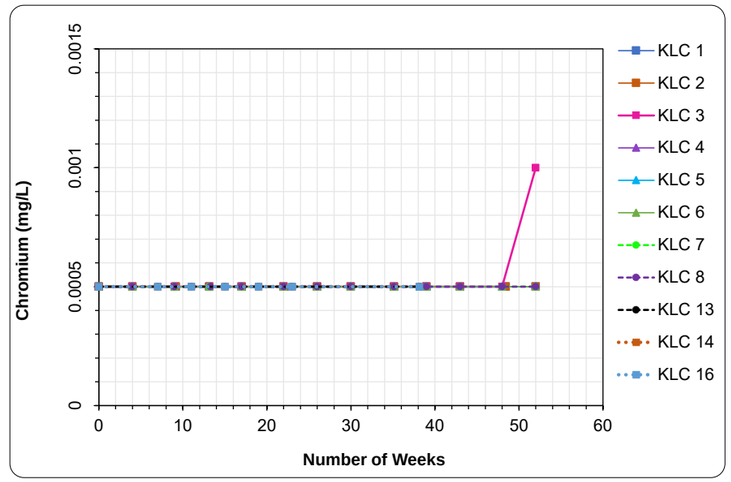


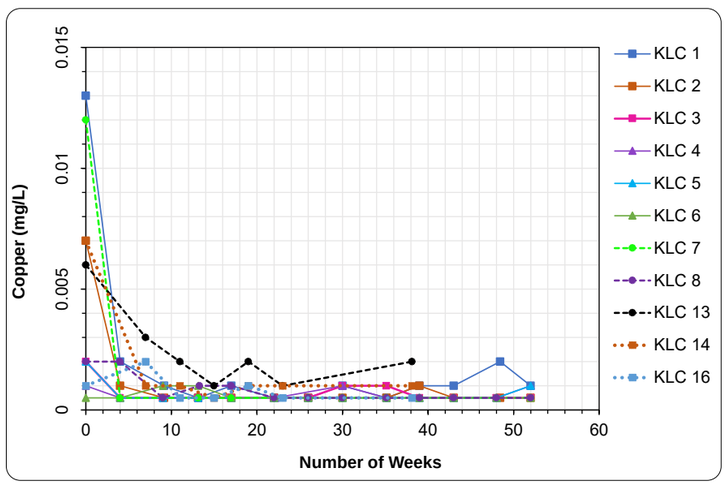
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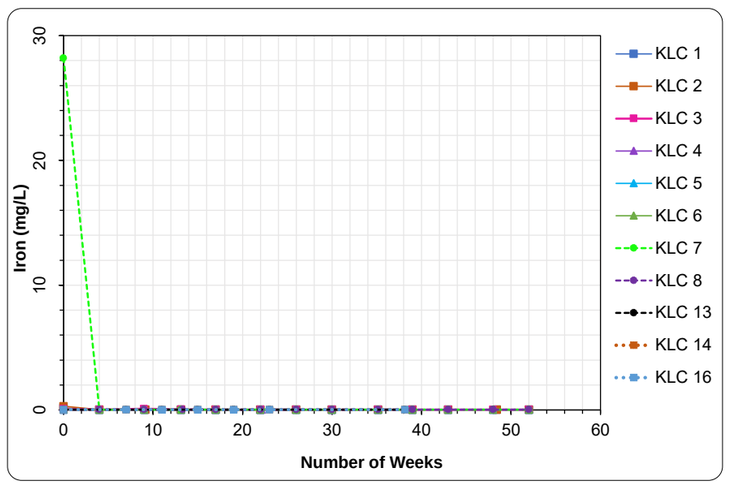
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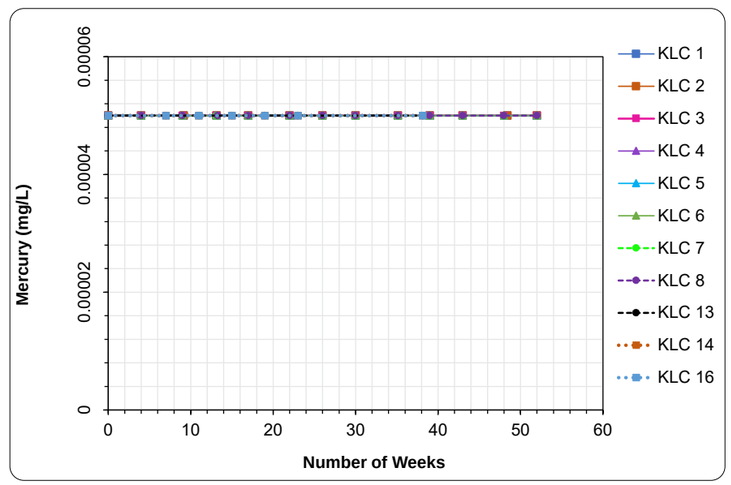




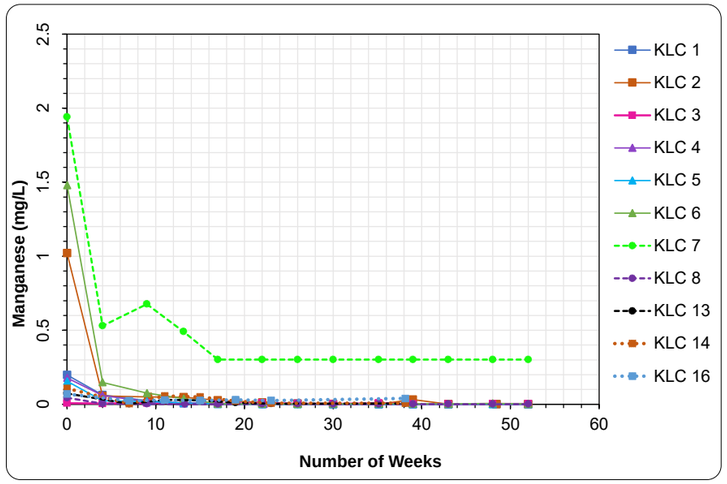


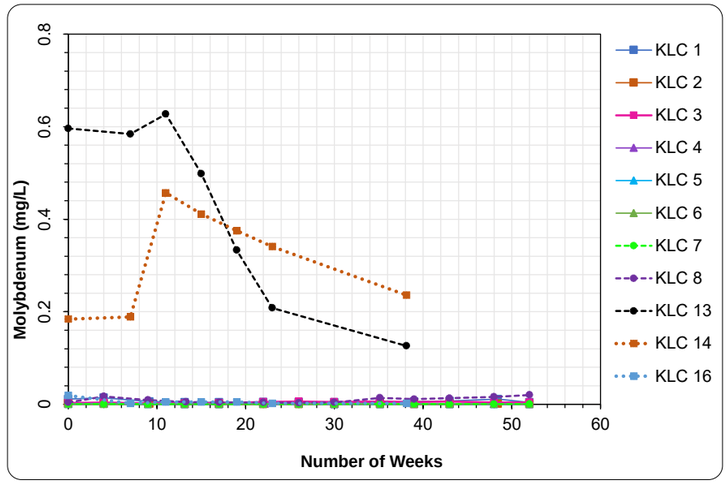






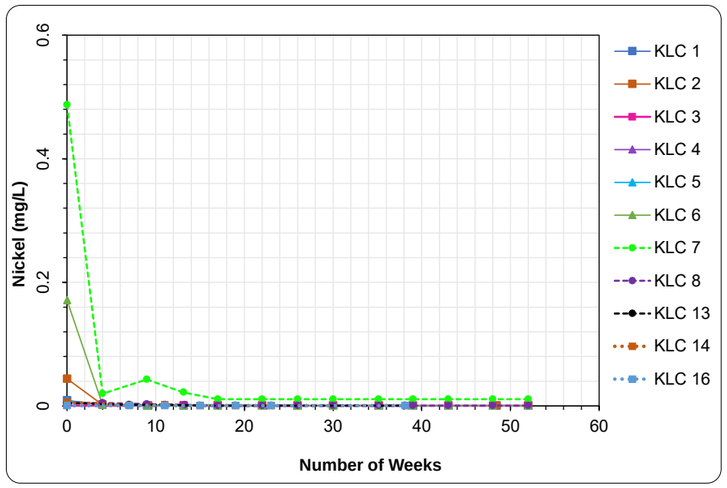
KLC Plots

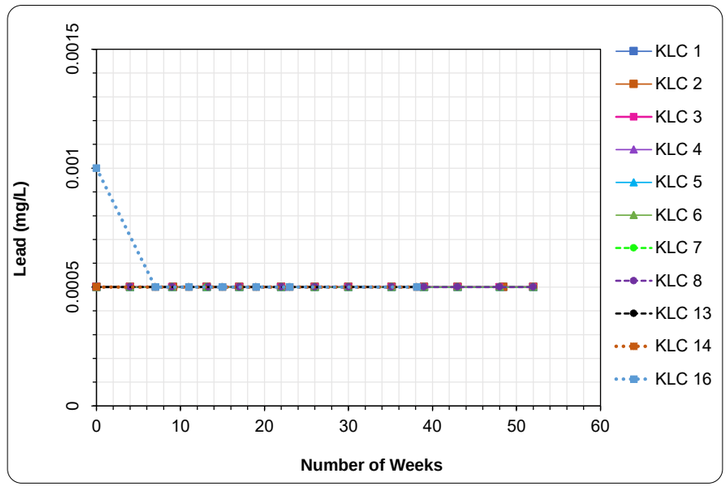


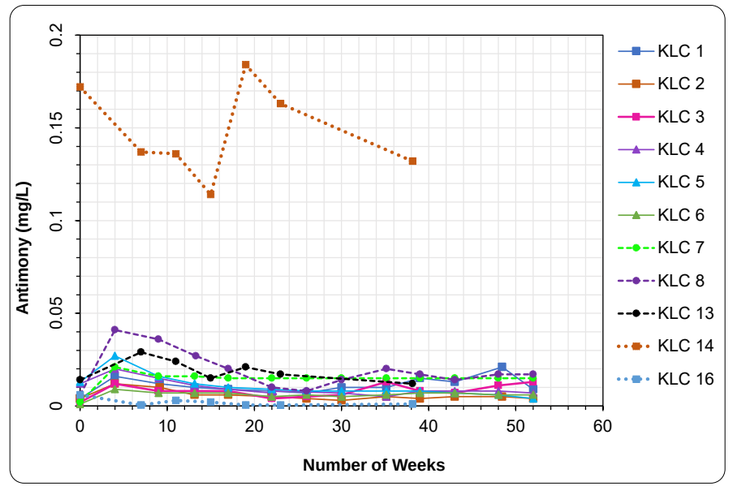


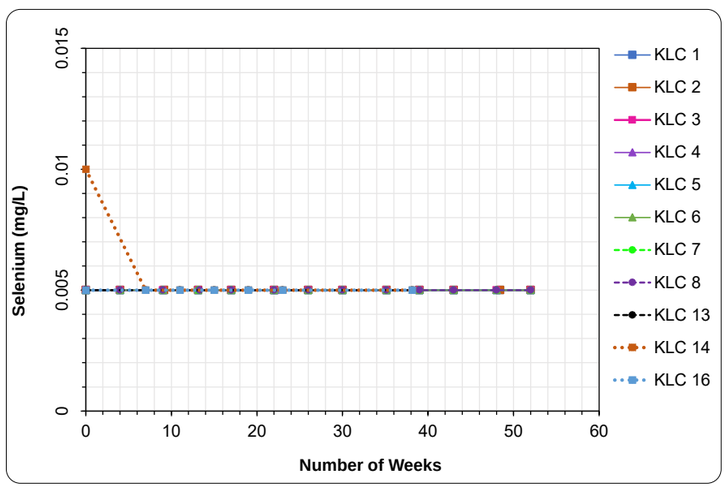
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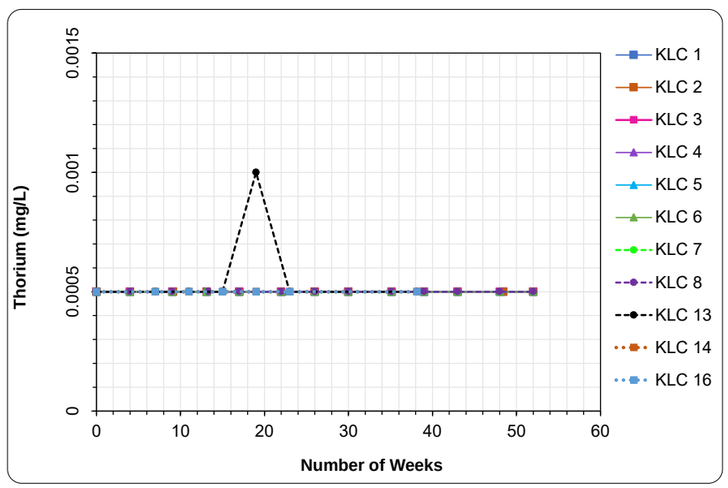
- KLC 1 Waste Rock (Free Leach)
- KLC 2 Waste Rock (Free Leach)
- KLC 3 Waste Rock (Free Leach)
- KLC 4 Waste Rock (Free Leach)
- KLC 5 Waste Rock (Free Leach)
- KLC 6 Waste Rock (Free Leach)
- KLC 7 Waste Rock (Free Leach)
- KLC 8 Waste Rock (Free Leach)
- KLC 13 BV2 Waste Rock (Free Leach)
- KLC 14 BV1 Waste Rock (Free Leach)
- KLC 16 PAF/NAF Waste Rock (Free Leach)

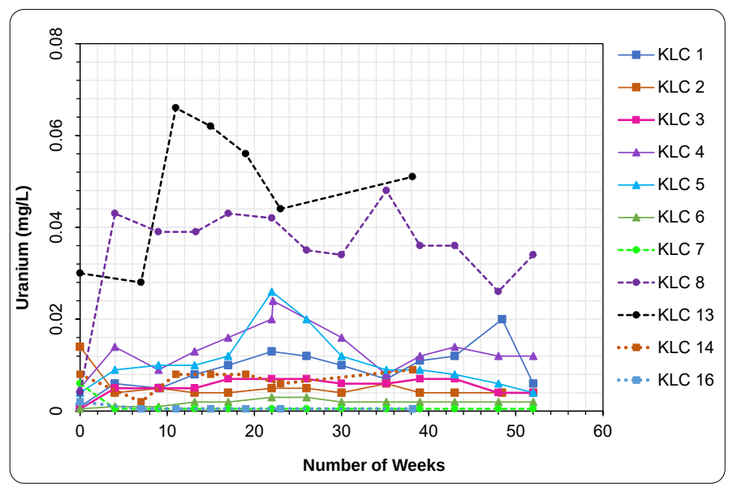




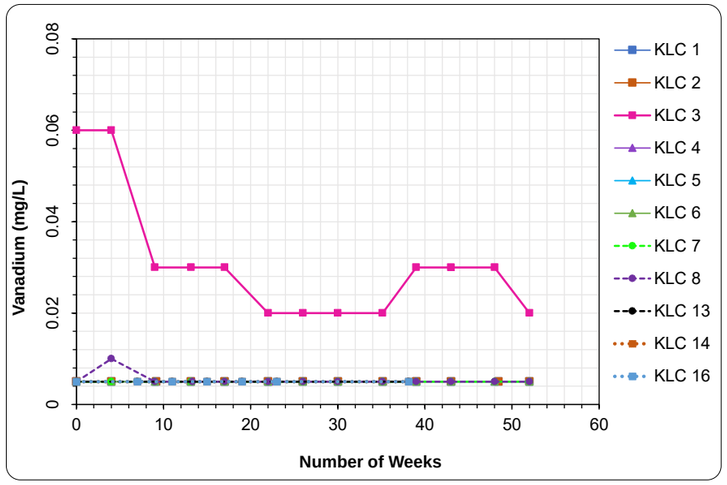


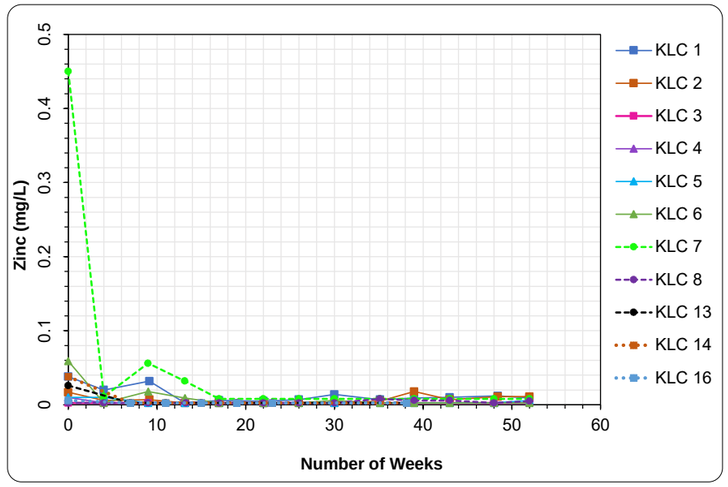






KLC Plots





LEGEND:

- KLC 1 Waste Rock (Free Leach)
- KLC 2 Waste Rock (Free Leach)
- KLC 3 Waste Rock (Free Leach)
- KLC 4 Waste Rock (Free Leach)
- KLC 5 Waste Rock (Free Leach)
- KLC 6 Waste Rock (Free Leach)
- KLC 7 Waste Rock (Free Leach)
- KLC 8 Waste Rock (Free Leach)
- KLC 13 BV2 Waste Rock (Free Leach)
- KLC 14 BV1 Waste Rock (Free Leach)
- KLC 16 PAF/NAF Waste Rock (Free Leach)

KLC 9 Strategic Woolgar Tailings (Free Leach)

Weight (kg)	1.06	Total S (%)	0.68	ANC	26.8	Porosity	-	Density (kg/L)	-				
pH (1:5)	9.00	Scr (%)	0.550	NAPP	-10.0	Volume (L)	-	Rock/Water Ratio	0.35				
EC (µS/cm)	132	MPA	16.8	ANC:MPA	1.6	Pore Volume (L)	1.35	Surface Area	-				

Date			03-Mar-20	08-Apr-20	06-May-20	09-Jun-20	07-Jul-20	04-Aug-20	01-Sep-20	07-Oct-20	03-Nov-20	01-Dec-20	08-Jan-21	02-Feb-21
Number of Weeks			0	5	9	14	18	22	26	31	35	39	44	48
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12
ALS Laboratory Number			EB2005928009	EB2009977009	EB2012199007	EB2015306001	EB2017856009	EB2020387009	EB2022964009	EB2026216009	EB2028814009	EB2031669009	EB2100143012	EB2102717009
Volume On (L)			3.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.4	1.4	1.4
Volume Off (L)			1.079	0.254	0.469	0.512	0.309	0.322	0.282	0.230	0.207	0.289	0.254	0.264
Cum. Volume (L)			1.08	1.33	1.80	2.31	2.62	2.95	3.23	3.46	3.66	3.95	4.21	4.47
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.8	1.0	1.3	1.7	1.9	2.2	2.4	2.6	2.7	2.9	3.1	3.3
pH (RGS Measurement)	6 to 9	-	8.18	7.84	8.38	8.04	8.13	8.26	7.93	8.03	7.89	8.02	7.74	7.90
pH (ALS Measurement)			7.86	7.69	8.07	7.95	7.78	7.92	7.91	7.76	7.81	6.51	7.82	7.39
pH (deionised water used in test)		-	5.71	6.01	6.35	6.75	6.73	6.48	6.23	6.59	6.03	6.70	5.86	5.96
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	669	838	742	675	630	547	669	813	844	1,084	968	855
EC (ALS Measurement) (µS/cm)			705	899	787	714	662	698	827	858	918	1,010	1,050	1,020
Acidity (mg/L as $CaCO_3$)*	-	-	1	5	<1	2	1	1	1	2	3	4	3	4
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	76	51	92	90	80	69	72	60	61	104	51	54
Total Alkalinity (mg/L as CaCO)*	-	-	76	51	92	90	80	69	72	60	61	104	51	54

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]	(All units mg/L)											
Calcium	Ca	1	-	1000	49	82	82	78	69	70	103	106	111	158	137	124
Potassium	K	1	-	-	25	21	19	19	17	18	20	21	22	27	24	24
Magnesium	Mg	1	-	-	18	29	28	28	28	27	34	35	34	49	44	40
Sodium	Na	1	-	-	62	45	31	27	22	18	20	20	21	28	27	23
Chloride	Cl	1	-	-	55	15	7	4	4	2	2	2	2	2	2	<1
Fluoride	F[4]	0.1	-	2	2.3	2.0	1.6	1.7	1.7	1.3	1.4	1.6	1.7	1.6	2.5	2.1
Sulfate	SO	1	-	1000	175	370	278	271	264	247	368	384	436	602	539	472
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**	**(All units mg/L)**											
Aluminium	Al	0.01	0.055	5	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
Arsenic	As	0.001	0.024(tri)*	0.5	0.024	0.018	0.012	0.010	0.010	0.009	0.009	0.010	0.010	0.011	0.016	0.014
Boron	B	0.05	0.37	5	0.62	0.66	0.42	0.39	0.33	0.26	0.36	0.35	0.41	0.60	0.54	0.48
Cadmium	Cd	0.0001	0.0002	0.01	0.0002	0.0010	0.0018	0.0015	0.0016	0.0022	0.0021	0.0010	0.0021	0.0034	0.0032	0.0023
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	<0.001
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	Cu	0.001	0.0014	1	0.004	0.003	0.003	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003
Iron	Fe	0.05	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese	Mn	0.001	1.9	-	0.022	0.017	0.019	0.002	0.002	<0.001	<0.001	<0.001	0.019	<0.001	<0.001	<0.001
Molybdenum	Mo	0.001	-	0.15	0.027	0.020	0.021	0.024	0.025	0.022	0.024	0.028	0.030	0.049	0.046	0.047
Nickel	Ni	0.001	0.011	1	<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	0.0034	0.1	0.002	<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	-	-	0.098	0.066	0.047	0.039	0.034	0.028	0.033	0.032	0.037	0.036	0.035	0.031
Selenium	Se	0.01	0.011	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
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
Uranium	U	0.001	-	-	0.012	0.011	0.015	0.015	0.017	0.015	0.020	0.022	0.020	0.031	0.019	0.023
Vanadium	V	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
Zinc	Zn	0.005	0.008	-	<0.005	0.012	0.037	0.032	0.025	0.032	0.035	0.016	0.037	0.042	0.037	0.029
Calculations**	**Elements**															
SO_4 Release Rate	SO[4]				178	89	123	131	77	75	98	83	85	164	129	118
Cumulative SO Release	Cum SO				178	267	390	521	598	673	771	854	939	1,103	1,232	1,350
Ca Release Rate	Ca				49.9	19.6	36.3	37.7	20.1	21.3	27.4	23.0	21.7	43.1	32.8	30.9
Cumulative Ca Release	Cum Ca				49.9	69.5	105.8	143.5	163.6	184.9	212.3	235.3	256.9	300.0	332.8	363.7
Mg Release Rate	Mg				18.3	6.9	12.4	13.5	8.2	8.2	9.0	7.6	6.6	13.4	10.5	10.0
Cumulative Mg Release	Cum Mg				18.3	25.3	37.7	51.2	59.3	67.5	76.6	84.2	90.8	104.2	114.7	124.7
Residual ANC (%)	Res. ANC				99.3	99.0	98.5	97.9	97.6	97.3	96.9	96.6	96.3	95.7	95.2	94.8
Residual Sulfur (%)	Res. S				99.1	98.7	98.1	97.4	97.1	96.7	96.2	95.8	95.4	94.6	94.0	93.4
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)				0.9	1.2	0.9	0.9	1.0	0.9	1.0	1.0	1.1	1.1	1.1	1.0

Notes:

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines. Recommended guideline limits for 1. freshwater aquatic ecosystems (95 % species protection) and 2. livestock drinking water.

< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 11 Spent Heap Residue (Free Leach)

Weight (kg)	1.06	Total S (%)	0.95	ANC	12.6	Porosity	-	Density (kg/L)	-					
pH (1:5)	9.00	Scr (%)	0.691	NAPP	8.6	Volume (L)	-	Rock/Water Ratio	0.35					
EC (µS/cm)	213	MPA	21.2	ANC:MPA	0.6	Pore Volume (L)	0.51	Surface Area	-					

Date			21-Oct-21	09-Dec-21	06-Jan-22	03-Feb-22	02-Mar-22	31-Mar-22	15-Jul-22	17-Oct-22				
Number of Weeks			0	7	11	15	19	23	38	52				
Leach Number			1	2	3	4	5	6	7	8				
ALS Laboratory Number			EB2130149001	EB2135898001	EB2200248001	EB2202793001	EB2205847001	EB2209020001	EB2220718001					
Volume On (L)			1.6	1.0	1.0	1.0	1.0	1.0	1.0					
Volume Off (L)			0.834	0.452	0.423	0.404	0.434	0.402	0.457					
Cum. Volume (L)			0.83	1.29	1.71	2.11	2.55	2.95	3.41					
Number of Pore Volumes through the Samples	Water Quality Guidelines		1.6	2.5	3.4	4.2	5.0	5.8	6.7					
pH (RGS Measurement)	6 to 9	-	6.98	7.20	6.21	6.36	6.14	7.30	6.92					
pH (ALS Measurement)			7.68	7.03	6.81	6.74	6.56	6.57	6.99					
pH (deionised water used in test)		-	7.05	7.27	7.58	5.78	6.55	6.35	6.42					
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	312	247	194	222	161	143	107					
EC (ALS Measurement) (µS/cm)			388	252	251	227	171	153	118					
Acidity (mg/L as $CaCO_3$)*	-	-	3	4	6	5	2	2	1.0					
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1					
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1					
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	41	13	15	12	12	9	9					
Total Alkalinity (mg/L as CaCO)*	-	-	41	13	15	12	12	9	9					

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]										
					(All units mg/L)									
Calcium	Ca	1	-	1000	37	16	26	24	15	15	7			
Potassium	K	1	-	-	28	22	7	5	5	8	3			
Magnesium	Mg	1	-	-	6	7	8	5	4	4	2			
Sodium	Na	1	-	-	13	9	8	9	6	7	8			
Chloride	Cl	1	-	-	12	14	2	2	2	1	1			
Fluoride	F[4]	0.1	-	2	0.9	0.1	0.2	0.2	0.1	<0.1	<0.1			
Sulfate	SO	1	-	1000	110	69	95	82	62	52	34			
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**										
					(All units mg/L)									
Aluminium	Al	0.01	0.055	5	0.02	0.06	0.04	0.03	0.07	0.05	0.02			
Arsenic	As	0.001	0.024(tri)*	0.5	0.015	0.003	0.005	0.004	0.006	0.005	0.003			
Boron	B	0.05	0.37	5	0.06	<0.05	<0.05	0.11	<0.05	<0.05	<0.05			
Cadmium	Cd	0.0001	0.0002	0.01	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001			
Cobalt	Co	0.001	-	1	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Copper	Cu	0.001	0.0014	1	0.003	0.001	0.001	<0.001	0.012	0.001	0.001			
Iron	Fe	0.05	-	-	0.11	<0.05	0.05	<0.05	0.06	<0.05	<0.05			
Mercury	Hg	0.0001	0.0006	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Manganese	Mn	0.001	1.9	-	0.022	0.053	0.047	0.032	0.027	0.020	0.010			
Molybdenum	Mo	0.001	-	0.15	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.002			
Nickel	Ni	0.001	0.011	1	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Lead	Pb	0.001	0.0034	0.1	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001			
Antimony	Sb	0.001	-	-	0.011	<0.001	0.002	0.001	<0.001	<0.001	<0.001			
Selenium	Se	0.01	0.011	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Thorium	Th	0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Uranium	U	0.001	-	-	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Vanadium	V	0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Zinc	Zn	0.005	0.008	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			

Calculations**	Elements													
SO_4 Release Rate	SO[4]		87	29	38	31	25	20	15					
Cumulative SO Release	Cum SO		87	116	154	185	211	230	245					
Ca Release Rate	Ca		29.1	6.8	10.4	9.1	6.1	5.7	3.0					
Cumulative Ca Release	Cum Ca		29.1	35.9	46.3	55.5	61.6	67.3	70.3					
Mg Release Rate	Mg		4.7	3.0	3.2	1.9	1.6	1.5	0.9					
Cumulative Mg Release	Cum Mg		4.7	7.7	10.9	12.8	14.4	16.0	16.8					
Residual ANC (%)	Res. ANC		99.3	99.1	98.8	98.5	98.3	98.2	98.1					
Residual Sulfur (%)	Res. S		99.7	99.6	99.5	99.3	99.3	99.2	99.1					
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)		1.0	1.0	1.0	1.1	1.2	1.0	1.4					

Notes:

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< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 12 Spent Heap Residue (Saturated)

Weight (kg)	1.02	Total S (%)	0.95	ANC	12.6	Porosity	-	Density (kg/L)	-					
pH (1:5)	9.00	Scr (%)	0.691	NAPP	8.6	Volume (L)	-	Rock/Water Ratio	0.34					
EC (µS/cm)	213	MPA	21.2	ANC:MPA	0.6	Pore Volume (L)	0.51	Surface Area	-					

Date			21-Oct-21	09-Dec-21	06-Jan-22	03-Feb-22	02-Mar-22	31-Mar-22	15-Jul-22	17-Oct-22				
Number of Weeks			0	7	11	15	19	23	38	52				
Leach Number			1	2	3	4	5	6	7	8				
ALS Laboratory Number			EB2130149002	EB2135898002	EB2200248002	EB2202793002	'EB2205847002	EB2209020002	EB2220718002					
Volume On (L)			1.2	1.0	0.6	0.9	0.6	1.0	1.0					
Volume Off (L)			0.923	1.020	0.667	0.843	0.584	0.992	1.079					
Cum. Volume (L)			0.92	1.94	2.61	3.45	4.04	5.03	6.11					
Number of Pore Volumes through the Samples	Water Quality Guidelines		1.8	3.8	5.2	6.8	8.0	9.9	12.1					
pH (RGS Measurement)	6 to 9	-	7.81	7.68	7.49	7.33	7.29	7.36	7.30					
pH (ALS Measurement)			7.58	7.56	7.32	7.72	7.63	7.82	7.93					
pH (deionised water used in test)		-	7.05	7.27	7.58	5.78	6.55	6.35	6.42					
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	170	218	156	199	237	214	287					
EC (ALS Measurement) (µS/cm)			211	202	192	204	236	229	299					
Acidity (mg/L as $CaCO_3$)*	-	-	2	3	4	6	3	1	1.0					
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1					
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1					
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	24	44	55	70	94	90	125					
Total Alkalinity (mg/L as CaCO)*	-	-	24	44	55	70	94	90	125					

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]										
					(All units mg/L)									
Calcium	Ca	1	-	1000	19	20	18	21	22	25	28			
Potassium	K	1	-	-	16	15	14	14	17	17	21			
Magnesium	Mg	1	-	-	3	5	5	5	6	6	9			
Sodium	Na	1	-	-	7	6	5	6	6	6	8			
Chloride	Cl	1	-	-	7	6	5	5	4	4	4			
Fluoride	F	0.1	-	2	0.5	0.9	0.8	0.6	0.6	0.3	0.5			
Sulfate	SO	1	-	1000	54	45	35	27	17	15	8			
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**										
					(All units mg/L)									
Aluminium	Al	0.01	0.055	5	0.08	0.03	0.01	<0.01	<0.01	<0.01	<0.01			
Arsenic	As	0.001	0.024(tri)*	0.5	0.011	0.010	0.017	0.016	0.011	0.002	0.002			
Boron	B	0.05	0.37	5	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	<0.05			
Cadmium	Cd	0.0001	0.0002	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Cobalt	Co	0.001	-	1	<0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001			
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Copper	Cu	0.001	0.0014	1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001			
Iron	Fe	0.05	-	-	0.05	<0.05	0.19	0.20	0.07	<0.05	<0.05			
Mercury	Hg	0.0001	0.0006	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Manganese	Mn	0.001	1.9	-	0.007	1.120	1.600	1.760	2.200	1.910	1.970			
Molybdenum	Mo	0.001	-	0.15	<0.001	0.003	0.003	0.003	0.002	0.002	0.003			
Nickel	Ni	0.001	0.011	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Lead	Pb	0.001	0.0034	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Antimony	Sb	0.001	-	-	0.005	0.007	0.005	0.003	<0.001	<0.001	<0.001			
Selenium	Se	0.01	0.011	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Thorium	Th	0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Uranium	U	0.001	-	-	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Vanadium	V	0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Zinc	Zn	0.005	0.008	-	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005			

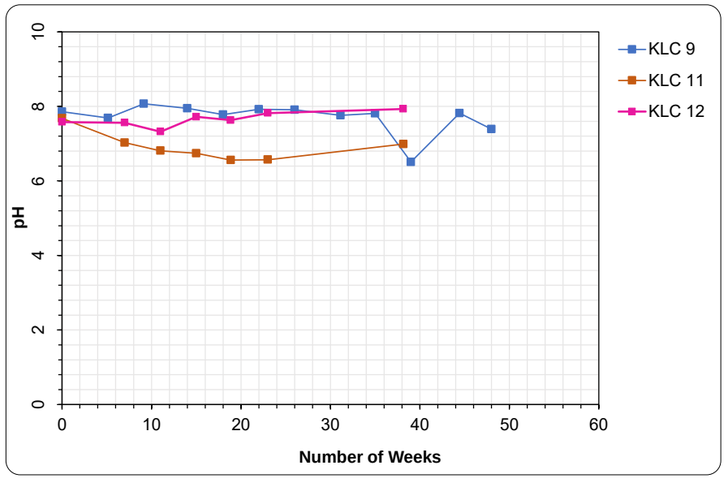
Calculations**	Elements													
SO_4 Release Rate	SO		49	45	23	22	10	15	8					
Cumulative SO Release	Cum SO		49	94	117	140	149	164	173					
Ca Release Rate	Ca		17.3	20.1	11.8	17.4	12.6	24.4	29.7					
Cumulative Ca Release	Cum Ca		17.3	37.3	49.2	66.6	79.2	103.6	133.4					
Mg Release Rate	Mg		2.7	5.0	3.3	4.1	3.4	5.9	9.6					
Cumulative Mg Release	Cum Mg		2.7	7.7	11.0	15.2	18.6	24.5	34.0					
Residual ANC (%)	Res. ANC		99.6	99.0	98.7	98.2	97.9	97.2	96.3					
Residual Sulfur (%)	Res. S		99.8	99.7	99.6	99.5	99.5	99.4	99.4					
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)		0.9	0.7	0.6	0.4	0.2	0.2	0.1					

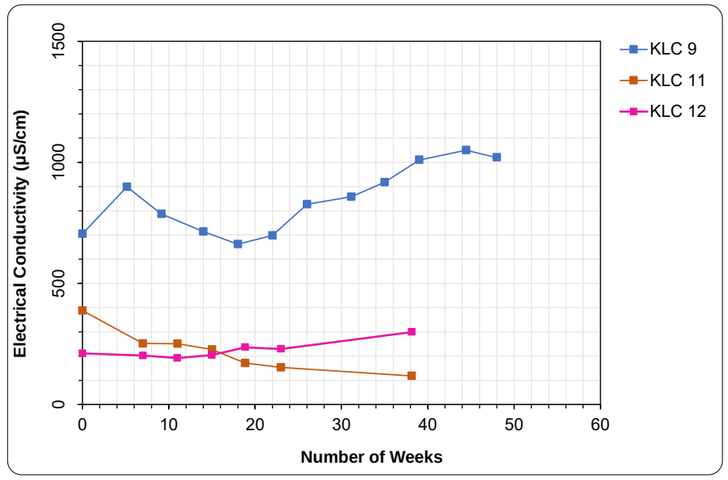
Notes:

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines. Recommended guideline limits for 1. freshwater aquatic ecosystems (95 % species protection) and 2. livestock drinking water.

< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

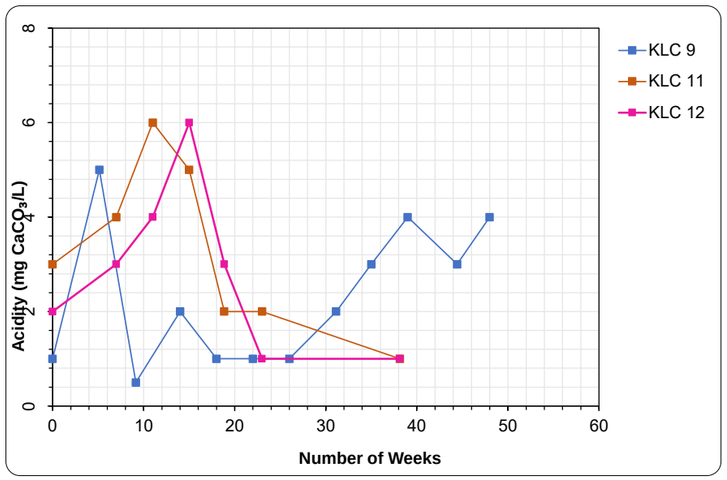
KLC Plots

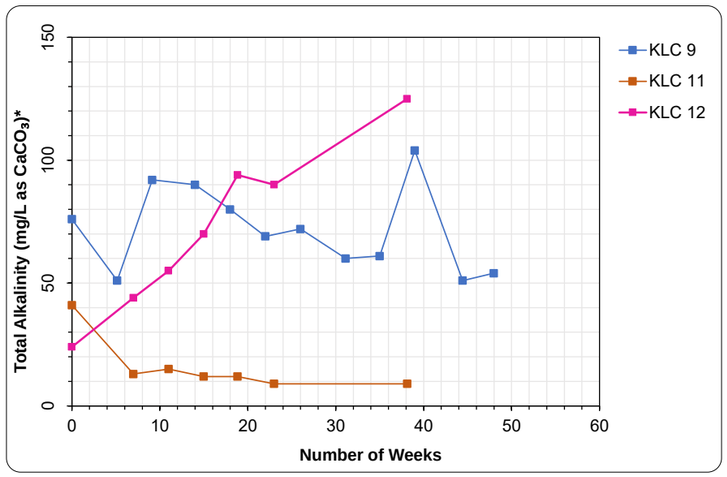


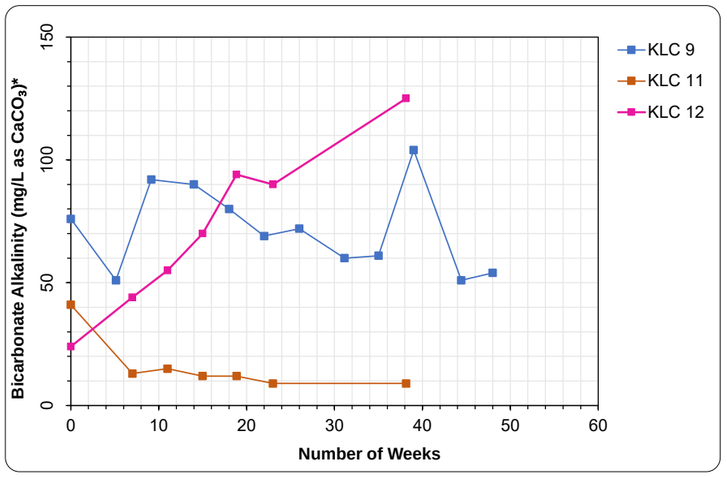


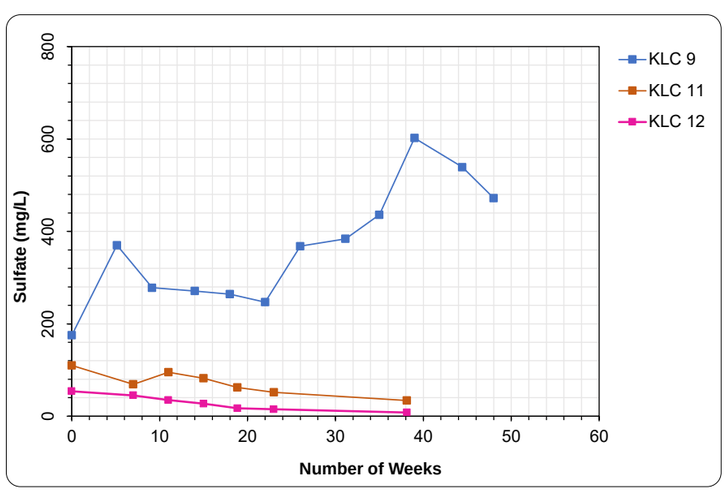
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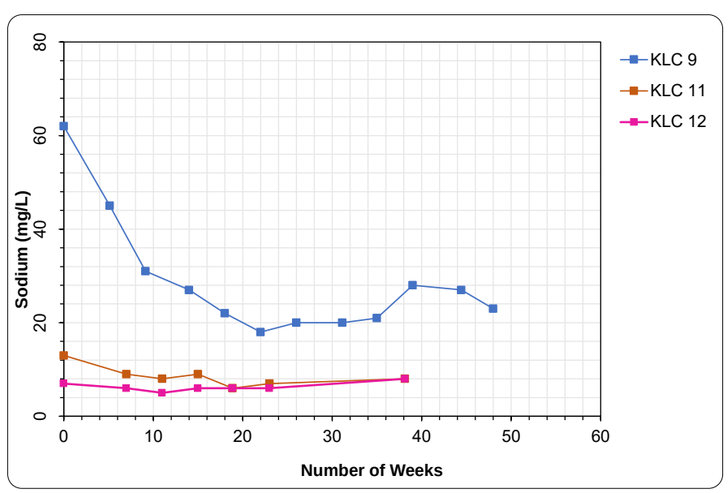
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- KLC 11 Spent Heap Residue (Free Leach)
- KLC 12 Spent Heap Residue (Saturated)

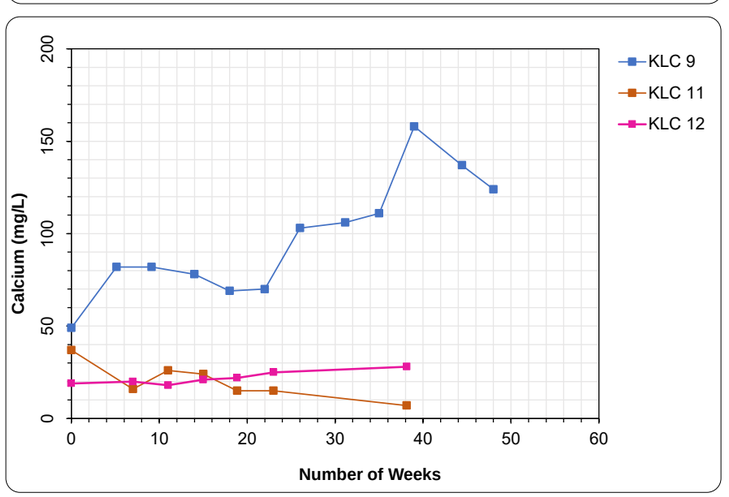




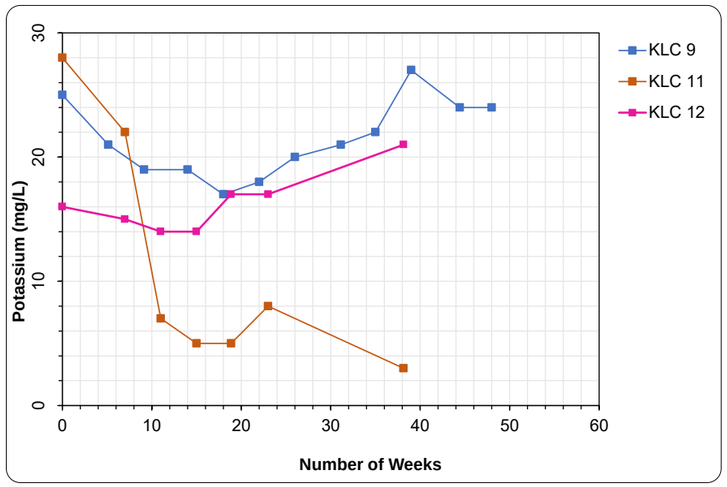


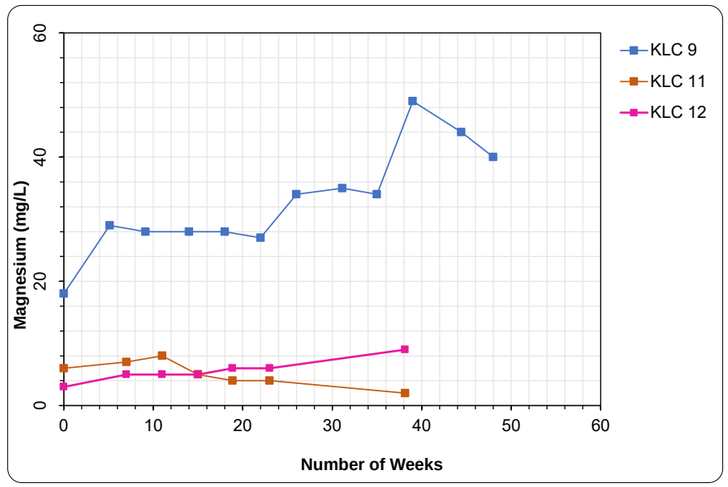






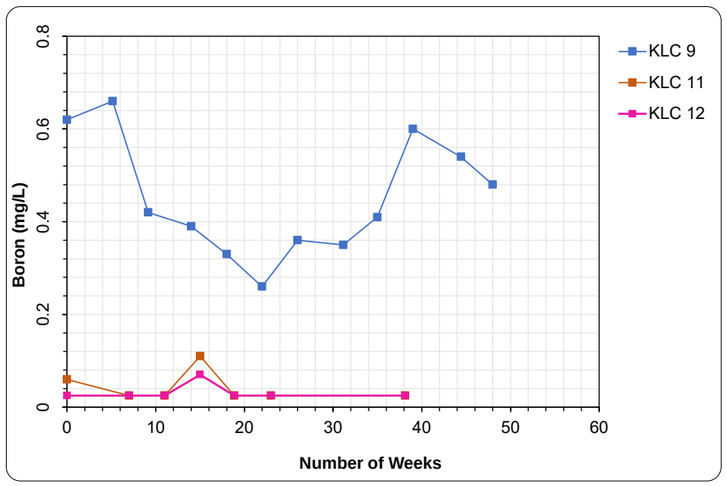
KLC Plots

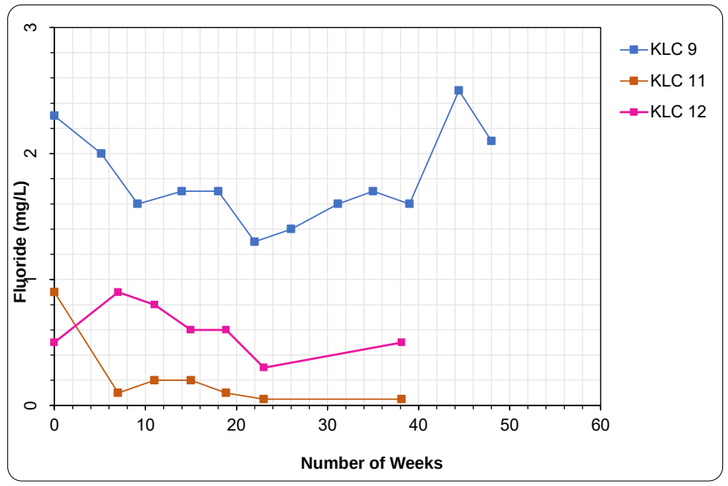


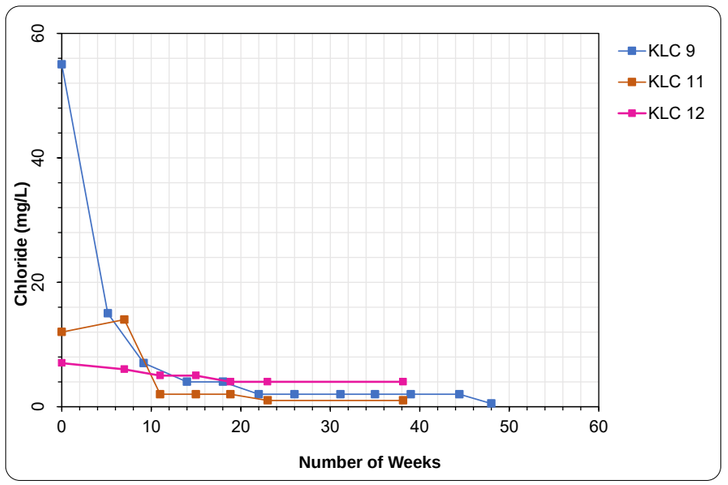


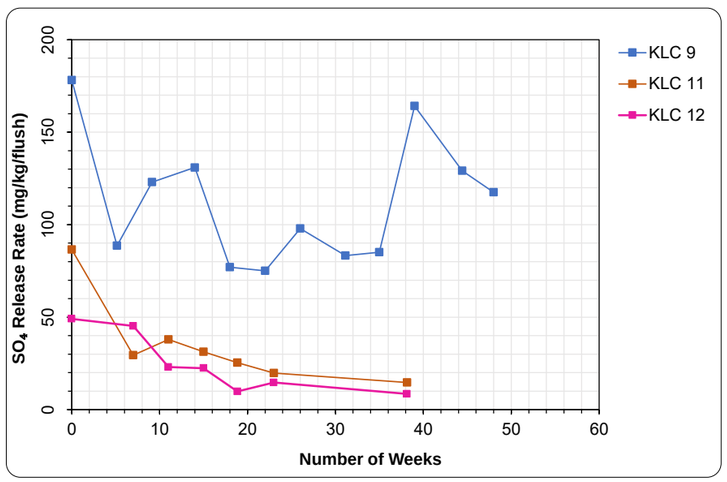
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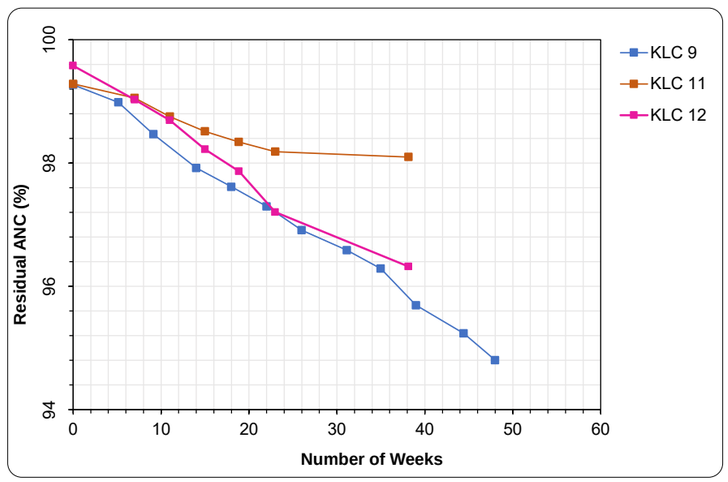
- KLC 9 Strategic Woolgar Tailings (Free Leach)
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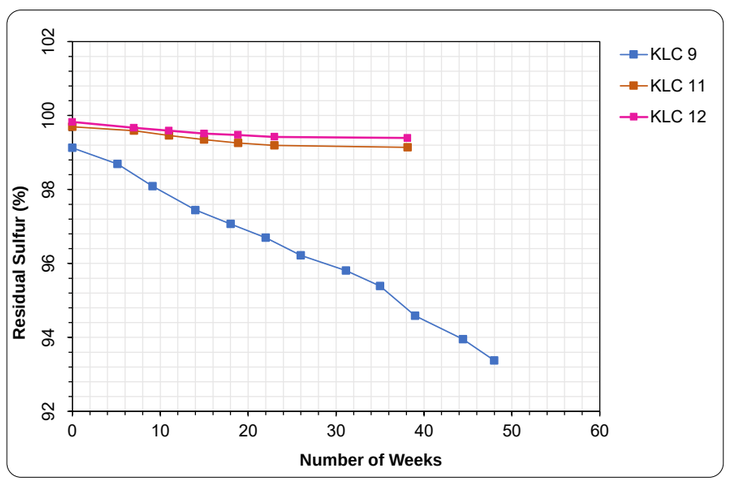




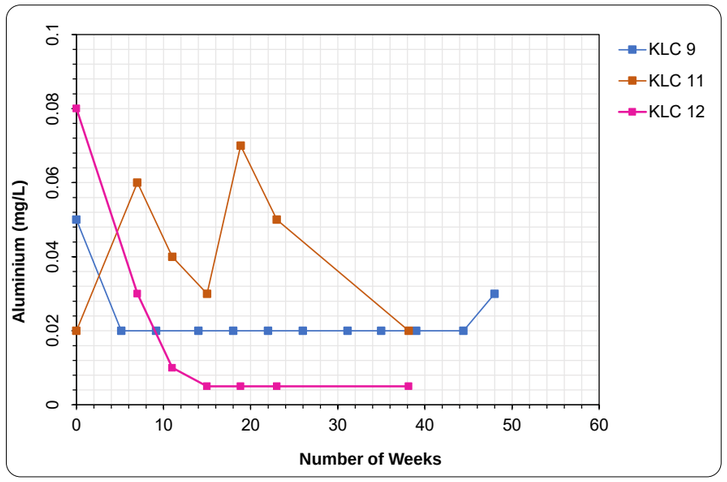


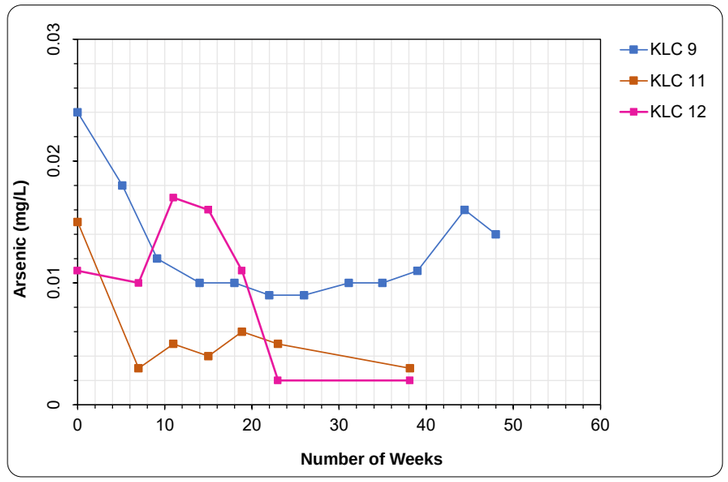






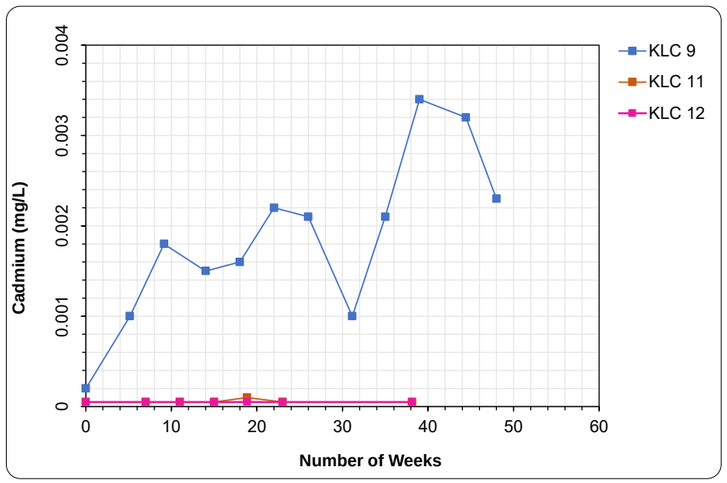
KLC Plots

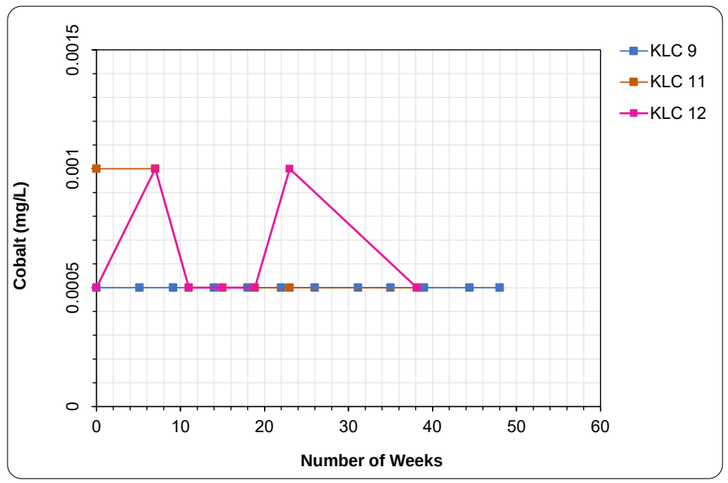


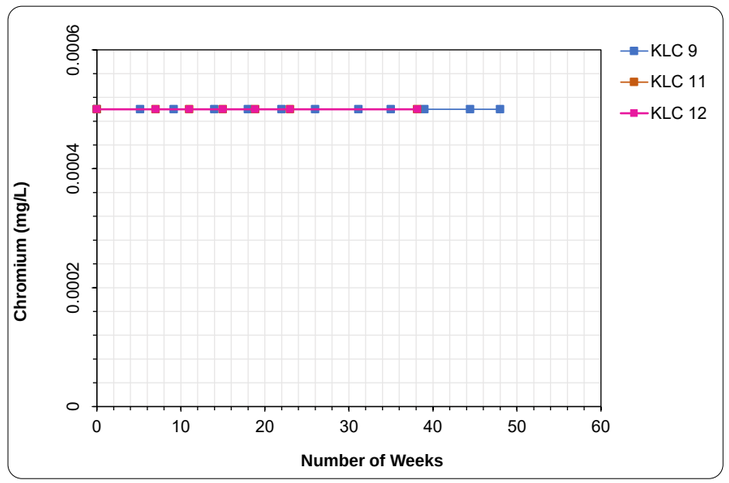


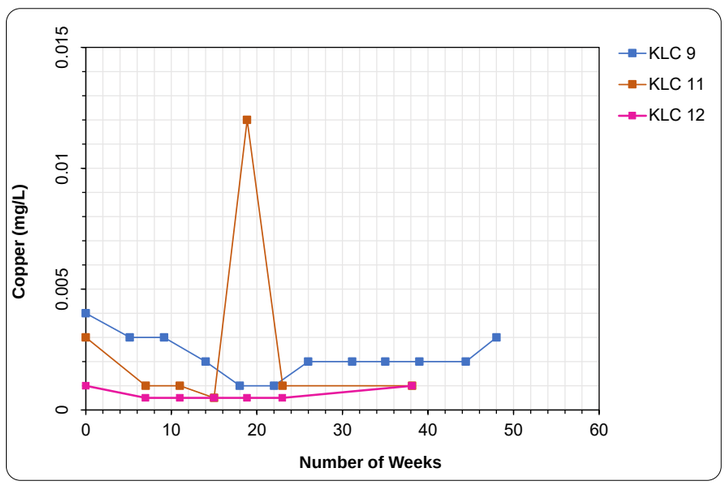
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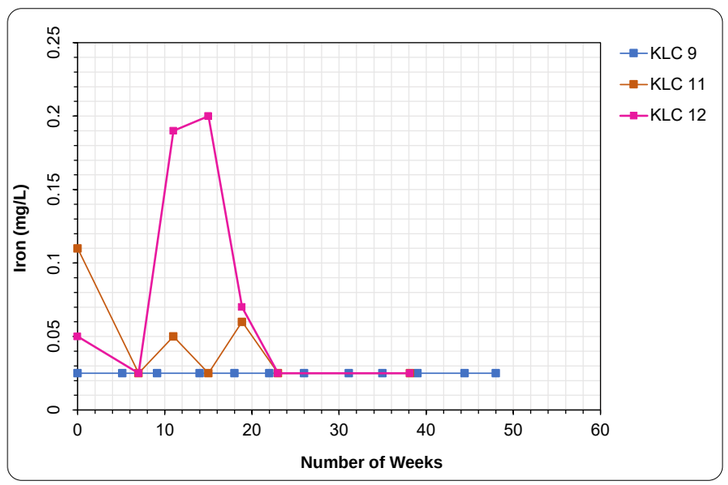
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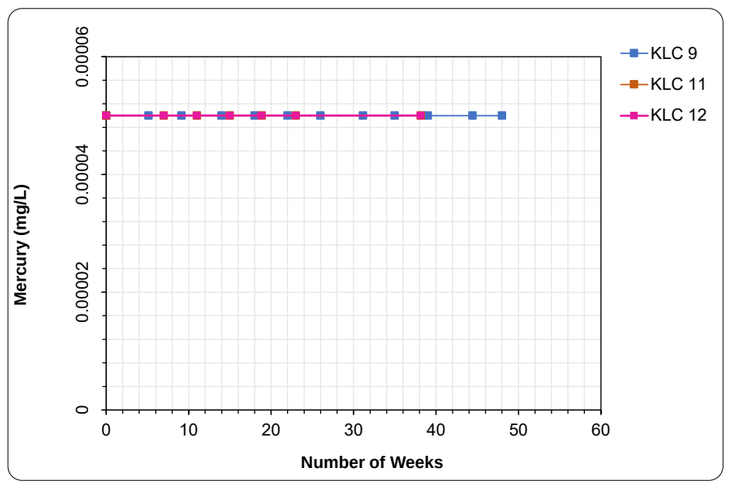




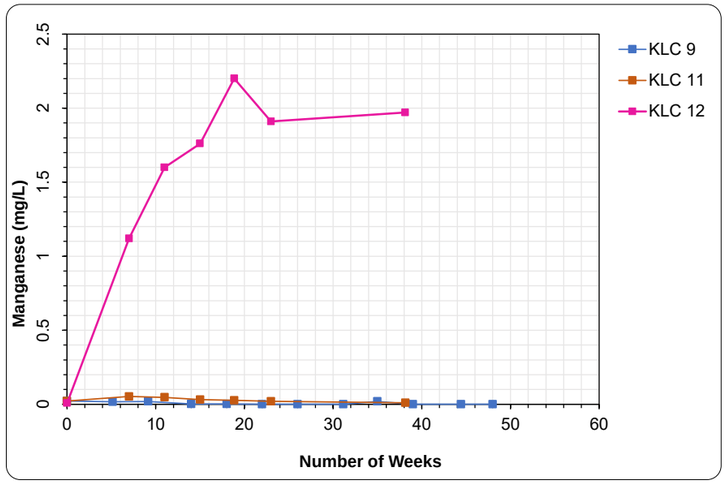


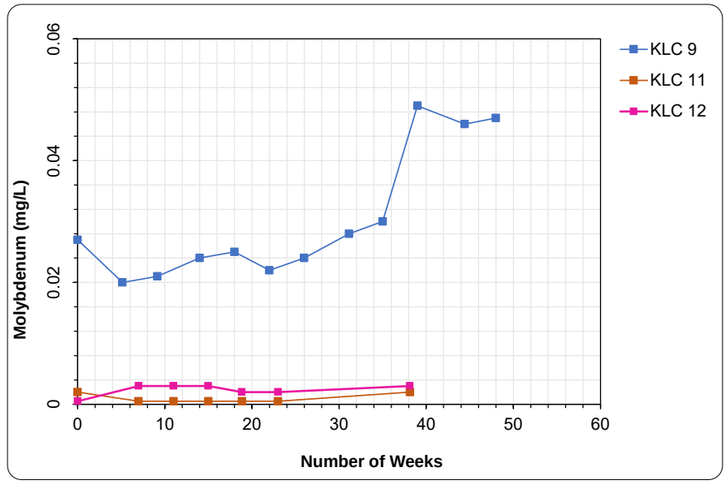






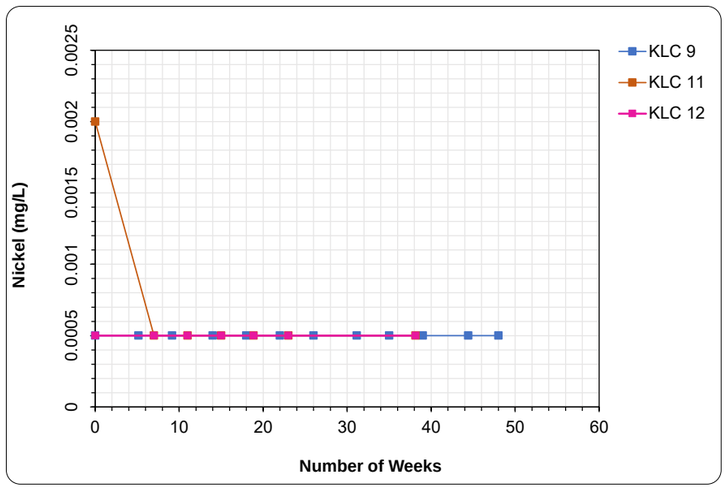
KLC Plots

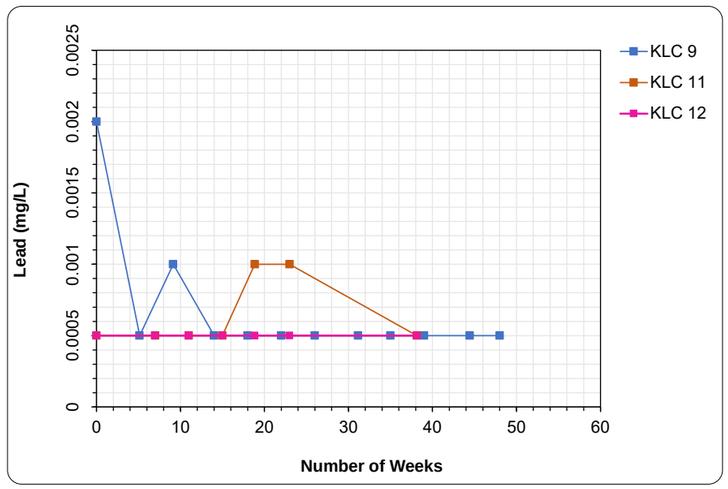


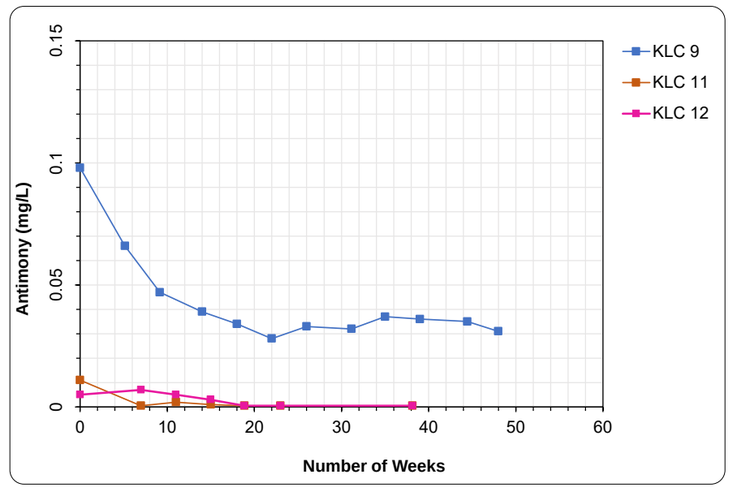


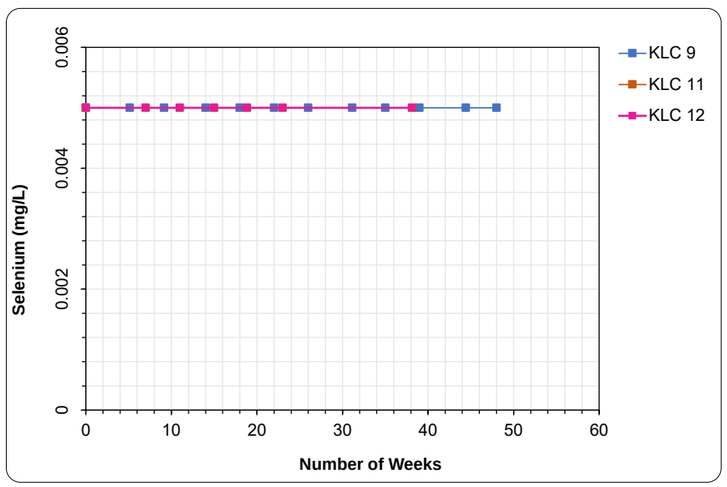
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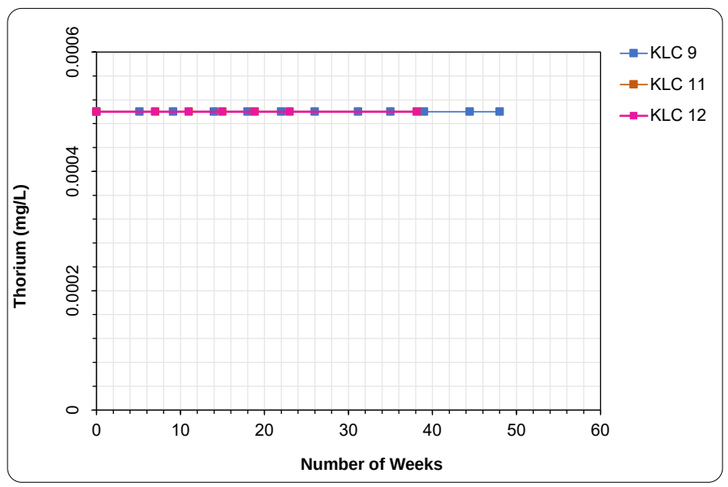
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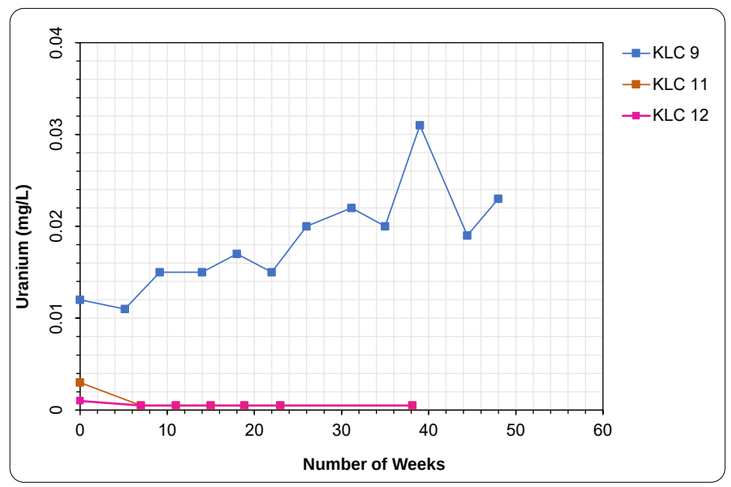




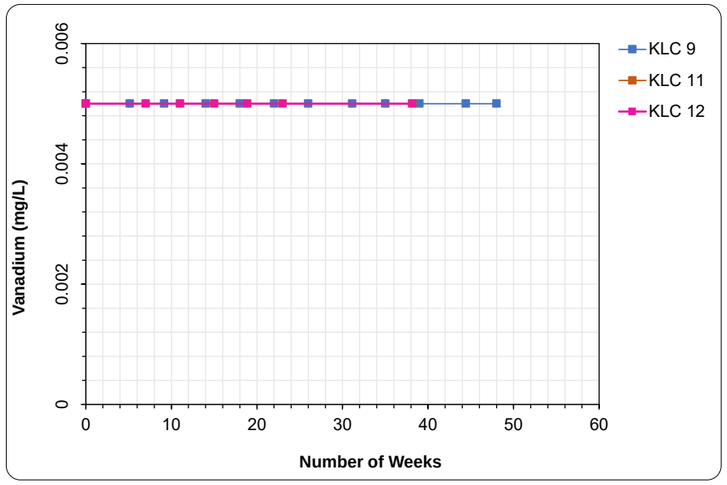


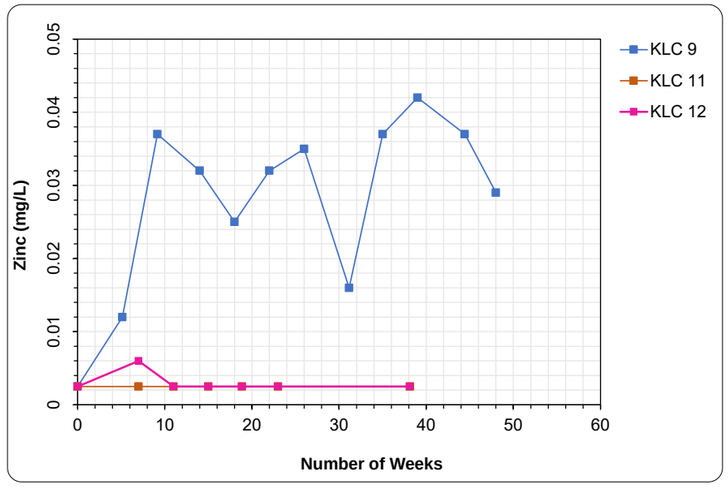






KLC Plots





LEGEND:

- KLC 9 Strategic Woolgar Tailings (Free Leach)
- KLC 11 Spent Heap Residue (Free Leach)
- KLC 12 Spent Heap Residue (Saturated)

KLC 10 Low-Grade Ore (Free Leach)

Weight (kg)	11.31	Total S (%)	0.80	ANC	35.6	Porosity	-	Density (kg/L)	-				
pH (1:5)	8.00	Scr (%)	0.658	NAPP	-15.4	Volume (L)	-	Rock/Water Ratio	8.08				
EC (µS/cm)	187	MPA	20.2	ANC:MPA	1.8	Pore Volume (L)	1.35	Surface Area	-				

Date			04-Aug-20	01-Sep-20	07-Oct-20	03-Nov-20	01-Dec-20	05-Jan-21	02-Feb-21	02-Mar-21	30-Mar-21	28-Apr-21	25-May-21	22-Jun-21
Number of Weeks			0	4	9	13	17	22	26	30	34	38	42	46
Leach Number			1	2	3	4	5	6	7	8	9	10	11	12
ALS Laboratory Number			EB2020387010	EB2022964010	EB2026216010	EB2028814010	EB2031669010	EB2100143010	EB2102717010	EB2105658001	EB2108583001	EB2111461001	EB2120544001	EB2120544002
Volume On (L)			1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Volume Off (L)			0.368	1.079	0.843	0.897	0.692	0.766	0.875	0.821	1.000	0.853	1.066	0.819
Cum. Volume (L)			0.37	1.45	2.29	3.19	3.88	4.65	5.52	6.34	7.34	8.19	9.26	10.08
Number of Pore Volumes through the Samples	Water Quality Guidelines		0.3	1.1	1.7	2.4	2.9	3.4	4.1	4.7	5.4	6.1	6.9	7.5
pH (RGS Measurement)	6 to 9	-	7.77	7.51	7.73	7.57	7.72	7.78	7.52	6.68	6.71	6.90	6.66	6.85
pH (ALS Measurement)			7.13	7.37	7.11	7.29	7.11	7.52	6.52	6.83	6.46	7.31	7.20	7.10
pH (deionised water used in test)		-	6.48	6.23	6.59	6.03	6.70	6.06	5.96	6.69	6.06	6.73	6.25	7.27
EC (RGS Measurement) (µS/cm)	<1,000 #	3,580^	1,017	1,105	1,042	831	768	719	572	591	531	600	544	520
EC (ALS Measurement) (µS/cm)			1310	1400	1140	923	781	732	659	594	537	622	566	488
Acidity (mg/L as $CaCO_3$)*	-	-	2.0	1.0	1.0	2.0	2.0	1.0	3.0	1.0	4.0	4.0	2.0	2.0
Hydroxide Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity (mg/L as CaCO)*	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity (mg/L as CaCO)*	-	-	30	22	16	16	13	14	8	8	12	12	10	11
Total Alkalinity (mg/L as CaCO)*	-	-	30	22	16	16	13	14	8	8	12	12	10	11

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]										
					(All units mg/L)									
Calcium	Ca	1	-	1000	87	101	75	56	43	47	33	31	34	38	12	9
Potassium	K	1	-	-	23	17	13	12	10	8	8	7	6	7	3	2
Magnesium	Mg	1	-	-	48	67	62	48	46	41	40	38	36	44	14	13
Sodium	Na	1	-	-	97	104	72	51	45	34	30	25	19	20	7	5
Chloride	Cl	1	-	-	66	73	39	28	21	16	14	13	9	10	12	8
Fluoride	F[4]	0.1	-	2	0.2	0.3	0.3	0.3	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1
Sulfate	SO	1	-	1,000	515	617	511	419	363	326	284	258	259	287	255	213
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**										
					(All units mg/L)									
Aluminium	Al	0.01	0.055	5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	As	0.001	0.024 (tri)*	0.5	0.001	0.008	0.005	0.005	0.004	0.004	0.002	0.002	0.003	0.002	<0.001	<0.001
Boron	B	0.05	0.37	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	Cd	0.0001	0.0002	0.01	0.0016	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	<0.0001	<0.0001
Cobalt	Co	0.001	-	1	0.028	0.004	0.003	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	Cu	0.001	0.0014	1	0.004	0.002	0.002	0.002	0.001	<0.001	0.001	<0.001	0.001	0.001	<0.001	<0.001
Iron	Fe	0.05	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	Hg	0.0001	0.0006	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese	Mn	0.001	1.9	-	0.742	0.224	0.110	0.030	0.019	0.010	0.018	0.015	0.007	0.005	0.003	0.002
Molybdenum	Mo	0.001	-	0.15	0.003	0.005	0.007	0.008	0.008	0.009	0.006	0.004	0.007	0.008	0.002	0.002
Nickel	Ni	0.001	0.011	1	0.076	0.012	0.007	0.004	0.003	0.002	0.002	0.001	0.001	0.001	<0.001	<0.001
Lead	Pb	0.001	0.0034	0.1	<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	-	-	0.003	0.006	0.006	0.005	0.003	0.003	0.002	0.002	0.002	0.003	<0.001	<0.001
Selenium	Se	0.01	0.011	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
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
Uranium	U	0.001	-	-	0.001	0.005	0.002	0.002	0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Vanadium	V	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
Zinc	Zn	0.005	0.008	-	0.067	0.008	0.014	0.011	0.012	0.010	0.011	0.011	0.007	0.008	<0.005	<0.005
Calculations**	**Elements**													
SO_4 Release Rate	SO[4]				17	59	38	33	22	22	22	19	23	22	24	15
Cumulative SO Release	Cum SO				17	76	114	147	169	191	213	232	255	276	300	316
Ca Release Rate	Ca				2.8	9.6	5.6	4.4	2.6	3.2	2.6	2.2	3.0	2.9	1.1	0.7
Cumulative Ca Release	Cum Ca				2.8	12.5	18.1	22.5	25.1	28.3	30.9	33.1	36.1	39.0	40.1	40.8
Mg Release Rate	Mg				1.6	6.4	4.6	3.8	2.8	2.8	3.1	2.8	3.2	3.3	1.3	0.9
Cumulative Mg Release	Cum Mg				1.6	8.0	12.6	16.4	19.2	22.0	25.1	27.8	31.0	34.3	35.6	36.6
Residual ANC (%)	Res. ANC				100.0	99.8	99.7	99.7	99.6	99.6	99.5	99.5	99.4	99.3	99.3	99.3
Residual Sulfur (%)	Res. S[4]				99.9	99.7	99.5	99.4	99.3	99.2	99.1	99.0	98.9	98.8	98.7	98.7
SO /(Ca+Mg) molar ratio	SO /(Ca+Mg)				1.3	1.2	1.2	1.3	1.3	1.2	1.2	1.1	1.2	1.1	3.0	2.9

Notes:

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines. Recommended guideline limits for 1. freshwater aquatic ecosystems (95 % species protection) and 2. livestock drinking water.

< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC 15 High-Grade Ore (Free Leach)

				Weight (kg)	2.00	Total S (%)	1.99	ANC	18.9	Porosity	-	Density (kg/L)	-			
				pH (1:5)	7.00	Scr (%)	1.660	NAPP	31.9	Volume (L)	-	Rock/Water Ratio	1.43			
				EC (µS/cm)	799	MPA	50.8	ANC:MPA	0.4	Pore Volume (L)	0.65	Surface Area	-			

Date				21-Oct-21	09-Dec-21	06-Jan-22	03-Feb-22	02-Mar-22	31-Mar-22	15-Jul-22	17-Oct-22					
Number of Weeks				0	7	11	15	19	23	38	52					
Leach Number				1	2	3	4	5	6	7	8					
ALS Laboratory Number				EB2130149005	EB2135898005	EB2200248005	EB2202793005	EB2205847005	EB2209020005	EB2220718005						
Volume On (L)				1.4	1.0	1.0	1.0	1.0	1.0	1.0						
Volume Off (L)				0.774	0.484	0.478	0.479	0.511	0.412	0.419						
Cum. Volume (L)				0.77	1.26	1.74	2.22	2.73	3.14	3.56						
Number of Pore Volumes through the Samples	Water Quality Guidelines			1.2	1.9	2.7	3.4	4.2	4.9	5.5						
pH (RGS Measurement)			-	4.66	5.94	5.38	6.69	6.76	7.12	7.48						
pH (ALS Measurement)	6 to 9			4.47	5.6	5.77	6.18	6.15	5.99	6.30						
pH (deionised water used in test)			-	7.05	7.27	7.58	5.74	6.55	6.35	6.42						
EC (RGS Measurement) (µS/cm)	<1,000 #		3,580^	1,797	784	624	780	704	697	774						
EC (ALS Measurement) (µS/cm)				2,070	728	778	787	714	680	778						
Acidity (mg/L as $CaCO_3$)*	-		-	200	4	5	5	4	1	2						
Hydroxide Alkalinity (mg/L as CaCO)*	-		-	<1	<1	<1	<1	<1	<1	<1						
Carbonate Alkalinity (mg/L as CaCO)*	-		-	<1	<1	<1	<1	<1	<1	<1						
Bicarbonate Alkalinity (mg/L as CaCO)*	-		-	<1	2	4	4	5	2	2						
Total Alkalinity (mg/L as CaCO)*	-		-	<1	2	4	4	5	2	2						

Major Ions (mg/L)	Elements	LoR	Aquatic Ecosystems (Freshwater)[1]	Livestock Drinking Water[2]												
Calcium	Ca	1	-	1000	217	45	35	38	26	31	24					
Potassium	K	1	-	-	19	4	3	3	2	5	3					
Magnesium	Mg	1	-	-	132	63	83	75	72	72	84					
Sodium	Na	1	-	-	34	9	8	8	6	6	9					
Chloride	Cl	1	-	-	16	5	4	4	3	3	3					
Fluoride	F[4]	0.1	-	2	0.8	<0.1	0.1	0.1	0.2	0.2	0.2					
Sulfate	SO	1	-	1,000	1,160	364	443	423	367	367	398					
Trace metals/ metalloids (mg/L)	**Elements**	**LoR**	**Aquatic Ecosystems (Freshwater)[1]**	**Livestock Drinking Water[2]**												
Aluminium	Al	0.01	0.055	5	4.19	0.11	<0.01	<0.01	<0.01	<0.01	<0.01					
Arsenic	As	0.001	0.024 (tri)*	0.5	0.002	<0.001	0.001	0.001	0.002	0.001	0.001					
Boron	B	0.05	0.37	5	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					
Cadmium	Cd	0.0001	0.0002	0.01	0.2050	0.0144	0.0049	0.0035	0.0028	0.0022	0.0029					
Cobalt	Co	0.001	-	1	0.598	0.061	0.018	0.011	0.009	0.007	0.008					
Chromium	Cr	0.001	0.001 (hex)*	1 (total)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Copper	Cu	0.001	0.0014	1	0.416	0.029	0.007	0.003	0.004	0.003	0.005					
Iron	Fe	0.05	-	-	55.40	0.12	0.08	<0.05	<0.05	<0.05	<0.05					
Mercury	Hg	0.0001	0.0006	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					
Manganese	Mn	0.001	1.9	-	13.300	2.490	1.730	1.500	1.490	1.360	1.410					
Molybdenum	Mo	0.001	-	0.15	0.001	<0.001	0.007	0.003	0.009	<0.001	<0.001					
Nickel	Ni	0.001	0.011	1	1.720	0.153	0.047	0.028	0.022	0.018	0.020					
Lead	Pb	0.001	0.0034	0.1	0.092	0.013	0.006	0.004	0.003	0.002	0.001					
Antimony	Sb	0.001	-	-	0.005	<0.001	0.001	0.001	<0.001	<0.001	<0.001					
Selenium	Se	0.01	0.011	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					
Thorium	Th	0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Uranium	U	0.001	-	-	0.145	0.005	<0.001	<0.001	<0.001	<0.001	<0.001					
Vanadium	V	0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					
Zinc	Zn	0.005	0.008	-	11.000	0.863	0.203	0.119	0.100	0.066	0.082					

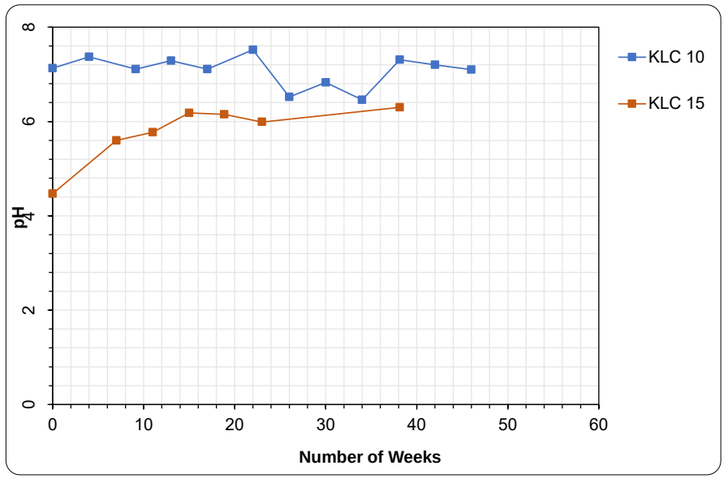
Calculations**	Elements															
SO_4 Release Rate[4]	SO[4]				448	88	106	101	94	76	83					
Cumulative SO Release[4]	Cum SO				448	536	642	743	837	913	996					
Ca Release Rate	Ca				83.9	10.9	8.4	9.1	6.6	6.4	5.0					
Cumulative Ca Release	Cum Ca				83.9	94.8	103.1	112.2	118.9	125.2	130.3					
Mg Release Rate	Mg				51.0	15.2	19.8	17.9	18.4	14.8	17.6					
Cumulative Mg Release	Cum Mg				51.0	66.3	86.1	104.0	122.4	137.2	154.8					
Residual ANC (%)	Res. ANC				97.8	97.4	96.8	96.3	95.8	95.5	95.0					
Residual Sulfur (%)[4]	Res. S[4]				99.2	99.1	98.9	98.8	98.6	98.5	98.3					
SO /(Ca+Mg) molar ratio[4]	SO /(Ca+Mg)				1.1	1.0	1.1	1.1	1.1	1.0	1.0					

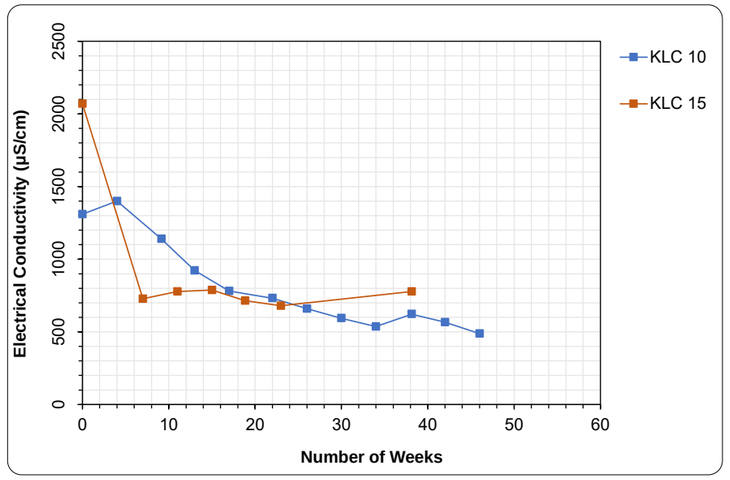
Notes:

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< indicates less than the analytical detection limit. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm * Acidity and alkalinity data calculated in mg CaCO3/L. Shaded cells exceed applied guideline values. (tri)* 0.024 g/L for trivalent Arsenic (III). (hex)* Cr (VI) = hexavalent. # for still water bodies only, moving rivers at low flow rates should not exceed 2,200µS/cm. ^ calculated based on total dissolved solids (TDS) conversion rate of 0.67% of EC. TDS is an approximate measure of inorganic dissolved salts and should not exceed 2,400mg/L for livestock drinking water. ** SO4, Ca and Mg release rates calculated in mg/kg/flush. Residual ANC assumes that all leached Mg and Ca is due to dissolution of calcite or dolomite. Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity. MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.

KLC Plots

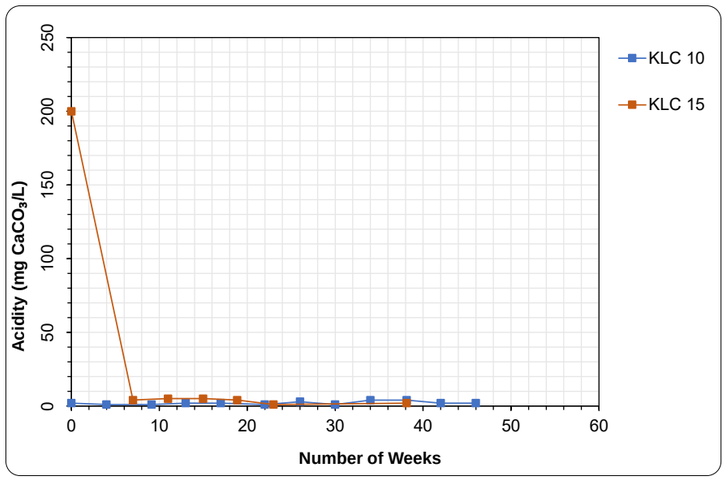


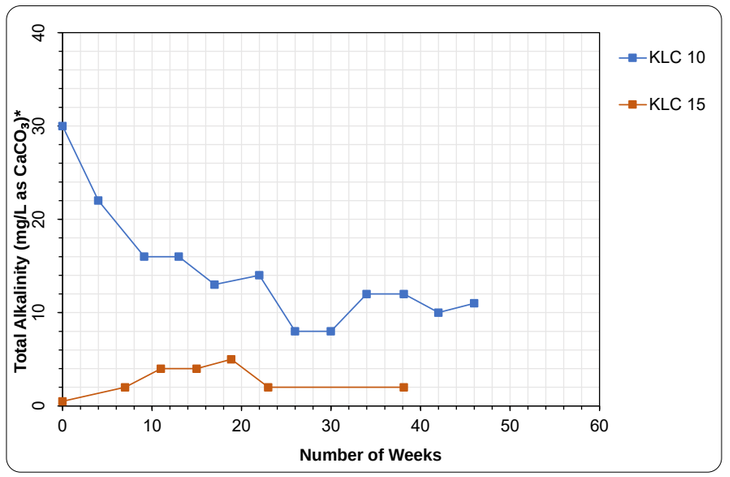


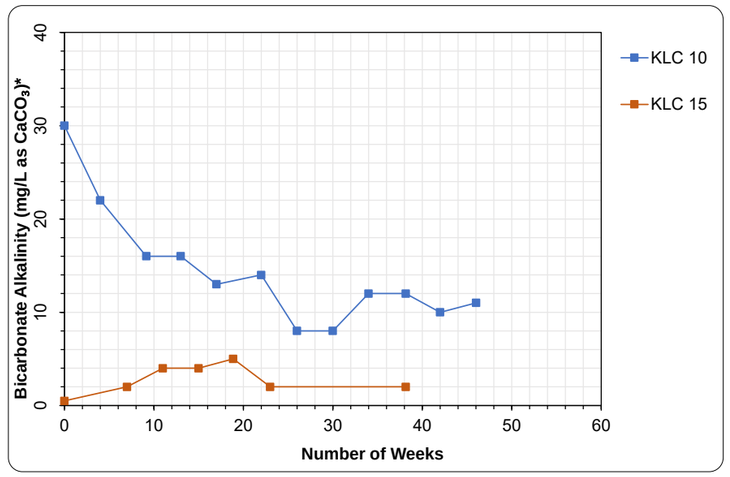
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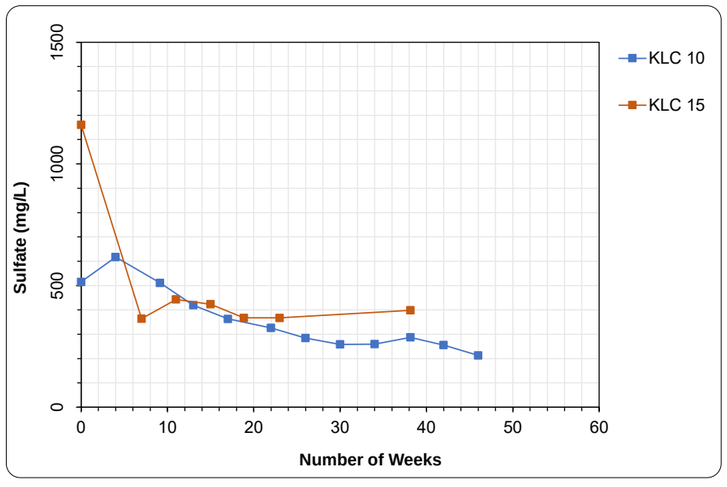
KLC 10 Low-Grade Ore (Free Leach)

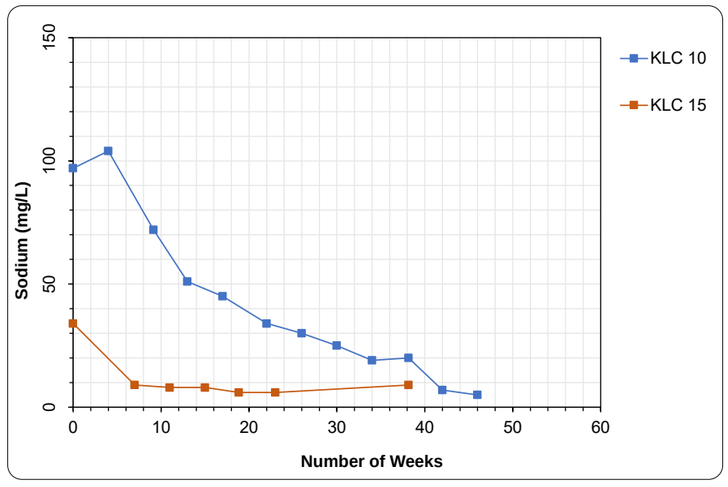
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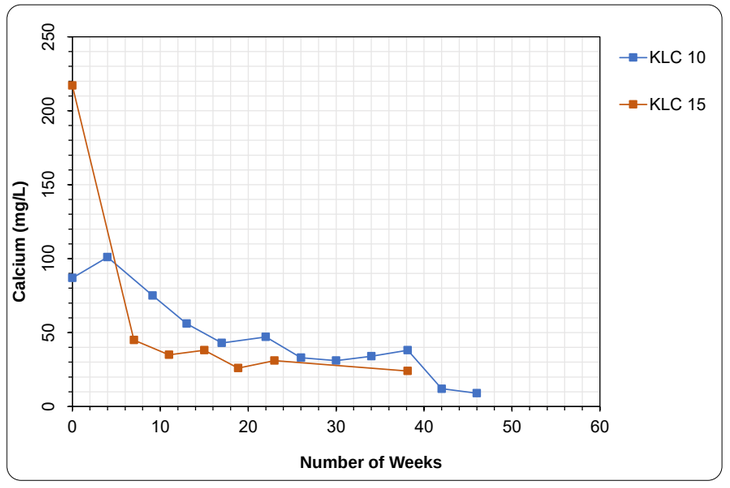




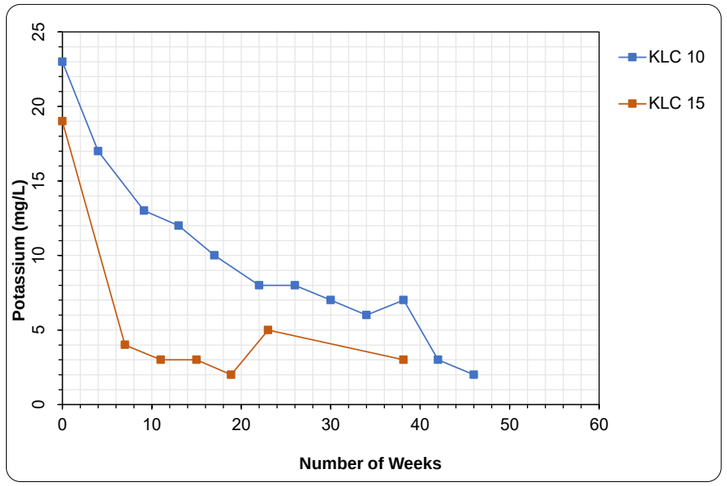


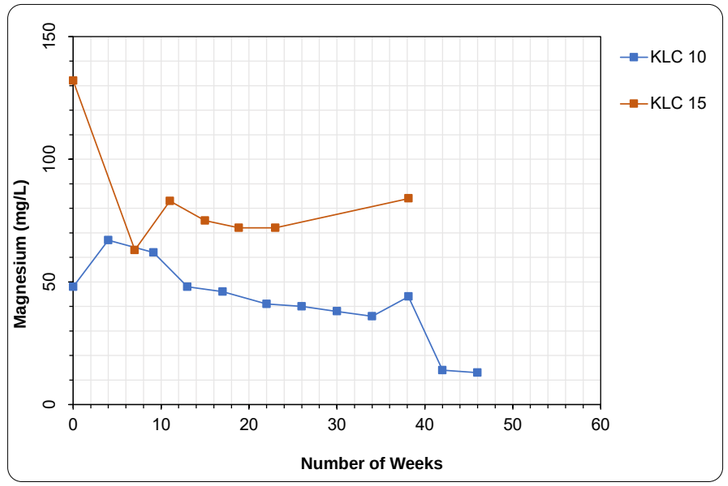






KLC Plots

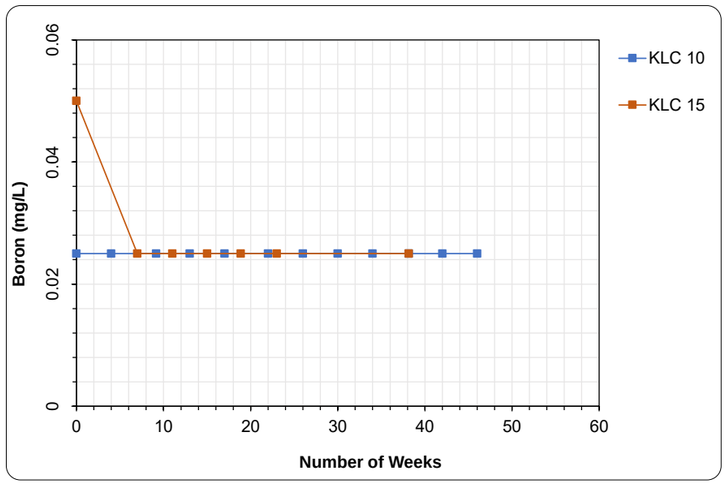


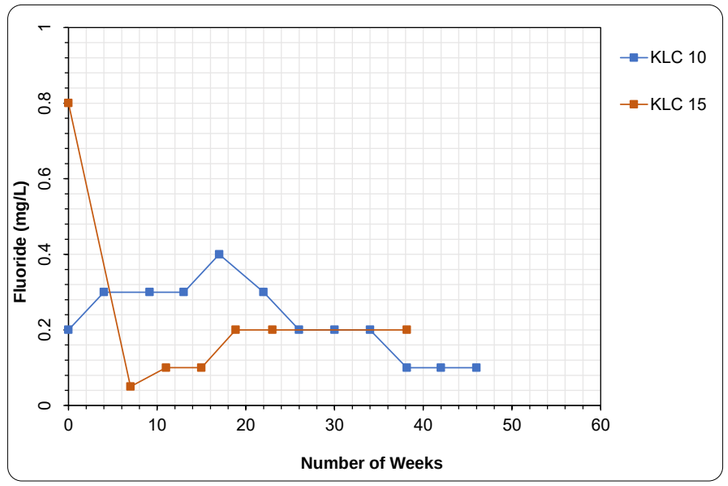


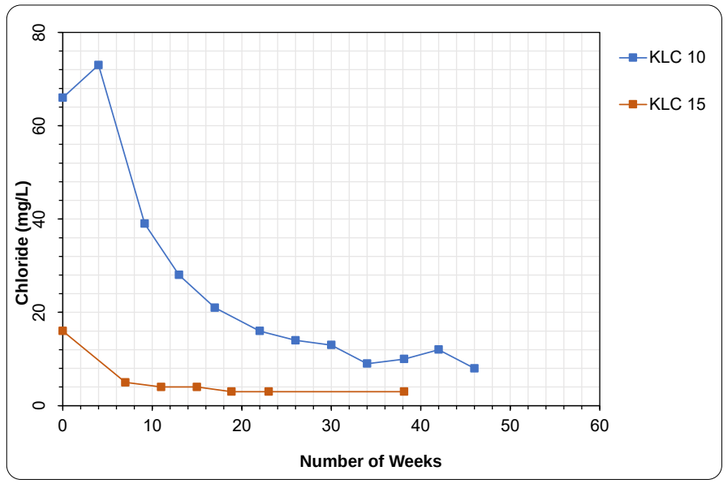
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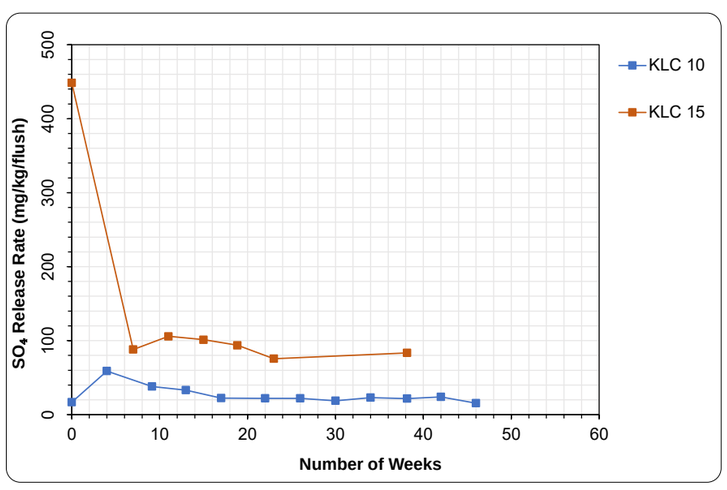
KLC 10 Low-Grade Ore (Free Leach)

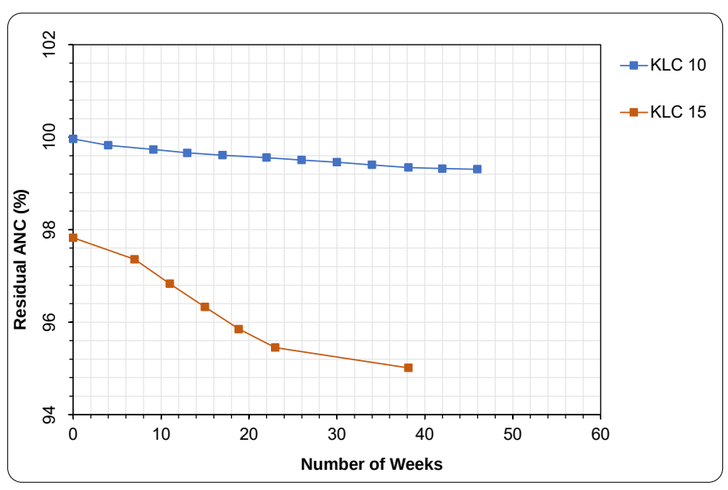
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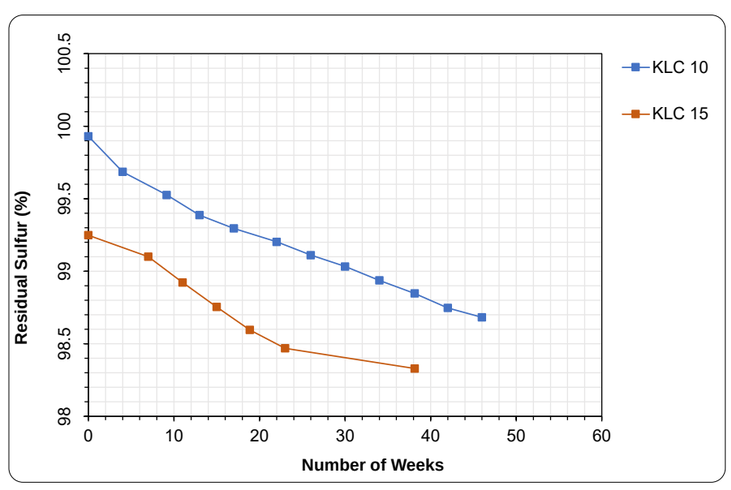




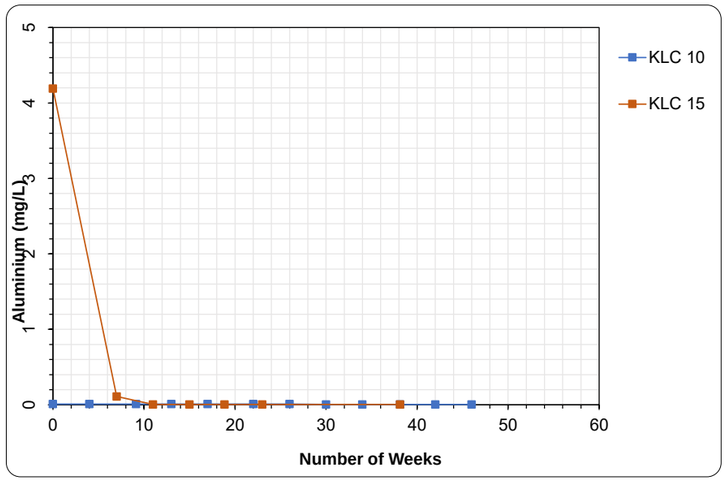


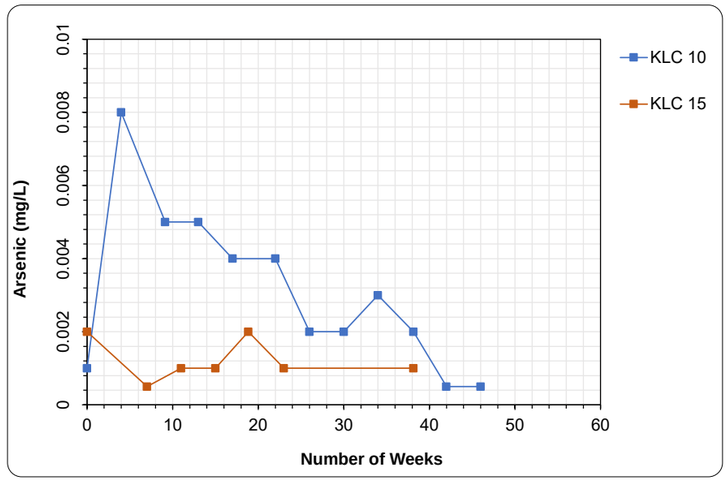






KLC Plots

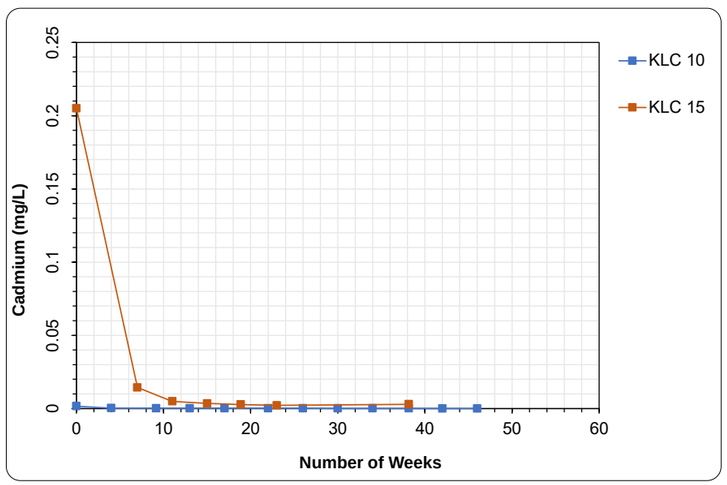


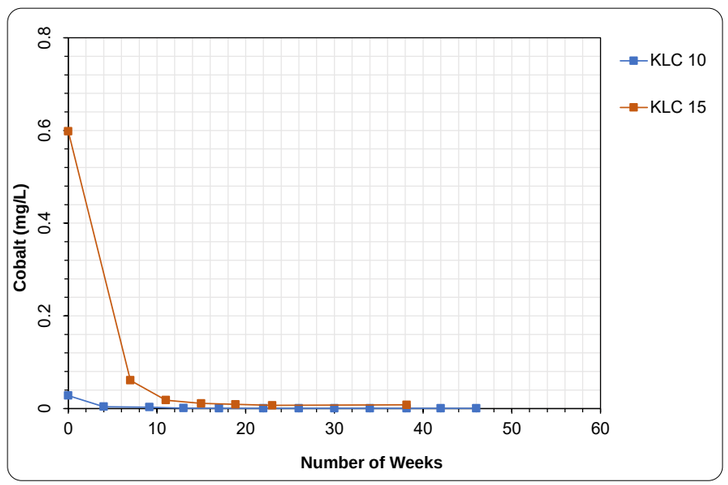


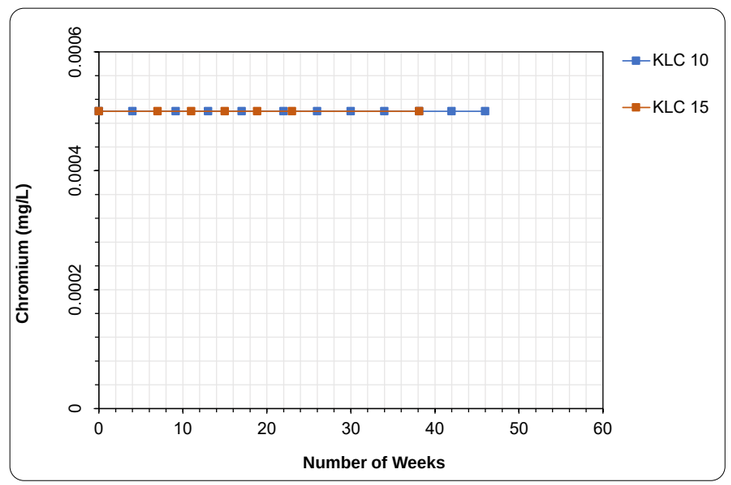
LEGEND:

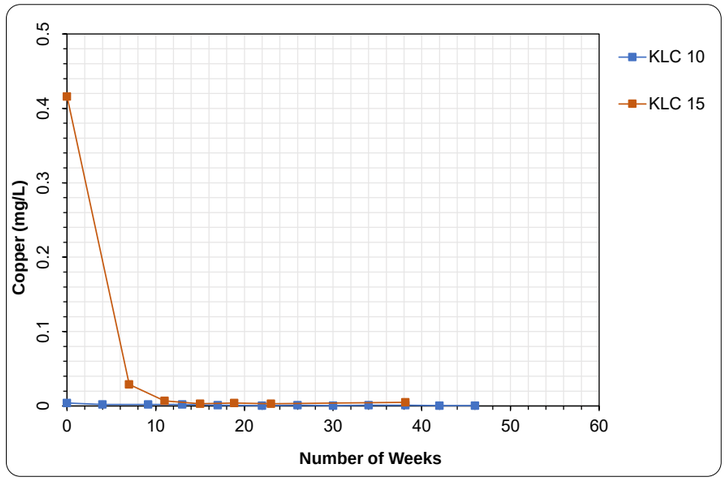
KLC 10 Low-Grade Ore (Free Leach)

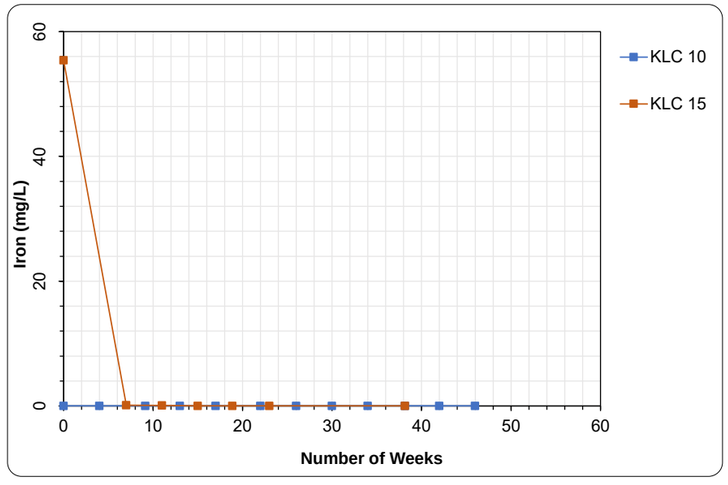
KLC 15 High-Grade Ore (Free Leach)

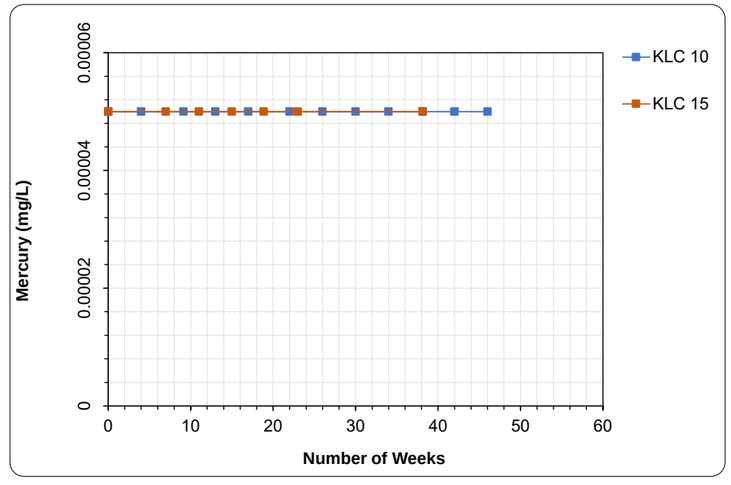




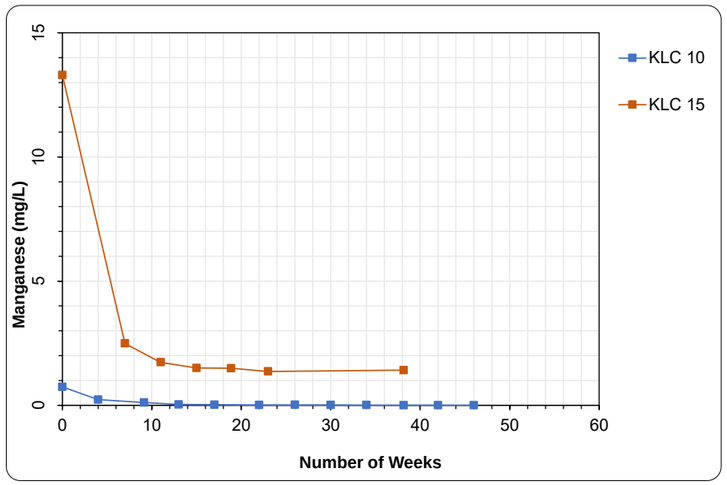


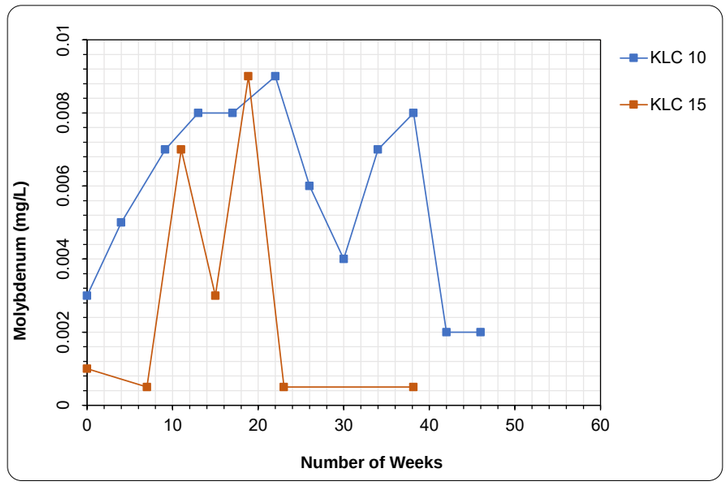






KLC Plots

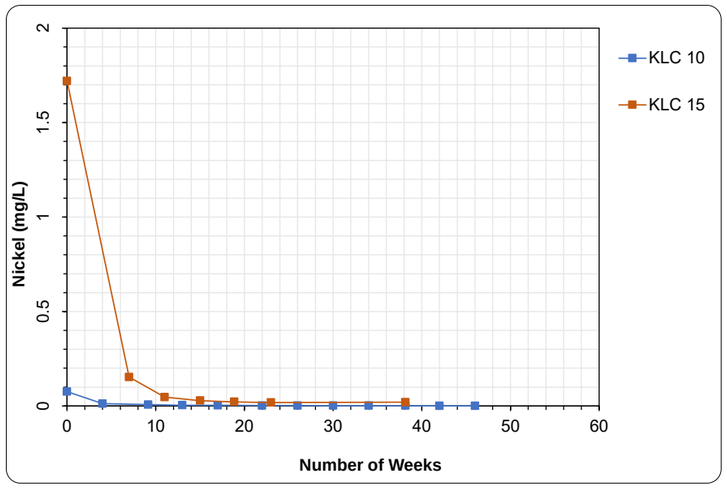


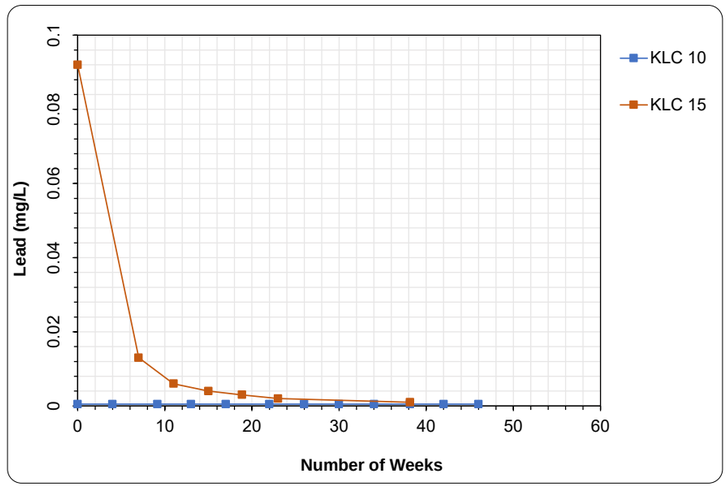


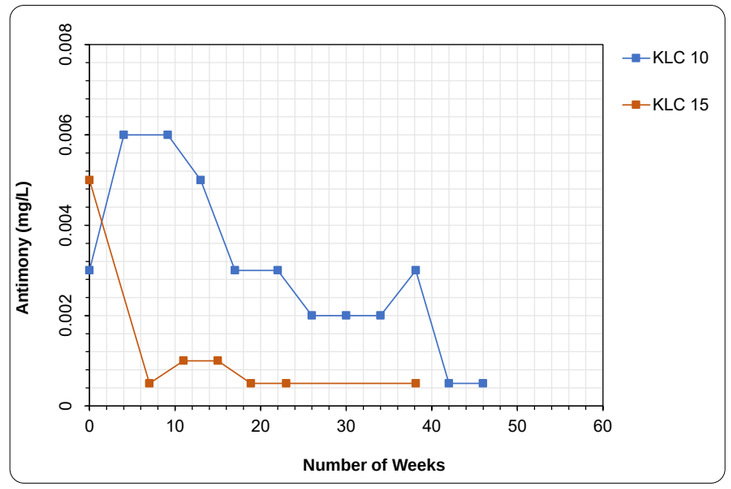
LEGEND:

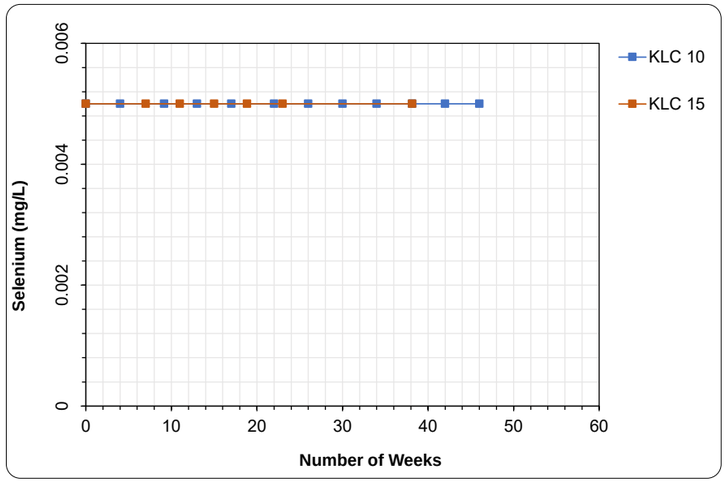
KLC 10 Low-Grade Ore (Free Leach)

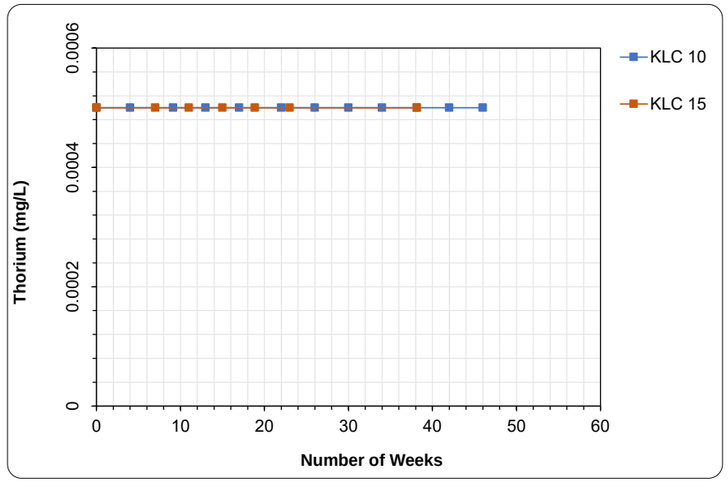
KLC 15 High-Grade Ore (Free Leach)

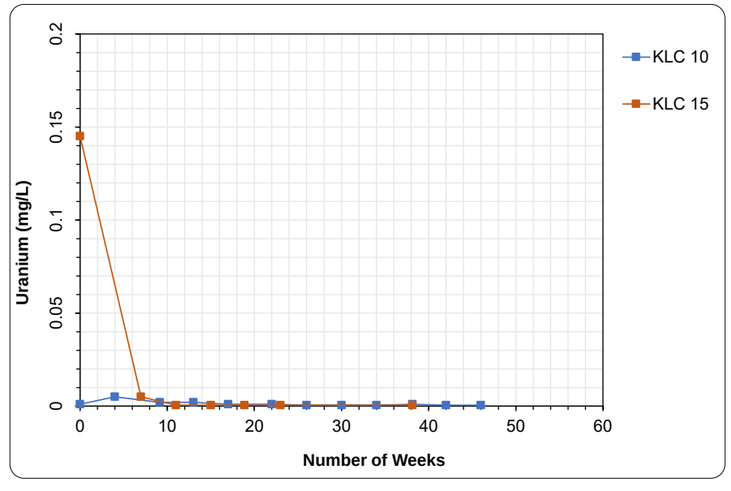




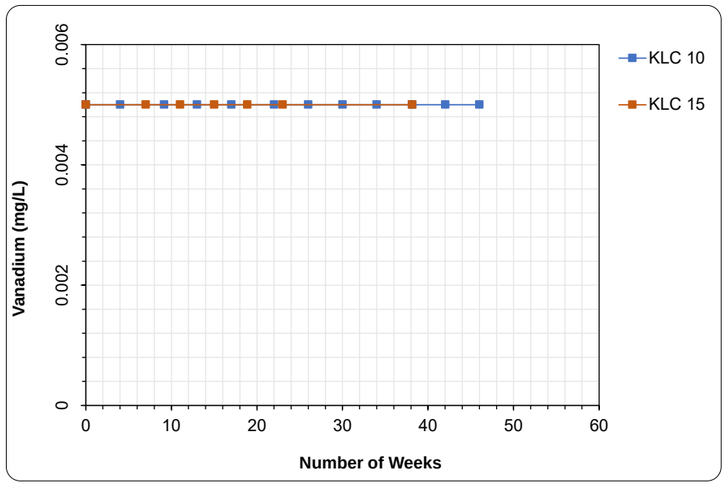


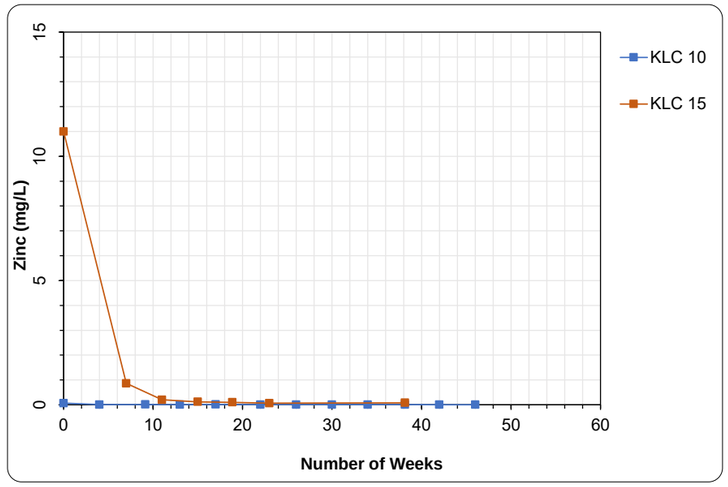






KLC Plots





LEGEND:

KLC 10 Low-Grade Ore (Free Leach)

KLC 15 High-Grade Ore (Free Leach)

Attachment E

ALS kinetic leach data (Certificate of Analyses)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2002870**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 04-Feb-2020 16:27
Order number	: -	Date Analysis Commenced	: 05-Feb-2020
C-O-C number	: 7926	Issue Date	: 12-Feb-2020 14:47
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L-1		
Quote number	: BN/1234/19		
No. of samples received	: 8		
No. of samples analysed	: 8		

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*
Dave Gitsham	Metals Instrument Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	04-Feb-2020 13:19	04-Feb-2020 13:20	04-Feb-2020 13:20	04-Feb-2020 13:21	04-Feb-2020 13:21
Compound	CAS Number	LOR	Unit	EB2002870-001	EB2002870-002	EB2002870-003	EB2002870-004	EB2002870-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.16**	**7.83**	**8.73**	**7.20**	**7.24**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1430**	**1470**	**316**	**847**	**754**
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	**17**	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**30**	**119**	**61**	**32**	**36**
Total Alkalinity as CaCO3	----	1	mg/L	**30**	**119**	**78**	**32**	**36**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	**2**	**6**	**1**	**1**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**490**	**582**	**46**	**275**	**235**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**110**	**41**	**12**	**42**	**34**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**82**	**185**	**4**	**42**	**39**
Magnesium	7439-95-4	1	mg/L	**30**	**36**	<1	**26**	**23**
Sodium	7440-23-5	1	mg/L	**152**	**81**	**58**	**71**	**62**
Potassium	7440-09-7	1	mg/L	**25**	**23**	**3**	**20**	**18**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	<0.01	**0.19**	**0.02**	**0.02**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	**0.004**	**0.004**	**0.002**	**0.012**	**0.013**
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.002**	**0.006**	**0.013**	**0.014**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	**0.033**	**0.120**	**0.005**	**0.026**	**0.026**
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	04-Feb-2020 13:19	04-Feb-2020 13:20	04-Feb-2020 13:20	04-Feb-2020 13:21	04-Feb-2020 13:21
Compound	CAS Number	LOR	Unit		EB2002870-001	EB2002870-002	EB2002870-003	EB2002870-004	EB2002870-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		**0.003**	**0.002**	<0.001	**0.002**	**0.002**
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L		**0.003**	**0.036**	<0.001	**0.002**	**0.002**
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.013**	**0.007**	**0.002**	**0.001**	**0.002**
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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		**0.013**	**0.016**	**0.001**	**0.014**	**0.012**
Manganese	7439-96-5	0.001	mg/L		**0.198**	**1.02**	**0.007**	**0.178**	**0.156**
Molybdenum	7439-98-7	0.001	mg/L		**0.011**	**0.002**	**0.003**	**0.001**	<0.001
Nickel	7440-02-0	0.001	mg/L		**0.009**	**0.044**	<0.001	**0.008**	**0.008**
Rubidium	7440-17-7	0.001	mg/L		**0.081**	**0.068**	**0.006**	**0.060**	**0.052**
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		**0.543**	**1.13**	**0.040**	**0.258**	**0.225**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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**	**0.014**	<0.001	**0.005**	**0.004**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.06**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.038**	**0.017**	<0.005	**0.010**	**0.010**
Boron	7440-42-8	0.05	mg/L		**0.06**	**0.10**	**0.09**	**0.08**	**0.06**
Iron	7439-89-6	0.05	mg/L		**0.15**	**0.30**	**0.09**	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	04-Feb-2020 13:19	04-Feb-2020 13:20	04-Feb-2020 13:20	04-Feb-2020 13:21	04-Feb-2020 13:21
Compound	CAS Number	LOR	Unit		EB2002870-001	EB2002870-002	EB2002870-003	EB2002870-004	EB2002870-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.3**	**0.4**	**0.9**	**0.3**	**0.3**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**13.9**	**15.6**	**2.85**	**7.55**	**6.57**
ø **Total Cations**	----	0.01	meq/L		**13.8**	**16.3**	**2.80**	**7.84**	**7.00**
ø **Ionic Balance**	----	0.01	%		**0.33**	**2.05**	**----**	**1.86**	**3.13**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	----	----
			Client sampling date / time	04-Feb-2020 13:22	04-Feb-2020 13:22	04-Feb-2020 13:23	----	----
Compound	CAS Number	LOR	Unit	EB2002870-006	EB2002870-007	EB2002870-008	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.89**	**4.70**	**7.15**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1010**	**991**	**446**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**28**	<1	**33**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**28**	<1	**33**	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	**72**	**1**	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**435**	**468**	**106**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**23**	**14**	**30**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**103**	**104**	**12**	----	----
Magnesium	7439-95-4	1	mg/L	**35**	**32**	**3**	----	----
Sodium	7440-23-5	1	mg/L	**44**	**29**	**67**	----	----
Potassium	7440-09-7	1	mg/L	**17**	**11**	**7**	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	**0.18**	**0.14**	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Antimony	7440-36-0	0.001	mg/L	**0.001**	**0.002**	**0.006**	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.118**	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	**0.002**	<0.001	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.035**	**0.055**	**0.020**	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0004**	**0.0055**	<0.0001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	----	----
			Client sampling date / time	04-Feb-2020 13:22	04-Feb-2020 13:22	04-Feb-2020 13:23	----	----
Compound	CAS Number	LOR	Unit	EB2002870-006	EB2002870-007	EB2002870-008	--------	--------
				Result	Result	Result	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	**0.005**	<0.001	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	**0.002**	<0.001	----	----
Caesium	7440-46-2	0.001	mg/L	**0.002**	**0.001**	**0.001**	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	**0.002**	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L	**0.092**	**0.070**	<0.001	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	**0.012**	**0.002**	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	**0.004**	<0.001	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lithium	7439-93-2	0.001	mg/L	**0.015**	**0.015**	**0.004**	----	----
Manganese	7439-96-5	0.001	mg/L	**1.48**	**1.94**	**0.044**	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	**0.004**	----	----
Nickel	7440-02-0	0.001	mg/L	**0.171**	**0.487**	**0.004**	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.053**	**0.032**	**0.015**	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**0.574**	**0.744**	**0.242**	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	**0.006**	**0.004**	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L	**0.059**	**0.450**	<0.005	----	----
Boron	7440-42-8	0.05	mg/L	**0.08**	**0.06**	**0.10**	----	----
Iron	7439-89-6	0.05	mg/L	**0.07**	**28.2**	<0.05	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	----	----
				Client sampling date / time	04-Feb-2020 13:22	04-Feb-2020 13:22	04-Feb-2020 13:23	----	----
Compound	CAS Number	LOR	Unit		EB2002870-006	EB2002870-007	EB2002870-008	--------	--------
					Result	Result	Result	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.1**	**0.1**	**0.6**	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**10.3**	**10.1**	**3.71**	----	----
ø **Total Cations**	----	0.01	meq/L		**10.4**	**9.37**	**3.94**	----	----
ø **Ionic Balance**	----	0.01	%		**0.50**	**3.96**	**2.96**	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2005928**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 03-Mar-2020 16:59
Order number	: -	Date Analysis Commenced	: 05-Mar-2020
C-O-C number	: 8810	Issue Date	: 11-Mar-2020 10:06
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L-2		
Quote number	: BN/1234/19		
No. of samples received	: 9		
No. of samples analysed	: 9		

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
Santusha Pandra	Senior Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	03-Mar-2020 13:48	03-Mar-2020 13:48	03-Mar-2020 13:49	03-Mar-2020 13:49	03-Mar-2020 13:50
Compound	CAS Number	LOR	Unit	EB2005928-001	EB2005928-002	EB2005928-003	EB2005928-004	EB2005928-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.88	7.08	8.58	6.85	6.87
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1560	575	240	751	709
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	14	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	34	35	55	28	26
Total Alkalinity as CaCO3	----	1	mg/L	34	35	69	28	26
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	4	3	<1	2	4
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	600	193	36	277	240
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	122	18	6	32	36
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	102	44	3	38	35
Magnesium	7439-95-4	1	mg/L	44	14	<1	29	26
Sodium	7440-23-5	1	mg/L	184	48	53	68	65
Potassium	7440-09-7	1	mg/L	26	12	2	16	15
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.04	0.10	0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.016	0.012	0.012	0.020	0.027
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.004	0.010	0.017	0.050	0.050
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.015	0.046	0.006	0.010	0.018
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	03-Mar-2020 13:48	03-Mar-2020 13:48	03-Mar-2020 13:49	03-Mar-2020 13:49	03-Mar-2020 13:50
Compound	CAS Number	LOR	Unit		EB2005928-001	EB2005928-002	EB2005928-003	EB2005928-004	EB2005928-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		**0.003**	**0.001**	<0.001	**0.001**	**0.001**
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L		**0.002**	**0.001**	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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		**0.015**	**0.008**	**0.001**	**0.014**	**0.012**
Manganese	7439-96-5	0.001	mg/L		**0.063**	**0.056**	**0.005**	**0.059**	**0.024**
Molybdenum	7439-98-7	0.001	mg/L		**0.014**	**0.002**	**0.004**	**0.002**	**0.001**
Nickel	7440-02-0	0.001	mg/L		**0.002**	**0.002**	<0.001	**0.003**	**0.002**
Rubidium	7440-17-7	0.001	mg/L		**0.071**	**0.028**	**0.004**	**0.039**	**0.036**
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		**0.763**	**0.340**	**0.045**	**0.251**	**0.214**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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		**0.006**	**0.004**	**0.005**	**0.014**	**0.009**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.06**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.020**	**0.006**	<0.005	<0.005	**0.010**
Boron	7440-42-8	0.05	mg/L		**0.13**	**0.16**	**0.18**	**0.16**	**0.06**
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	03-Mar-2020 13:48	03-Mar-2020 13:48	03-Mar-2020 13:49	03-Mar-2020 13:49	03-Mar-2020 13:50
Compound	CAS Number	LOR	Unit	EB2005928-001	EB2005928-002	EB2005928-003	EB2005928-004	EB2005928-005
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.6**	**0.5**	**0.8**	**0.4**	**0.3**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**16.6**	**5.22**	**2.30**	**7.23**	**6.53**
ø **Total Cations**	----	0.01	meq/L	**----**	**----**	**2.50**	**----**	**----**
ø **Total Cations**	----	0.01	meq/L	**17.4**	**5.74**	**----**	**7.65**	**7.10**
ø **Ionic Balance**	----	0.01	%	**2.26**	**4.72**	**----**	**2.83**	**4.15**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	KLC-9	----
			Client sampling date / time	03-Mar-2020 13:50	03-Mar-2020 13:50	03-Mar-2020 13:51	03-Mar-2020 13:51	----
Compound	CAS Number	LOR	Unit	EB2005928-006	EB2005928-007	EB2005928-008	EB2005928-009	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.68**	**6.61**	**7.64**	**7.86**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**705**	**802**	**719**	**705**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**27**	**14**	**71**	**76**	----
Total Alkalinity as CaCO3	----	1	mg/L	**27**	**14**	**71**	**76**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	**1**	**1**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**317**	**407**	**165**	**175**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**14**	**8**	**52**	**55**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**78**	**122**	**16**	**49**	----
Magnesium	7439-95-4	1	mg/L	**29**	**29**	**4**	**18**	----
Sodium	7440-23-5	1	mg/L	**31**	**20**	**130**	**62**	----
Potassium	7440-09-7	1	mg/L	**10**	**6**	**9**	**25**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.01**	<0.01	**0.04**	**0.05**	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	**0.009**	**0.021**	**0.041**	**0.098**	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.004**	**0.360**	**0.024**	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.012**	**0.019**	**0.032**	**0.012**	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0001**	<0.0001	**0.0002**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	KLC-9	----
				Client sampling date / time	03-Mar-2020 13:50	03-Mar-2020 13:50	03-Mar-2020 13:51	03-Mar-2020 13:51	----
Compound	CAS Number	LOR	Unit		EB2005928-006	EB2005928-007	EB2005928-008	EB2005928-009	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	**0.001**	<0.001	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	**0.002**	<0.001	<0.001	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.002**	**0.004**	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	**0.002**	----
Lithium	7439-93-2	0.001	mg/L		**0.008**	**0.005**	**0.010**	**0.003**	----
Manganese	7439-96-5	0.001	mg/L		**0.148**	**0.530**	**0.004**	**0.022**	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.017**	**0.027**	----
Nickel	7440-02-0	0.001	mg/L		**0.002**	**0.020**	**0.005**	<0.001	----
Rubidium	7440-17-7	0.001	mg/L		**0.022**	**0.014**	**0.021**	**0.053**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		**0.379**	**0.855**	**0.563**	**0.209**	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L		**0.001**	<0.001	**0.043**	**0.012**	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.01**	<0.01	----
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.011**	<0.005	<0.005	----
Boron	7440-42-8	0.05	mg/L		**0.09**	<0.05	**0.11**	**0.62**	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	KLC-9	----
				Client sampling date / time	03-Mar-2020 13:50	03-Mar-2020 13:50	03-Mar-2020 13:51	03-Mar-2020 13:51	----
Compound	CAS Number	LOR	Unit		EB2005928-006	EB2005928-007	EB2005928-008	EB2005928-009	--------
					Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.3**	**0.3**	**1.7**	**2.3**	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		----	----	**6.41**	----	----
ø **Total Anions**	----	0.01	meq/L		**7.53**	**8.98**	----	**6.71**	----
ø **Total Cations**	----	0.01	meq/L		**7.88**	**9.50**	**7.01**	**7.26**	----
ø **Ionic Balance**	----	0.01	%		----	----	**4.48**	----	----
ø **Ionic Balance**	----	0.01	%		**2.26**	**2.81**	----	**3.93**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2009977**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 09-Apr-2020 16:15
Order number	: -	Date Analysis Commenced	: 14-Apr-2020
C-O-C number	: 10113	Issue Date	: 20-Apr-2020 17:44
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar_L3		
Quote number	: BN/1234/19		
No. of samples received	: 9		
No. of samples analysed	: 9		

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
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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	09-Apr-2020 12:04	09-Apr-2020 12:08	09-Apr-2020 12:08	09-Apr-2020 12:09	09-Apr-2020 12:10
Compound	CAS Number	LOR	Unit	EB2009977-001	EB2009977-002	EB2009977-003	EB2009977-004	EB2009977-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.41	7.65	9.08	7.42	7.48
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	990	557	177	411	544
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	18	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	33	38	42	20	27
Total Alkalinity as CaCO3	----	1	mg/L	33	38	59	20	27
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	5	3	1	2	2
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	349	184	25	146	174
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	53	11	2	11	21
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	47	45	2	20	24
Magnesium	7439-95-4	1	mg/L	23	15	<1	15	19
Sodium	7440-23-5	1	mg/L	106	35	35	31	41
Potassium	7440-09-7	1	mg/L	17	10	1	10	11
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.10	0.02	0.14	0.02	0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.012	0.010	0.008	0.015	0.016
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.004	0.009	0.017	0.038	0.042
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.014	0.022	0.004	0.007	0.008
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	09-Apr-2020 12:04	09-Apr-2020 12:08	09-Apr-2020 12:08	09-Apr-2020 12:09	09-Apr-2020 12:10
Compound	CAS Number	LOR	Unit		EB2009977-001	EB2009977-002	EB2009977-003	EB2009977-004	EB2009977-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		**0.002**	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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		**0.009**	**0.007**	<0.001	**0.008**	**0.009**
Manganese	7439-96-5	0.001	mg/L		**0.023**	**0.049**	**0.008**	**0.018**	**0.018**
Molybdenum	7439-98-7	0.001	mg/L		**0.006**	**0.001**	**0.002**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	**0.001**	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.046**	**0.023**	**0.004**	**0.022**	**0.025**
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		**0.376**	**0.383**	**0.040**	**0.135**	**0.153**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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		**0.005**	**0.005**	**0.005**	**0.009**	**0.010**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.03**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.032**	**0.007**	<0.005	<0.005	<0.005
Boron	7440-42-8	0.05	mg/L		**0.08**	**0.06**	**0.08**	**0.08**	**0.05**
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	**0.10**	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	09-Apr-2020 12:04	09-Apr-2020 12:08	09-Apr-2020 12:08	09-Apr-2020 12:09	09-Apr-2020 12:10
Compound	CAS Number	LOR	Unit		EB2009977-001	EB2009977-002	EB2009977-003	EB2009977-004	EB2009977-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.5**	**0.4**	**0.6**	**0.3**	**0.3**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**9.42**	**4.90**	**1.76**	**3.75**	**4.75**
ø **Total Cations**	----	0.01	meq/L		**9.28**	**5.26**	**1.65**	**3.84**	**4.83**
ø **Ionic Balance**	----	0.01	%		**0.73**	**3.52**	**----**	**1.15**	**0.75**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	KLC-9	----
			Client sampling date / time	09-Apr-2020 12:10	09-Apr-2020 12:11	09-Apr-2020 12:12	09-Apr-2020 12:14	----
Compound	CAS Number	LOR	Unit	EB2009977-006	EB2009977-007	EB2009977-008	EB2009977-009	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.17**	**7.01**	**8.14**	**7.69**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**649**	**639**	**401**	**899**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**17**	**11**	**69**	**51**	----
Total Alkalinity as CaCO3	----	1	mg/L	**17**	**11**	**69**	**51**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	**1**	**5**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**280**	**290**	**88**	**370**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**8**	**4**	**18**	**15**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**65**	**85**	**9**	**82**	----
Magnesium	7439-95-4	1	mg/L	**24**	**21**	**2**	**29**	----
Sodium	7440-23-5	1	mg/L	**19**	**10**	**68**	**45**	----
Potassium	7440-09-7	1	mg/L	**7**	**4**	**6**	**21**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	**0.16**	**0.15**	**0.02**	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	**0.007**	**0.016**	**0.036**	**0.066**	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<0.001	**0.364**	**0.018**	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.010**	**0.018**	**0.027**	**0.019**	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0003**	<0.0001	**0.0010**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	KLC-9	----
				Client sampling date / time	09-Apr-2020 12:10	09-Apr-2020 12:11	09-Apr-2020 12:12	09-Apr-2020 12:14	----
Compound	CAS Number	LOR	Unit		EB2009977-006	EB2009977-007	EB2009977-008	EB2009977-009	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	**0.006**	<0.001	<0.001	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		**0.001**	<0.001	<0.001	**0.003**	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lithium	7439-93-2	0.001	mg/L		**0.006**	**0.005**	**0.006**	**0.004**	----
Manganese	7439-96-5	0.001	mg/L		**0.076**	**0.677**	**0.002**	**0.017**	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.009**	**0.020**	----
Nickel	7440-02-0	0.001	mg/L		**0.001**	**0.043**	**0.003**	<0.001	----
Rubidium	7440-17-7	0.001	mg/L		**0.016**	**0.010**	**0.013**	**0.046**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		**0.306**	**0.518**	**0.262**	**0.325**	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L		**0.001**	<0.001	**0.039**	**0.011**	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		**0.018**	**0.056**	<0.005	**0.012**	----
Boron	7440-42-8	0.05	mg/L		**0.06**	**0.10**	**0.09**	**0.66**	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	KLC-9	----
				Client sampling date / time	09-Apr-2020 12:10	09-Apr-2020 12:11	09-Apr-2020 12:12	09-Apr-2020 12:14	----
Compound	CAS Number	LOR	Unit		EB2009977-006	EB2009977-007	EB2009977-008	EB2009977-009	--------
					Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	**0.2**	**1.5**	**2.0**	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**6.40**	**6.37**	**3.72**	**9.14**	----
ø **Total Cations**	----	0.01	meq/L		**6.22**	**6.51**	**3.72**	**8.97**	----
ø **Ionic Balance**	----	0.01	%		**1.35**	**1.06**	**0.09**	**0.95**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2012199**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 07-May-2020 16:20
Order number	: -	Date Analysis Commenced	: 08-May-2020
C-O-C number	: 10852	Issue Date	: 12-May-2020 10:56
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar_L4		
Quote number	: BN/1234/19		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	07-May-2020 12:13	07-May-2020 12:13	07-May-2020 12:14	07-May-2020 12:14	07-May-2020 12:15
Compound	CAS Number	LOR	Unit	EB2012199-001	EB2012199-002	EB2012199-003	EB2012199-004	EB2012199-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.26	7.69	8.68	7.39	7.33
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	993	394	170	437	646
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	10	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	41	49	55	27	26
Total Alkalinity as CaCO3	----	1	mg/L	41	49	65	27	26
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	1	<1	<1	<1	1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	336	142	25	162	213
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	53	7	2	10	23
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	54	38	3	23	30
Magnesium	7439-95-4	1	mg/L	27	12	<1	17	26
Sodium	7440-23-5	1	mg/L	107	22	38	27	48
Potassium	7440-09-7	1	mg/L	15	8	1	8	10
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.03	0.07	0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.010	0.006	0.008	0.011	0.012
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.003	0.007	0.017	0.024	0.029
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.014	0.010	0.006	0.007	0.012
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	07-May-2020 12:13	07-May-2020 12:13	07-May-2020 12:14	07-May-2020 12:14	07-May-2020 12:15
Compound	CAS Number	LOR	Unit		EB2012199-001	EB2012199-002	EB2012199-003	EB2012199-004	EB2012199-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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		**0.009**	**0.006**	<0.001	**0.008**	**0.010**
Manganese	7439-96-5	0.001	mg/L		**0.007**	**0.048**	**0.008**	**0.007**	**0.009**
Molybdenum	7439-98-7	0.001	mg/L		**0.004**	<0.001	**0.002**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	**0.001**	**0.001**	**0.001**
Rubidium	7440-17-7	0.001	mg/L		**0.039**	**0.016**	**0.003**	**0.018**	**0.023**
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		**0.381**	**0.292**	**0.050**	**0.142**	**0.201**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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		**0.008**	**0.004**	**0.005**	**0.013**	**0.010**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.03**	<0.01	<0.01
Zinc	7440-66-6	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		<0.05	<0.05	**0.05**	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	07-May-2020 12:13	07-May-2020 12:13	07-May-2020 12:14	07-May-2020 12:14	07-May-2020 12:15
Compound	CAS Number	LOR	Unit		EB2012199-001	EB2012199-002	EB2012199-003	EB2012199-004	EB2012199-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**0.3**	**0.4**	**0.2**	**0.2**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**9.31**	**4.13**	**1.88**	**4.19**	**5.60**
ø **Total Cations**	----	0.01	meq/L		**9.95**	**4.04**	**1.83**	**3.92**	**5.98**
ø **Ionic Balance**	----	0.01	%		**3.35**	**1.07**	**----**	**3.31**	**3.26**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-8	KLC-9	----	----	----
			Client sampling date / time	07-May-2020 12:15	07-May-2020 12:16	----	----	----
Compound	CAS Number	LOR	Unit	EB2012199-006	EB2012199-007	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.03**	**8.07**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**316**	**787**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**77**	**92**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**77**	**92**	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	<1	<1	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**64**	**278**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**9**	**7**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**9**	**82**	----	----	----
Magnesium	7439-95-4	1	mg/L	**2**	**28**	----	----	----
Sodium	7440-23-5	1	mg/L	**51**	**31**	----	----	----
Potassium	7440-09-7	1	mg/L	**5**	**19**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.11**	**0.02**	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.027**	**0.047**	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.339**	**0.012**	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.019**	**0.012**	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0018**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-8	KLC-9	----	----	----
			Client sampling date / time	07-May-2020 12:15	07-May-2020 12:16	----	----	----
Compound	CAS Number	LOR	Unit	EB2012199-006	EB2012199-007	--------	--------	--------
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.001**	**0.003**	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	**0.001**	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.006**	**0.005**	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	**0.019**	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.005**	**0.021**	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.002**	<0.001	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.012**	**0.044**	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.279**	**0.356**	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.039**	**0.015**	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.037**	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	**0.42**	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-8	KLC-9	----	----	----
				Client sampling date / time	07-May-2020 12:15	07-May-2020 12:16	----	----	----
Compound	CAS Number	LOR	Unit		EB2012199-006	EB2012199-007	--------	--------	--------
					Result	Result	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**1.1**	**1.6**	----	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**3.12**	**7.82**	----	----	----
ø **Total Cations**	----	0.01	meq/L		**2.96**	**8.23**	----	----	----
ø **Ionic Balance**	----	0.01	%		**2.71**	**2.54**	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2014656**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 02-Jun-2020 16:45
Order number	: -	Date Analysis Commenced	: 03-Jun-2020
C-O-C number	: 11575	Issue Date	: 09-Jun-2020 09:36
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar_L5		
Quote number	: BN/1234/19		
No. of samples received	: 8		
No. of samples analysed	: 8		

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

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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	02-Jun-2020 14:09	02-Jun-2020 14:10	02-Jun-2020 14:10	02-Jun-2020 14:11	02-Jun-2020 14:11
Compound	CAS Number	LOR	Unit	EB2014656-001	EB2014656-002	EB2014656-003	EB2014656-004	EB2014656-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.71	7.81	8.75	7.63	7.62
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	901	356	173	356	434
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	9	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	41	47	54	26	27
Total Alkalinity as CaCO3	----	1	mg/L	41	47	63	26	27
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	4	2	<1	2	1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	314	110	22	126	146
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	57	6	3	10	16
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	47	34	3	18	19
Magnesium	7439-95-4	1	mg/L	25	12	<1	16	18
Sodium	7440-23-5	1	mg/L	97	17	35	23	33
Potassium	7440-09-7	1	mg/L	14	6	1	7	7
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.03	0.06	0.01	0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.009	0.006	0.008	0.009	0.010
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.003	0.006	0.017	0.020	0.022
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.013	0.011	0.005	0.005	0.007
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	02-Jun-2020 14:09	02-Jun-2020 14:10	02-Jun-2020 14:10	02-Jun-2020 14:11	02-Jun-2020 14:11
Compound	CAS Number	LOR	Unit		EB2014656-001	EB2014656-002	EB2014656-003	EB2014656-004	EB2014656-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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**	**0.005**	<0.001	**0.006**	**0.007**
Manganese	7439-96-5	0.001	mg/L		**0.002**	**0.026**	**0.004**	**0.004**	**0.002**
Molybdenum	7439-98-7	0.001	mg/L		**0.004**	<0.001	**0.003**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.001**	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.036**	**0.015**	**0.003**	**0.015**	**0.016**
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		**0.356**	**0.276**	**0.054**	**0.116**	**0.126**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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		**0.010**	**0.004**	**0.007**	**0.016**	**0.012**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.03**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.006**	<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		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	02-Jun-2020 14:09	02-Jun-2020 14:10	02-Jun-2020 14:10	02-Jun-2020 14:11	02-Jun-2020 14:11
Compound	CAS Number	LOR	Unit		EB2014656-001	EB2014656-002	EB2014656-003	EB2014656-004	EB2014656-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**0.2**	**0.4**	**0.2**	**0.2**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**8.96**	**3.40**	**1.80**	**3.42**	**4.03**
ø **Total Cations**	----	0.01	meq/L		**8.98**	**3.58**	**1.70**	**3.39**	**4.04**
ø **Ionic Balance**	----	0.01	%		**0.09**	**2.56**	**----**	**0.44**	**0.17**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	----	----
			Client sampling date / time	02-Jun-2020 14:12	02-Jun-2020 14:12	02-Jun-2020 14:13	----	----
Compound	CAS Number	LOR	Unit	EB2014656-006	EB2014656-007	EB2014656-008	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.38**	**7.30**	**8.07**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**517**	**452**	**319**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**22**	**14**	**72**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**22**	**14**	**72**	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	**1**	<1	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**204**	**190**	**68**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**6**	**2**	**8**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**55**	**57**	**11**	----	----
Magnesium	7439-95-4	1	mg/L	**23**	**18**	**3**	----	----
Sodium	7440-23-5	1	mg/L	**12**	**5**	**52**	----	----
Potassium	7440-09-7	1	mg/L	**5**	**2**	**5**	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	**0.06**	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Antimony	7440-36-0	0.001	mg/L	**0.007**	**0.015**	**0.020**	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.001**	**0.201**	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.009**	**0.012**	**0.019**	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0001**	<0.0001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	----	----
			Client sampling date / time	02-Jun-2020 14:12	02-Jun-2020 14:12	02-Jun-2020 14:13	----	----
Compound	CAS Number	LOR	Unit	EB2014656-006	EB2014656-007	EB2014656-008	--------	--------
				Result	Result	Result	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.002**	<0.001	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.001**	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lithium	7439-93-2	0.001	mg/L	**0.005**	**0.003**	**0.006**	----	----
Manganese	7439-96-5	0.001	mg/L	**0.004**	**0.302**	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	**0.004**	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.011**	<0.001	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.010**	**0.005**	**0.011**	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**0.236**	**0.255**	**0.340**	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Uranium	7440-61-1	0.001	mg/L	**0.002**	<0.001	**0.043**	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.008**	<0.005	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	----	----
				Client sampling date / time	02-Jun-2020 14:12	02-Jun-2020 14:12	02-Jun-2020 14:13	----	----
Compound	CAS Number	LOR	Unit		EB2014656-006	EB2014656-007	EB2014656-008	--------	--------
					Result	Result	Result	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	**0.2**	**0.8**	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**4.86**	**4.29**	**3.08**	----	----
ø **Total Cations**	----	0.01	meq/L		**5.29**	**4.59**	**3.18**	----	----
ø **Ionic Balance**	----	0.01	%		**4.25**	**3.40**	**1.68**	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2015306**	Page	: 1 of 5
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 09-Jun-2020 17:30
Order number	: -	Date Analysis Commenced	: 10-Jun-2020
C-O-C number	: 11701	Issue Date	: 15-Jun-2020 08:59
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar_L4-1		
Quote number	: BN/1234/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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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*
Dave Gitsham	Metals Instrument Chemist	Brisbane Inorganics, 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-9	----	----	----	----
				Client sampling date / time	09-Jun-2020 15:01	----	----	----	----
Compound	CAS Number	LOR	Unit		EB2015306-001	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.95**	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**714**	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**90**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**90**	----	----	----	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		**2**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**271**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**4**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**78**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**28**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**27**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**19**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.02**	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L		<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L		**0.039**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L		<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.010**	----	----	----	----
Europium	7440-53-1	0.001	mg/L		<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L		<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.010**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L		<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L		<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L		<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		**0.0015**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-9	----	----	----	----
			Client sampling date / time	09-Jun-2020 15:01	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2015306-001	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.002**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.006**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.002**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.024**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.041**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.342**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.015**	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.032**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	**0.39**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	**KLC-9**	----	----	----	----
				Client sampling date / time	09-Jun-2020 15:01	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB2015306-001**	--------	--------	--------	--------
					Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	**----**	**----**	**----**	**----**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**1.7**	**----**	**----**	**----**	**----**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**7.55**	**----**	**----**	**----**	**----**
ø **Total Cations**	----	0.01	meq/L		**7.86**	**----**	**----**	**----**	**----**
ø **Ionic Balance**	----	0.01	%		**1.97**	**----**	**----**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2017856**	Page	: 1 of 11
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 07-Jul-2020 16:09
Order number	: -	Date Analysis Commenced	: 08-Jul-2020
C-O-C number	: 12405	Issue Date	: 13-Jul-2020 09:53
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar_L6		
Quote number	: BN/1234/19		
No. of samples received	: 9		
No. of samples analysed	: 9		

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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*
Dave Gitsham	Metals Instrument Chemist	Brisbane Inorganics, 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.

- Ionic Balance out of acceptable limits due to analytes not quantified in this report.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)			Client sample ID	KLC-9	----	----	----	----
			Client sampling date / time	07-Jul-2020 14:22	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2017856-009	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.78**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**662**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**80**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**80**	----	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**264**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**4**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**69**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**28**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**22**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**17**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.034**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.010**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.010**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0016**	----	----	----	----

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)			Client sample ID	KLC-9	----	----	----	----
			Client sampling date / time	07-Jul-2020 14:22	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2017856-009	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.001**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.004**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.002**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.025**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.035**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.322**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.017**	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.025**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	**0.33**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)				Client sample ID	**KLC-9**	----	----	----	----
				Client sampling date / time	07-Jul-2020 14:22	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB2017856-009**	--------	--------	--------	--------
					Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**1.7**	----	----	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**7.21**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L		**7.14**	----	----	----	----
ø **Ionic Balance**	----	0.01	%		**0.48**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	07-Jul-2020 14:16	07-Jul-2020 14:16	07-Jul-2020 14:17	07-Jul-2020 14:18	07-Jul-2020 14:19
Compound	CAS Number	LOR	Unit	EB2017856-001	EB2017856-002	EB2017856-003	EB2017856-004	EB2017856-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.05	7.23	8.84	7.00	7.10
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	799	305	115	293	429
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	20	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	41	45	38	37	68
Total Alkalinity as CaCO3	----	1	mg/L	41	45	58	37	68
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	1	1	<1	<1	1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	256	100	15	112	153
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	42	4	1	6	12
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	40	30	3	16	20
Magnesium	7439-95-4	1	mg/L	25	12	<1	15	22
Sodium	7440-23-5	1	mg/L	88	14	25	18	33
Potassium	7440-09-7	1	mg/L	13	5	1	6	8
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.04	0.06	0.02	0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.008	0.005	0.004	0.007	0.009
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.002	0.005	0.012	0.017	0.020
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.011	0.010	0.003	0.004	0.008
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	07-Jul-2020 14:16	07-Jul-2020 14:16	07-Jul-2020 14:17	07-Jul-2020 14:18	07-Jul-2020 14:19
Compound	CAS Number	LOR	Unit		EB2017856-001	EB2017856-002	EB2017856-003	EB2017856-004	EB2017856-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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		**0.007**	**0.004**	<0.001	**0.005**	**0.007**
Manganese	7439-96-5	0.001	mg/L		**0.004**	**0.012**	**0.007**	**0.002**	<0.001
Molybdenum	7439-98-7	0.001	mg/L		**0.005**	<0.001	**0.005**	**0.001**	**0.001**
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.031**	**0.012**	**0.002**	**0.012**	**0.016**
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		**0.340**	**0.268**	**0.047**	**0.114**	**0.149**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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		**0.013**	**0.005**	**0.007**	**0.020**	**0.026**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.02**	<0.01	<0.01
Zinc	7440-66-6	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		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	07-Jul-2020 14:16	07-Jul-2020 14:16	07-Jul-2020 14:17	07-Jul-2020 14:18	07-Jul-2020 14:19
Compound	CAS Number	LOR	Unit		EB2017856-001	EB2017856-002	EB2017856-003	EB2017856-004	EB2017856-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**0.2**	**0.3**	**0.2**	**0.2**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**7.33**	**3.09**	**1.50**	**3.24**	**4.88**
ø **Total Cations**	----	0.01	meq/L		**8.21**	**3.22**	**1.26**	**2.97**	**4.45**
ø **Ionic Balance**	----	0.01	%		**5.66**	**2.02**	**----**	**4.36**	**4.65**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	----	----
			Client sampling date / time	07-Jul-2020 14:20	07-Jul-2020 14:21	07-Jul-2020 14:21	----	----
Compound	CAS Number	LOR	Unit	EB2017856-006	EB2017856-007	EB2017856-008	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.75**	**6.67**	**7.49**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**437**	**376**	**205**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**17**	**17**	**52**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**17**	**17**	**52**	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	**1**	<1	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**198**	**181**	**48**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**4**	<1	**4**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**47**	**48**	**6**	----	----
Magnesium	7439-95-4	1	mg/L	**21**	**16**	**1**	----	----
Sodium	7440-23-5	1	mg/L	**10**	**4**	**37**	----	----
Potassium	7440-09-7	1	mg/L	**4**	**2**	**3**	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	**0.13**	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Antimony	7440-36-0	0.001	mg/L	**0.005**	**0.012**	**0.010**	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.136**	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.008**	**0.011**	**0.010**	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0001**	<0.0001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	----	----
			Client sampling date / time	07-Jul-2020 14:20	07-Jul-2020 14:21	07-Jul-2020 14:21	----	----
Compound	CAS Number	LOR	Unit	EB2017856-006	EB2017856-007	EB2017856-008	--------	--------
				Result	Result	Result	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.003**	<0.001	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lithium	7439-93-2	0.001	mg/L	**0.004**	**0.002**	**0.003**	----	----
Manganese	7439-96-5	0.001	mg/L	**0.003**	**0.303**	**0.002**	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	**0.004**	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.014**	<0.001	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.008**	**0.004**	**0.007**	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**0.225**	**0.225**	**0.204**	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Uranium	7440-61-1	0.001	mg/L	**0.003**	<0.001	**0.042**	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.014**	<0.005	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	----	----
				Client sampling date / time	07-Jul-2020 14:20	07-Jul-2020 14:21	07-Jul-2020 14:21	----	----
Compound	CAS Number	LOR	Unit		EB2017856-006	EB2017856-007	EB2017856-008	--------	--------
					Result	Result	Result	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.1**	**0.1**	**0.6**	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**4.57**	**4.11**	**2.15**	----	----
ø **Total Cations**	----	0.01	meq/L		**4.61**	**3.94**	**2.07**	----	----
ø **Ionic Balance**	----	0.01	%		**0.39**	**2.12**	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2020387**	Page	: 1 of 11
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 04-Aug-2020 17:23
Order number	:	Date Analysis Commenced	: 04-Aug-2020
C-O-C number	: 13057	Issue Date	: 11-Aug-2020 12:58
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L7		
Quote number	: BN/1234/19		
No. of samples received	: 10		
No. of samples analysed	: 10		

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*
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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)			Client sample ID	KLC-9	----	----	----	----
			Client sampling date / time	04-Aug-2020 10:28	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2020387-009	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.92**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**698**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**69**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**69**	----	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**247**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**70**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**27**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**18**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**18**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.028**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.009**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.008**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0022**	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)			Client sample ID	**KLC-9**	----	----	----	----
			Client sampling date / time	04-Aug-2020 10:28	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2020387-009**	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.001**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.004**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.022**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.036**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.313**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.015**	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.032**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	**0.26**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)				Client sample ID	**KLC-9**	----	----	----	----
				Client sampling date / time	04-Aug-2020 10:28	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB2020387-009**	--------	--------	--------	--------
					Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**1.3**	----	----	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**6.58**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L		**6.96**	----	----	----	----
ø **Ionic Balance**	----	0.01	%		**2.81**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	04-Aug-2020 10:24	04-Aug-2020 10:25	04-Aug-2020 10:25	04-Aug-2020 10:26	04-Aug-2020 10:26
Compound	CAS Number	LOR	Unit	EB2020387-001	EB2020387-002	EB2020387-003	EB2020387-004	EB2020387-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.69	7.72	8.31	7.59	7.64
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	793	346	144	382	423
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	2	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	42	52	46	45	34
Total Alkalinity as CaCO3	----	1	mg/L	42	52	48	45	34
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	1	1	<1	<1	1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	248	105	15	128	134
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	38	4	2	7	11
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	38	32	3	20	18
Magnesium	7439-95-4	1	mg/L	22	12	<1	18	20
Sodium	7440-23-5	1	mg/L	75	11	26	20	26
Potassium	7440-09-7	1	mg/L	12	5	1	7	7
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.01	0.04	0.06	0.01	0.02
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.007	0.004	0.005	0.008	0.008
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.002	0.004	0.014	0.017	0.017
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.011	0.009	0.003	0.006	0.007
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	04-Aug-2020 10:24	04-Aug-2020 10:25	04-Aug-2020 10:25	04-Aug-2020 10:26	04-Aug-2020 10:26
Compound	CAS Number	LOR	Unit		EB2020387-001	EB2020387-002	EB2020387-003	EB2020387-004	EB2020387-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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		**0.007**	**0.004**	<0.001	**0.006**	**0.007**
Manganese	7439-96-5	0.001	mg/L		**0.003**	**0.003**	**0.004**	**0.001**	<0.001
Molybdenum	7439-98-7	0.001	mg/L		**0.005**	<0.001	**0.006**	**0.001**	**0.001**
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.030**	**0.011**	**0.003**	**0.015**	**0.015**
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		**0.297**	**0.256**	**0.055**	**0.128**	**0.126**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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		**0.012**	**0.005**	**0.007**	**0.024**	**0.020**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.02**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.007**	<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		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	04-Aug-2020 10:24	04-Aug-2020 10:25	04-Aug-2020 10:25	04-Aug-2020 10:26	04-Aug-2020 10:26
Compound	CAS Number	LOR	Unit		EB2020387-001	EB2020387-002	EB2020387-003	EB2020387-004	EB2020387-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.3**	**0.2**	**0.2**	**0.2**	**0.2**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**7.07**	**3.34**	**1.33**	**3.76**	**3.78**
ø **Total Cations**	----	0.01	meq/L		**7.28**	**3.19**	**1.31**	**3.53**	**3.85**
ø **Ionic Balance**	----	0.01	%		**1.40**	**2.25**	**----**	**3.20**	**0.98**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Client sampling date / time	04-Aug-2020 10:27	04-Aug-2020 10:27	04-Aug-2020 10:28	04-Aug-2020 10:30	----
Compound	CAS Number	LOR	Unit	EB2020387-006	EB2020387-007	EB2020387-008	EB2020387-010	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.30**	**7.18**	**7.82**	**7.13**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**427**	**332**	**186**	**1310**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**13**	**31**	**38**	**30**	----
Total Alkalinity as CaCO3	----	1	mg/L	**13**	**31**	**38**	**30**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	**2**	<1	**2**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**171**	**137**	**37**	**515**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**3**	<1	**4**	**66**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**42**	**38**	**5**	**87**	----
Magnesium	7439-95-4	1	mg/L	**18**	**14**	**1**	**48**	----
Sodium	7440-23-5	1	mg/L	**7**	**2**	**28**	**97**	----
Potassium	7440-09-7	1	mg/L	**3**	**2**	**2**	**23**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.01**	<0.01	**0.10**	**0.01**	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	**0.006**	**0.012**	**0.008**	**0.003**	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.109**	**0.001**	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.008**	**0.009**	**0.007**	**0.021**	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0001**	<0.0001	**0.0016**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
				Client sampling date / time	04-Aug-2020 10:27	04-Aug-2020 10:27	04-Aug-2020 10:28	04-Aug-2020 10:30	----
Compound	CAS Number	LOR	Unit		EB2020387-006	EB2020387-007	EB2020387-008	EB2020387-010	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	**0.001**	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	**0.002**	<0.001	**0.028**	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	**0.004**	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lithium	7439-93-2	0.001	mg/L		**0.004**	**0.002**	**0.003**	**0.012**	----
Manganese	7439-96-5	0.001	mg/L		**0.002**	**0.207**	**0.002**	**0.742**	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.003**	**0.003**	----
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.008**	<0.001	**0.076**	----
Rubidium	7440-17-7	0.001	mg/L		**0.008**	**0.004**	**0.006**	**0.045**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		**0.187**	**0.153**	**0.176**	**0.495**	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L		**0.003**	<0.001	**0.035**	**0.001**	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.008**	<0.005	**0.067**	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
				Client sampling date / time	04-Aug-2020 10:27	04-Aug-2020 10:27	04-Aug-2020 10:28	04-Aug-2020 10:30	----
Compound	CAS Number	LOR	Unit		EB2020387-006	EB2020387-007	EB2020387-008	EB2020387-010	--------
					Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.1**	**0.1**	**0.4**	**0.2**	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**3.90**	**3.47**	**1.64**	**13.2**	----
ø **Total Cations**	----	0.01	meq/L		**3.96**	**3.19**	**1.60**	**13.1**	----
ø **Ionic Balance**	----	0.01	%		**0.68**	**4.28**	**----**	**0.32**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2022964**	Page	: 1 of 11
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 01-Sep-2020 17:19
Order number	:	Date Analysis Commenced	: 04-Sep-2020
C-O-C number	: 13677	Issue Date	: 10-Sep-2020 09:40
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L8		
Quote number	: BN/1234/19		
No. of samples received	: 10		
No. of samples analysed	: 10		

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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
Mark Hallas	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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)			Client sample ID	KLC-9	----	----	----	----
			Client sampling date / time	01-Sep-2020 13:01	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2022964-009	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.91**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**827**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**72**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**72**	----	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**368**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**103**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**34**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**20**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**20**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.033**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.009**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.012**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0021**	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)			Client sample ID	**KLC-9**	----	----	----	----
			Client sampling date / time	01-Sep-2020 13:01	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2022964-009**	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.002**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.005**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.024**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.043**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.404**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.020**	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.035**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	**0.36**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)				Client sample ID	**KLC-9**	----	----	----	----
				Client sampling date / time	01-Sep-2020 13:01	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB2022964-009**	--------	--------	--------	--------
					Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	**----**	**----**	**----**	**----**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**1.4**	**----**	**----**	**----**	**----**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**9.16**	**----**	**----**	**----**	**----**
ø **Total Cations**	----	0.01	meq/L		**9.32**	**----**	**----**	**----**	**----**
ø **Ionic Balance**	----	0.01	%		**0.88**	**----**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	01-Sep-2020 12:58	01-Sep-2020 12:58	01-Sep-2020 12:59	01-Sep-2020 12:59	01-Sep-2020 13:00
Compound	CAS Number	LOR	Unit	EB2022964-001	EB2022964-002	EB2022964-003	EB2022964-004	EB2022964-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.54**	**7.77**	**8.05**	**7.58**	**7.65**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**812**	**354**	**162**	**356**	**362**
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	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**43**	**44**	**61**	**30**	**34**
Total Alkalinity as CaCO3	----	1	mg/L	**43**	**44**	**61**	**30**	**34**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	<1	**1**	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**301**	**119**	**18**	**137**	**126**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**34**	**5**	**2**	**6**	**8**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**43**	**35**	**4**	**20**	**18**
Magnesium	7439-95-4	1	mg/L	**27**	**14**	<1	**20**	**20**
Sodium	7440-23-5	1	mg/L	**84**	**14**	**32**	**19**	**23**
Potassium	7440-09-7	1	mg/L	**13**	**5**	**2**	**7**	**7**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	**0.06**	**0.04**	**0.04**	**0.03**
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	**0.010**	**0.003**	**0.006**	**0.007**	**0.008**
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.003**	**0.016**	**0.015**	**0.017**
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	**0.015**	**0.010**	**0.005**	**0.006**	**0.009**
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	01-Sep-2020 12:58	01-Sep-2020 12:58	01-Sep-2020 12:59	01-Sep-2020 12:59	01-Sep-2020 13:00
Compound	CAS Number	LOR	Unit		EB2022964-001	EB2022964-002	EB2022964-003	EB2022964-004	EB2022964-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L		**0.001**	<0.001	**0.001**	**0.001**	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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		**0.007**	**0.004**	<0.001	**0.006**	**0.006**
Manganese	7439-96-5	0.001	mg/L		<0.001	**0.001**	**0.003**	**0.001**	<0.001
Molybdenum	7439-98-7	0.001	mg/L		**0.004**	<0.001	**0.005**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.034**	**0.012**	**0.004**	**0.016**	**0.016**
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		**0.324**	**0.278**	**0.077**	**0.131**	**0.120**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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		**0.010**	**0.004**	**0.006**	**0.016**	**0.012**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.02**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.014**	<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		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	01-Sep-2020 12:58	01-Sep-2020 12:58	01-Sep-2020 12:59	01-Sep-2020 12:59	01-Sep-2020 13:00
Compound	CAS Number	LOR	Unit		EB2022964-001	EB2022964-002	EB2022964-003	EB2022964-004	EB2022964-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.3**	**0.2**	**0.3**	**0.2**	**0.2**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**8.08**	**3.50**	**1.65**	**3.62**	**3.53**
ø **Total Cations**	----	0.01	meq/L		**8.35**	**3.64**	**1.64**	**3.65**	**3.72**
ø **Ionic Balance**	----	0.01	%		**1.64**	**1.93**	**----**	**0.39**	**2.69**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Client sampling date / time	01-Sep-2020 13:00	01-Sep-2020 13:00	01-Sep-2020 13:01	01-Sep-2020 13:02	----
Compound	CAS Number	LOR	Unit	EB2022964-006	EB2022964-007	EB2022964-008	EB2022964-010	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.30**	**7.27**	**7.95**	**7.37**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**378**	**318**	**210**	**1400**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**16**	**15**	**60**	**22**	----
Total Alkalinity as CaCO3	----	1	mg/L	**16**	**15**	**60**	**22**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	**1**	<1	**1**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**160**	**138**	**35**	**617**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	<1	**4**	**73**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**43**	**38**	**10**	**101**	----
Magnesium	7439-95-4	1	mg/L	**18**	**14**	**2**	**67**	----
Sodium	7440-23-5	1	mg/L	**6**	**2**	**30**	**104**	----
Potassium	7440-09-7	1	mg/L	**4**	**2**	**4**	**17**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	<0.01	**0.06**	**0.01**	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	**0.005**	**0.012**	**0.014**	**0.006**	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	**0.001**	**0.132**	**0.008**	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.008**	**0.010**	**0.012**	**0.016**	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0001**	<0.0001	**0.0003**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Client sampling date / time	01-Sep-2020 13:00	01-Sep-2020 13:00	01-Sep-2020 13:01	01-Sep-2020 13:02	----
Compound	CAS Number	LOR	Unit	EB2022964-006	EB2022964-007	EB2022964-008	EB2022964-010	--------
				Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.002**	<0.001	**0.004**	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lithium	7439-93-2	0.001	mg/L	**0.004**	**0.002**	**0.004**	**0.012**	----
Manganese	7439-96-5	0.001	mg/L	**0.003**	**0.221**	**0.001**	**0.224**	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	**0.004**	**0.005**	----
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.009**	<0.001	**0.012**	----
Rubidium	7440-17-7	0.001	mg/L	**0.008**	**0.005**	**0.009**	**0.029**	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L	**0.169**	**0.142**	**0.300**	**0.580**	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L	**0.002**	<0.001	**0.034**	**0.005**	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L	**0.006**	**0.012**	<0.005	**0.008**	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
				Client sampling date / time	01-Sep-2020 13:00	01-Sep-2020 13:00	01-Sep-2020 13:01	01-Sep-2020 13:02	----
Compound	CAS Number	LOR	Unit		EB2022964-006	EB2022964-007	EB2022964-008	EB2022964-010	--------
					Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.1**	**0.1**	**0.5**	**0.3**	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**3.71**	**3.17**	**2.04**	**15.3**	----
ø **Total Cations**	----	0.01	meq/L		**3.99**	**3.19**	**2.07**	**15.5**	----
ø **Ionic Balance**	----	0.01	%		**3.68**	**0.22**	**----**	**0.54**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2026216**	Page	: 1 of 11
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 07-Oct-2020 16:39
Order number	:	Date Analysis Commenced	: 08-Oct-2020
C-O-C number	: 14579	Issue Date	: 13-Oct-2020 09:25
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar_L9		
Quote number	: BN/1234/19		
No. of samples received	: 10		
No. of samples analysed	: 10		

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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

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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)			Client sample ID	KLC-9	----	----	----	----
			Client sampling date / time	07-Oct-2020 10:53	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2026216-009	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.76**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**858**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**60**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**60**	----	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**384**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**106**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**35**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**20**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**21**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.032**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.010**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.013**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0010**	----	----	----	----

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)				Client sample ID	KLC-9	----	----	----	----
				Client sampling date / time	07-Oct-2020 10:53	----	----	----	----
Compound	CAS Number	LOR	Unit		EB2026216-009	--------	--------	--------	--------
					Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L		<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L		<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.002**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L		<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L		<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L		<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L		**0.004**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L		<0.001	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.028**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L		**0.045**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L		<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L		**0.436**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L		<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L		<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L		<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L		<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L		**0.022**	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.016**	----	----	----	----
Boron	7440-42-8	0.05	mg/L		**0.35**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)				Client sample ID	**KLC-9**	----	----	----	----
				Client sampling date / time	07-Oct-2020 10:53	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB2026216-009**	--------	--------	--------	--------
					Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	**----**	**----**	**----**	**----**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**1.6**	**----**	**----**	**----**	**----**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**9.25**	**----**	**----**	**----**	**----**
ø **Total Cations**	----	0.01	meq/L		**9.58**	**----**	**----**	**----**	**----**
ø **Ionic Balance**	----	0.01	%		**1.74**	**----**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	07-Oct-2020 10:50	07-Oct-2020 10:51	07-Oct-2020 10:51	07-Oct-2020 10:52	07-Oct-2020 10:52
Compound	CAS Number	LOR	Unit	EB2026216-001	EB2026216-002	EB2026216-003	EB2026216-004	EB2026216-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.21	7.71	7.84	7.12	7.38
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	625	430	159	265	305
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	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	36	63	57	18	30
Total Alkalinity as CaCO3	----	1	mg/L	36	63	57	18	30
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	2	1	<1	1	1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	224	139	20	92	99
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	26	4	1	4	4
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	31	44	5	13	15
Magnesium	7439-95-4	1	mg/L	19	18	<1	14	16
Sodium	7440-23-5	1	mg/L	62	14	30	13	16
Potassium	7440-09-7	1	mg/L	11	6	2	5	6
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.01	0.05	0.05	0.02	0.03
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.010	0.005	0.013	0.005	0.008
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.002	0.003	0.015	0.011	0.017
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.011	0.013	0.008	0.004	0.008
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	07-Oct-2020 10:50	07-Oct-2020 10:51	07-Oct-2020 10:51	07-Oct-2020 10:52	07-Oct-2020 10:52
Compound	CAS Number	LOR	Unit		EB2026216-001	EB2026216-002	EB2026216-003	EB2026216-004	EB2026216-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.001**	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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		**0.006**	**0.005**	<0.001	**0.004**	**0.005**
Manganese	7439-96-5	0.001	mg/L		<0.001	**0.001**	**0.007**	**0.001**	<0.001
Molybdenum	7439-98-7	0.001	mg/L		**0.004**	<0.001	**0.006**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.031**	**0.016**	**0.005**	**0.013**	**0.015**
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		**0.245**	**0.357**	**0.089**	**0.093**	**0.100**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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		**0.007**	**0.006**	**0.006**	**0.008**	**0.009**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.02**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.007**	**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		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	07-Oct-2020 10:50	07-Oct-2020 10:51	07-Oct-2020 10:51	07-Oct-2020 10:52	07-Oct-2020 10:52
Compound	CAS Number	LOR	Unit		EB2026216-001	EB2026216-002	EB2026216-003	EB2026216-004	EB2026216-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.3**	**0.2**	**0.3**	**0.1**	**0.1**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**6.12**	**4.26**	**1.58**	**2.39**	**2.77**
ø **Total Cations**	----	0.01	meq/L		**6.09**	**4.44**	**1.60**	**2.49**	**2.91**
ø **Ionic Balance**	----	0.01	%		**0.23**	**2.00**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Client sampling date / time	07-Oct-2020 10:52	07-Oct-2020 10:53	07-Oct-2020 10:53	07-Oct-2020 10:54	----
Compound	CAS Number	LOR	Unit	EB2026216-006	EB2026216-007	EB2026216-008	EB2026216-010	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.03**	**7.03**	**7.99**	**7.11**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**428**	**441**	**249**	**1140**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**16**	**21**	**84**	**16**	----
Total Alkalinity as CaCO3	----	1	mg/L	**16**	**21**	**84**	**16**	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	<1	**1**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**181**	**189**	**33**	**511**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	<1	**4**	**39**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**48**	**56**	**14**	**75**	----
Magnesium	7439-95-4	1	mg/L	**18**	**18**	**4**	**62**	----
Sodium	7440-23-5	1	mg/L	**5**	**2**	**32**	**72**	----
Potassium	7440-09-7	1	mg/L	**4**	**2**	**5**	**13**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	<0.01	**0.05**	**0.01**	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	**0.006**	**0.012**	**0.020**	**0.006**	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.148**	**0.005**	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.010**	**0.016**	**0.022**	**0.010**	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0001**	<0.0001	**0.0002**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
				Client sampling date / time	07-Oct-2020 10:52	07-Oct-2020 10:53	07-Oct-2020 10:53	07-Oct-2020 10:54	----
Compound	CAS Number	LOR	Unit		EB2026216-006	EB2026216-007	EB2026216-008	EB2026216-010	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	**0.003**	<0.001	**0.003**	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	**0.002**	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lithium	7439-93-2	0.001	mg/L		**0.004**	**0.002**	**0.006**	**0.008**	----
Manganese	7439-96-5	0.001	mg/L		**0.005**	**0.311**	<0.001	**0.110**	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.014**	**0.007**	----
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.014**	<0.001	**0.007**	----
Rubidium	7440-17-7	0.001	mg/L		**0.009**	**0.006**	**0.012**	**0.024**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		**0.194**	**0.205**	**0.478**	**0.406**	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L		**0.002**	<0.001	**0.048**	**0.002**	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.025**	**0.008**	**0.014**	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Client sampling date / time	07-Oct-2020 10:52	07-Oct-2020 10:53	07-Oct-2020 10:53	07-Oct-2020 10:54	----
Compound	CAS Number	LOR	Unit	EB2026216-006	EB2026216-007	EB2026216-008	EB2026216-010	--------
				Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.1**	<0.1	**0.6**	**0.3**	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**4.14**	**4.35**	**2.48**	**12.0**	----
ø **Total Cations**	----	0.01	meq/L	**4.20**	**4.41**	**2.55**	**12.3**	----
ø **Ionic Balance**	----	0.01	%	**0.62**	**0.68**	**----**	**1.03**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2028814**	Page	: 1 of 11
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 03-Nov-2020 17:10
Order number	:	Date Analysis Commenced	: 04-Nov-2020
C-O-C number	: 15503	Issue Date	: 12-Nov-2020 10:44
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L10		
Quote number	: BN/1234/19		
No. of samples received	: 10		
No. of samples analysed	: 10		

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*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)			Client sample ID	KLC-9	----	----	----	----
			Client sampling date / time	03-Nov-2020 13:31	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2028814-009	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.81**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**918**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**61**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**61**	----	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**3**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**436**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**111**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**34**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**21**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**22**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.037**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.010**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.015**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0021**	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)			Client sample ID	**KLC-9**	----	----	----	----
			Client sampling date / time	03-Nov-2020 13:31	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2028814-009**	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.002**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.004**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.019**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.030**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.048**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.436**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.020**	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.037**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	**0.41**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)				Client sample ID	**KLC-9**	----	----	----	----
				Client sampling date / time	03-Nov-2020 13:31	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB2028814-009**	--------	--------	--------	--------
					Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**1.7**	----	----	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**10.4**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L		**9.81**	----	----	----	----
ø **Ionic Balance**	----	0.01	%		**2.68**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Client sampling date / time	03-Nov-2020 13:27	03-Nov-2020 13:28	03-Nov-2020 13:28	03-Nov-2020 13:29	03-Nov-2020 13:29
Compound	CAS Number	LOR	Unit	EB2028814-001	EB2028814-002	EB2028814-003	EB2028814-004	EB2028814-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.73	7.74	7.99	7.49	7.61
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	696	353	193	274	290
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	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	64	45	68	30	34
Total Alkalinity as CaCO3	----	1	mg/L	64	45	68	30	34
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	2	2	1	2	2
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	238	116	27	87	87
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	23	3	<1	4	5
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	36	33	5	14	13
Magnesium	7439-95-4	1	mg/L	22	14	<1	14	16
Sodium	7440-23-5	1	mg/L	64	11	35	12	14
Potassium	7440-09-7	1	mg/L	15	6	2	6	7
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.02	0.14	0.06	0.02	0.03
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.015	0.004	0.008	0.008	0.008
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.022	0.013	0.015
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.015	0.010	0.006	0.005	0.008
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	03-Nov-2020 13:27	03-Nov-2020 13:28	03-Nov-2020 13:28	03-Nov-2020 13:29	03-Nov-2020 13:29
Compound	CAS Number	LOR	Unit		EB2028814-001	EB2028814-002	EB2028814-003	EB2028814-004	EB2028814-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L		**0.001**	**0.001**	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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		**0.009**	**0.004**	**0.001**	**0.005**	**0.005**
Manganese	7439-96-5	0.001	mg/L		<0.001	**0.031**	**0.001**	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L		**0.006**	<0.001	**0.005**	<0.001	**0.001**
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.037**	**0.013**	**0.005**	**0.013**	**0.014**
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		**0.271**	**0.248**	**0.100**	**0.092**	**0.090**
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
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
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		**0.011**	**0.004**	**0.007**	**0.012**	**0.009**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	**0.03**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.009**	**0.018**	<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		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
				Client sampling date / time	03-Nov-2020 13:27	03-Nov-2020 13:28	03-Nov-2020 13:28	03-Nov-2020 13:29	03-Nov-2020 13:29
Compound	CAS Number	LOR	Unit		EB2028814-001	EB2028814-002	EB2028814-003	EB2028814-004	EB2028814-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**0.1**	**0.4**	**0.1**	**0.1**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**6.88**	**3.40**	**1.92**	**2.52**	**2.63**
ø **Total Cations**	----	0.01	meq/L		**6.77**	**3.43**	**1.82**	**2.53**	**2.75**
ø **Ionic Balance**	----	0.01	%		**0.79**	**0.47**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Client sampling date / time	03-Nov-2020 13:29	03-Nov-2020 13:30	03-Nov-2020 13:30	03-Nov-2020 13:31	----
Compound	CAS Number	LOR	Unit	EB2028814-006	EB2028814-007	EB2028814-008	EB2028814-010	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.26**	**7.25**	**7.99**	**7.29**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**381**	**385**	**216**	**923**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**21**	**18**	**77**	**16**	----
Total Alkalinity as CaCO3	----	1	mg/L	**21**	**18**	**77**	**16**	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	**2**	**2**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**154**	**161**	**27**	**419**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1**	<1	**3**	**28**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**40**	**44**	**13**	**56**	----
Magnesium	7439-95-4	1	mg/L	**16**	**16**	**3**	**48**	----
Sodium	7440-23-5	1	mg/L	**5**	**2**	**24**	**51**	----
Potassium	7440-09-7	1	mg/L	**4**	**2**	**5**	**12**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	<0.01	**0.06**	**0.01**	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	**0.007**	**0.013**	**0.017**	**0.005**	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.130**	**0.005**	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.010**	**0.012**	**0.020**	**0.007**	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	**0.0002**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
				Client sampling date / time	03-Nov-2020 13:29	03-Nov-2020 13:30	03-Nov-2020 13:30	03-Nov-2020 13:31	----
Compound	CAS Number	LOR	Unit		EB2028814-006	EB2028814-007	EB2028814-008	EB2028814-010	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	**0.002**	<0.001	**0.001**	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	**0.002**	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lithium	7439-93-2	0.001	mg/L		**0.004**	**0.002**	**0.005**	**0.008**	----
Manganese	7439-96-5	0.001	mg/L		**0.003**	**0.192**	<0.001	**0.030**	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.011**	**0.008**	----
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.009**	<0.001	**0.004**	----
Rubidium	7440-17-7	0.001	mg/L		**0.008**	**0.006**	**0.012**	**0.020**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		**0.154**	**0.146**	**0.411**	**0.287**	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L		**0.002**	<0.001	**0.036**	**0.002**	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.015**	**0.006**	**0.011**	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Client sampling date / time	03-Nov-2020 13:29	03-Nov-2020 13:30	03-Nov-2020 13:30	03-Nov-2020 13:31	----
Compound	CAS Number	LOR	Unit	EB2028814-006	EB2028814-007	EB2028814-008	EB2028814-010	--------
				Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	**0.5**	**0.3**	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**3.65**	**3.71**	**2.18**	**9.83**	----
ø **Total Cations**	----	0.01	meq/L	**3.63**	**3.65**	**2.07**	**9.27**	----
ø **Ionic Balance**	----	0.01	%	**0.29**	**0.83**	**----**	**2.95**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2031669**	Page	: 1 of 11
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 01-Dec-2020 16:56
Order number	:	Date Analysis Commenced	: 02-Dec-2020
C-O-C number	: 16600	Issue Date	: 07-Dec-2020 10:45
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L11		
Quote number	: BN/1234/19		
No. of samples received	: 10		
No. of samples analysed	: 10		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)			Sample ID	KLC-9	----	----	----	----
			Sampling date / time	01-Dec-2020 14:06	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2031669-009	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.51**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1010**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**104**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**104**	----	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**4**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**602**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**158**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**49**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**28**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**27**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.036**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.011**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.018**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0034**	----	----	----	----

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)			Sample ID	KLC-9	----	----	----	----
			Sampling date / time	01-Dec-2020 14:06	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2031669-009	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.002**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.006**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.049**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.057**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.658**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.031**	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.042**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	**0.60**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)			Sample ID	**KLC-9**	**----**	**----**	**----**	**----**
			Sampling date / time	01-Dec-2020 14:06	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2031669-009**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	**----**	**----**	**----**	**----**
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**1.6**	**----**	**----**	**----**	**----**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**14.7**	**----**	**----**	**----**	**----**
ø **Total Cations**	----	0.01	meq/L	**13.8**	**----**	**----**	**----**	**----**
ø **Ionic Balance**	----	0.01	%	**2.96**	**----**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Sampling date / time	01-Dec-2020 14:03	01-Dec-2020 14:03	01-Dec-2020 14:04	01-Dec-2020 14:04	01-Dec-2020 14:05
Compound	CAS Number	LOR	Unit	EB2031669-001	EB2031669-002	EB2031669-003	EB2031669-004	EB2031669-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.69	7.71	7.85	7.63	7.64
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	687	359	182	297	290
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	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	65	44	68	35	35
Total Alkalinity as CaCO3	----	1	mg/L	65	44	68	35	35
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	3	2	<1	2	2
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	248	124	24	100	97
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	20	4	2	4	4
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	37	34	5	15	13
Magnesium	7439-95-4	1	mg/L	24	15	<1	18	18
Sodium	7440-23-5	1	mg/L	64	11	35	13	13
Potassium	7440-09-7	1	mg/L	14	6	2	6	6
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.02	0.06	0.06	0.02	0.03
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.013	0.005	0.007	0.008	0.007
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.022	0.014	0.013
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.015	0.010	0.005	0.006	0.008
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Sampling date / time	01-Dec-2020 14:03	01-Dec-2020 14:03	01-Dec-2020 14:04	01-Dec-2020 14:04	01-Dec-2020 14:05
Compound	CAS Number	LOR	Unit	EB2031669-001	EB2031669-002	EB2031669-003	EB2031669-004	EB2031669-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
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	**0.009**	**0.005**	**0.001**	**0.006**	**0.006**
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	**0.001**	**0.001**	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.007**	<0.001	**0.006**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.037**	**0.012**	**0.005**	**0.014**	**0.014**
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	**0.280**	**0.253**	**0.100**	**0.100**	**0.088**
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
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
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	**0.012**	**0.004**	**0.007**	**0.014**	**0.008**
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	**0.03**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.010**	**0.007**	<0.005	<0.005	<0.005
Boron	7440-42-8	0.05	mg/L	**0.06**	<0.05	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Sampling date / time	01-Dec-2020 14:03	01-Dec-2020 14:03	01-Dec-2020 14:04	01-Dec-2020 14:04	01-Dec-2020 14:05
Compound	CAS Number	LOR	Unit	EB2031669-001	EB2031669-002	EB2031669-003	EB2031669-004	EB2031669-005
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.4**	**0.1**	**0.3**	**0.1**	**0.1**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**7.03**	**3.57**	**1.91**	**2.89**	**2.83**
ø **Total Cations**	----	0.01	meq/L	**6.96**	**3.56**	**1.82**	**2.95**	**2.85**
ø **Ionic Balance**	----	0.01	%	**0.45**	**0.15**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Sampling date / time	01-Dec-2020 14:05	01-Dec-2020 14:06	01-Dec-2020 14:06	01-Dec-2020 14:07	----
Compound	CAS Number	LOR	Unit	EB2031669-006	EB2031669-007	EB2031669-008	EB2031669-010	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.33**	**7.31**	**7.91**	**7.11**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**378**	**388**	**200**	**781**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**21**	**23**	**71**	**13**	----
Total Alkalinity as CaCO3	----	1	mg/L	**21**	**23**	**71**	**13**	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	**1**	**2**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**158**	**167**	**26**	**363**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1**	<1	**2**	**21**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**38**	**43**	**13**	**43**	----
Magnesium	7439-95-4	1	mg/L	**18**	**18**	**4**	**46**	----
Sodium	7440-23-5	1	mg/L	**4**	**2**	**22**	**45**	----
Potassium	7440-09-7	1	mg/L	**4**	**2**	**5**	**10**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	<0.01	**0.07**	**0.01**	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	**0.007**	**0.011**	**0.014**	**0.003**	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.110**	**0.004**	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.009**	**0.013**	**0.019**	**0.005**	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0001**	<0.0001	**0.0002**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Sampling date / time	01-Dec-2020 14:05	01-Dec-2020 14:06	01-Dec-2020 14:06	01-Dec-2020 14:07	----
Compound	CAS Number	LOR	Unit	EB2031669-006	EB2031669-007	EB2031669-008	EB2031669-010	--------
				Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lithium	7439-93-2	0.001	mg/L	**0.004**	**0.002**	**0.006**	**0.009**	----
Manganese	7439-96-5	0.001	mg/L	**0.003**	**0.194**	<0.001	**0.019**	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	**0.013**	**0.008**	----
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.010**	<0.001	**0.003**	----
Rubidium	7440-17-7	0.001	mg/L	**0.009**	**0.006**	**0.012**	**0.018**	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L	**0.149**	**0.136**	**0.493**	**0.214**	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L	**0.002**	<0.001	**0.036**	**0.001**	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.028**	**0.006**	**0.012**	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Sampling date / time	01-Dec-2020 14:05	01-Dec-2020 14:06	01-Dec-2020 14:06	01-Dec-2020 14:07	----
Compound	CAS Number	LOR	Unit	EB2031669-006	EB2031669-007	EB2031669-008	EB2031669-010	--------
				Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	**0.5**	**0.4**	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**3.74**	**3.94**	**2.02**	**8.41**	----
ø **Total Cations**	----	0.01	meq/L	**3.65**	**3.76**	**2.06**	**8.14**	----
ø **Ionic Balance**	----	0.01	%	**1.13**	**2.22**	**----**	**1.60**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2100143**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 05-Jan-2021 17:50
Order number	:	Date Analysis Commenced	: 05-Jan-2021
C-O-C number	: 17460	Issue Date	: 15-Jan-2021 09:54
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L12		
Quote number	: BN/1234/19		
No. of samples received	: 10		
No. of samples analysed	: 10		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane 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.

- Ionic Balance out of acceptable limits due to analytes not quantified in this report.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-3	KLC-4	KLC-5	KLC-6	KLC-7
			Sampling date / time	05-Jan-2021 10:13	05-Jan-2021 10:13	05-Jan-2021 10:14	05-Jan-2021 10:14	05-Jan-2021 10:15
Compound	CAS Number	LOR	Unit	EB2100143-003	EB2100143-004	EB2100143-005	EB2100143-006	EB2100143-007
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.46	8.31	7.90	7.58	7.57
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	146	401	310	378	449
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	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	46	59	30	16	21
Total Alkalinity as CaCO3	----	1	mg/L	47	60	30	16	21
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	<1	<1	<1	1	1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	20	125	104	156	197
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	<1	3	3	<1	<1
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	5	22	15	44	54
Magnesium	7439-95-4	1	mg/L	<1	27	20	18	21
Sodium	7440-23-5	1	mg/L	26	13	13	4	2
Potassium	7440-09-7	1	mg/L	2	8	6	3	2
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.06	0.01	0.04	0.02	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.011	0.008	0.006	0.006	0.011
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.016	0.013	0.012	0.001	<0.001
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.006	0.006	0.009	0.011	0.018
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-3	KLC-4	KLC-5	KLC-6	KLC-7
			Sampling date / time	05-Jan-2021 10:13	05-Jan-2021 10:13	05-Jan-2021 10:14	05-Jan-2021 10:14	05-Jan-2021 10:15
Compound	CAS Number	LOR	Unit	EB2100143-003	EB2100143-004	EB2100143-005	EB2100143-006	EB2100143-007
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.003**
Praseodymium	7440-10-0	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
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
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**	**0.007**	**0.005**	**0.004**	**0.003**
Manganese	7439-96-5	0.001	mg/L	**0.002**	**0.002**	<0.001	**0.006**	**0.344**
Molybdenum	7439-98-7	0.001	mg/L	**0.004**	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.014**
Rubidium	7440-17-7	0.001	mg/L	**0.005**	**0.021**	**0.016**	**0.008**	**0.006**
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	**0.093**	**0.145**	**0.094**	**0.149**	**0.157**
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
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
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	**0.004**	**0.012**	**0.006**	**0.002**	<0.001
Vanadium	7440-62-2	0.01	mg/L	**0.03**	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	**0.015**
Boron	7440-42-8	0.05	mg/L	**0.08**	<0.05	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-3	KLC-4	KLC-5	KLC-6	KLC-7
			Sampling date / time	05-Jan-2021 10:13	05-Jan-2021 10:13	05-Jan-2021 10:14	05-Jan-2021 10:14	05-Jan-2021 10:15
Compound	CAS Number	LOR	Unit	EB2100143-003	EB2100143-004	EB2100143-005	EB2100143-006	EB2100143-007
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.2**	**0.1**	<0.1	<0.1
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**1.36**	**3.88**	**2.85**	**3.57**	**4.52**
ø **Total Cations**	----	0.01	meq/L	**1.43**	**4.09**	**3.11**	**3.93**	**4.56**
ø **Ionic Balance**	----	0.01	%	**----**	**2.56**	**----**	**4.80**	**0.44**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-8	KLC-10	KLC-1	KLC-9	KLC-2
			Sampling date / time	05-Jan-2021 10:15	05-Jan-2021 10:15	08-Jan-2021 10:15	08-Jan-2021 10:15	08-Jan-2021 10:15
Compound	CAS Number	LOR	Unit	EB2100143-008	EB2100143-010	EB2100143-011	EB2100143-012	EB2100143-013
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.07	7.52	8.06	7.82	7.82
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	184	732	1050	1050	396
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	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	58	14	116	51	44
Total Alkalinity as CaCO3	----	1	mg/L	58	14	116	51	44
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	<1	1	1	3	2
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	24	326	397	539	142
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	2	16	29	2	3
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	14	47	66	137	39
Magnesium	7439-95-4	1	mg/L	3	41	42	44	18
Sodium	7440-23-5	1	mg/L	18	34	98	27	10
Potassium	7440-09-7	1	mg/L	4	8	21	24	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.07	0.01	0.04	0.02	0.07
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.017	0.003	0.021	0.035	0.005
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.099	0.004	0.007	0.016	0.006
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.021	0.006	0.025	0.018	0.011
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0002	<0.0001	0.0032	<0.0001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-8	KLC-10	KLC-1	KLC-9	KLC-2
			Sampling date / time	05-Jan-2021 10:15	05-Jan-2021 10:15	08-Jan-2021 10:15	08-Jan-2021 10:15	08-Jan-2021 10:15
Compound	CAS Number	LOR	Unit	EB2100143-008	EB2100143-010	EB2100143-011	EB2100143-012	EB2100143-013
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	**0.002**	<0.001	<0.001
Lutetium	7439-94-3	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	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.002**	**0.002**	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
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	**0.005**	**0.008**	**0.014**	**0.004**	**0.004**
Manganese	7439-96-5	0.001	mg/L	<0.001	**0.010**	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.016**	**0.009**	**0.011**	**0.046**	**0.001**
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.011**	**0.018**	**0.060**	**0.054**	**0.012**
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	**0.395**	**0.209**	**0.442**	**0.450**	**0.254**
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
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
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	**0.026**	**0.001**	**0.020**	**0.019**	**0.004**
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.010**	**0.012**	**0.037**	**0.011**
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	**0.08**	**0.54**	<0.05
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-8	KLC-10	KLC-1	KLC-9	KLC-2
			Sampling date / time	05-Jan-2021 10:15	05-Jan-2021 10:15	08-Jan-2021 10:15	08-Jan-2021 10:15	08-Jan-2021 10:15
Compound	CAS Number	LOR	Unit	EB2100143-008	EB2100143-010	EB2100143-011	EB2100143-012	EB2100143-013
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.4**	**0.3**	**0.7**	**2.5**	**0.1**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**1.71**	**7.52**	**11.4**	**12.3**	**3.92**
ø **Total Cations**	----	0.01	meq/L	**1.83**	**7.40**	**11.6**	**12.2**	**3.96**
ø **Ionic Balance**	----	0.01	%	**----**	**0.77**	**0.65**	**0.21**	**0.57**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2102717**	Page	: 1 of 11
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 02-Feb-2021 16:45
Order number	: -	Date Analysis Commenced	: 03-Feb-2021
C-O-C number	: 18481	Issue Date	: 08-Feb-2021 10:05
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L13		
Quote number	: BN/1234/19		
No. of samples received	: 10		
No. of samples analysed	: 10		

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, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WASTEWATER (Matrix: WATER)			Sample ID	KLC-9	----	----	----	----
			Sampling date / time	02-Feb-2021 12:47	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2102717-009	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.39**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1020**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**54**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**54**	----	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**4**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**472**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	<1	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**124**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**40**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**23**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**24**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.03**	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.031**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.014**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.017**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0023**	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)			Sample ID	KLC-9	----	----	----	----
			Sampling date / time	02-Feb-2021 12:47	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2102717-009	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.003**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.004**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.047**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.055**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.463**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.023**	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.029**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	**0.48**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **WASTEWATER** (Matrix: **WATER**)			Sample ID	**KLC-9**	**----**	**----**	**----**	**----**
			Sampling date / time	02-Feb-2021 12:47	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2102717-009**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	**----**	**----**	**----**	**----**
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**2.1**	**----**	**----**	**----**	**----**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**10.9**	**----**	**----**	**----**	**----**
ø **Total Cations**	----	0.01	meq/L	**11.1**	**----**	**----**	**----**	**----**
ø **Ionic Balance**	----	0.01	%	**0.85**	**----**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Sampling date / time	02-Feb-2021 12:44	02-Feb-2021 12:44	02-Feb-2021 12:45	02-Feb-2021 12:45	02-Feb-2021 12:46
Compound	CAS Number	LOR	Unit	EB2102717-001	EB2102717-002	EB2102717-003	EB2102717-004	EB2102717-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.28	7.72	7.87	7.54	7.35
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	554	429	140	259	308
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	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	36	51	51	26	20
Total Alkalinity as CaCO3	----	1	mg/L	36	51	51	26	20
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	5	3	<1	2	2
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	194	147	17	84	112
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	13	3	<1	2	2
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	31	44	6	12	11
Magnesium	7439-95-4	1	mg/L	19	19	<1	16	21
Sodium	7440-23-5	1	mg/L	45	9	24	10	10
Potassium	7440-09-7	1	mg/L	11	5	2	5	5
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.02	0.06	0.04	0.02	0.02
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	0.009	0.004	0.013	0.007	0.004
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.013	0.010	0.006
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	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
Barium	7440-39-3	0.001	mg/L	0.012	0.011	0.009	0.006	0.005
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	7440-60-0	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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Sampling date / time	02-Feb-2021 12:44	02-Feb-2021 12:44	02-Feb-2021 12:45	02-Feb-2021 12:45	02-Feb-2021 12:46
Compound	CAS Number	LOR	Unit	EB2102717-001	EB2102717-002	EB2102717-003	EB2102717-004	EB2102717-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	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
Caesium	7440-46-2	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	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**	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	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
Copper	7440-50-8	0.001	mg/L	**0.001**	<0.001	<0.001	**0.001**	**0.001**
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	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
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
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
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	**0.006**	**0.005**	**0.001**	**0.004**	**0.004**
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	**0.002**	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.004**	<0.001	**0.004**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.028**	**0.013**	**0.005**	**0.012**	**0.013**
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	**0.216**	**0.300**	**0.106**	**0.078**	**0.081**
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
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
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	**0.006**	**0.004**	**0.004**	**0.012**	**0.004**
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	**0.02**	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.009**	**0.011**	<0.005	<0.005	**0.006**
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	**0.06**	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-1	KLC-2	KLC-3	KLC-4	KLC-5
			Sampling date / time	02-Feb-2021 12:44	02-Feb-2021 12:44	02-Feb-2021 12:45	02-Feb-2021 12:45	02-Feb-2021 12:46
Compound	CAS Number	LOR	Unit	EB2102717-001	EB2102717-002	EB2102717-003	EB2102717-004	EB2102717-005
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.3**	**0.1**	**0.2**	<0.1	<0.1
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**5.12**	**4.16**	**1.37**	**2.32**	**2.79**
ø **Total Cations**	----	0.01	meq/L	**5.35**	**4.28**	**1.39**	**2.48**	**2.84**
ø **Ionic Balance**	----	0.01	%	**2.14**	**1.36**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Sampling date / time	02-Feb-2021 12:46	02-Feb-2021 12:46	02-Feb-2021 12:47	02-Feb-2021 12:48	----
Compound	CAS Number	LOR	Unit	EB2102717-006	EB2102717-007	EB2102717-008	EB2102717-010	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.36**	**7.36**	**7.86**	**6.52**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**362**	**423**	**222**	**659**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**22**	**21**	**76**	**8**	----
Total Alkalinity as CaCO3	----	1	mg/L	**22**	**21**	**76**	**8**	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**3**	**3**	**2**	**3**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**141**	**177**	**28**	**284**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	<1	<1	**2**	**14**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**36**	**47**	**18**	**33**	----
Magnesium	7439-95-4	1	mg/L	**18**	**21**	**5**	**40**	----
Sodium	7440-23-5	1	mg/L	**3**	**2**	**20**	**30**	----
Potassium	7440-09-7	1	mg/L	**3**	**1**	**5**	**8**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	<0.01	**0.07**	**0.01**	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	**0.006**	**0.010**	**0.017**	**0.002**	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.095**	**0.002**	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.010**	**0.014**	**0.026**	**0.004**	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	**0.0002**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Sampling date / time	02-Feb-2021 12:46	02-Feb-2021 12:46	02-Feb-2021 12:47	02-Feb-2021 12:48	----
Compound	CAS Number	LOR	Unit	EB2102717-006	EB2102717-007	EB2102717-008	EB2102717-010	--------
				Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lithium	7439-93-2	0.001	mg/L	**0.004**	**0.002**	**0.006**	**0.007**	----
Manganese	7439-96-5	0.001	mg/L	**0.002**	**0.163**	<0.001	**0.018**	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	**0.020**	**0.006**	----
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.008**	<0.001	**0.002**	----
Rubidium	7440-17-7	0.001	mg/L	**0.007**	**0.005**	**0.012**	**0.014**	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L	**0.129**	**0.124**	**0.512**	**0.146**	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Uranium	7440-61-1	0.001	mg/L	**0.002**	<0.001	**0.034**	<0.001	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.012**	**0.005**	**0.011**	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-6	KLC-7	KLC-8	KLC-10	----
			Sampling date / time	02-Feb-2021 12:46	02-Feb-2021 12:46	02-Feb-2021 12:47	02-Feb-2021 12:48	----
Compound	CAS Number	LOR	Unit	EB2102717-006	EB2102717-007	EB2102717-008	EB2102717-010	--------
				Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	**0.4**	**0.2**	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**3.38**	**4.10**	**2.16**	**6.47**	----
ø **Total Cations**	----	0.01	meq/L	**3.48**	**4.19**	**2.31**	**6.45**	----
ø **Ionic Balance**	----	0.01	%	**1.60**	**0.98**	**----**	**0.15**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2105658**	Page	: 1 of 5
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 02-Mar-2021 17:05
Order number	:	Date Analysis Commenced	: 03-Mar-2021
C-O-C number	: 19767	Issue Date	: 08-Mar-2021 15:00
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L8		
Quote number	: BN/1234/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-10	----	----	----	----
			Sampling date / time	02-Mar-2021 14:17	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2105658-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.83**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**594**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**8**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**8**	----	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**1**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**258**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**13**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**31**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**38**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**25**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**7**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.002**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.004**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0001**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC-10	----	----	----	----
				Sampling date / time	02-Mar-2021 14:17	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2105658-001	--------	--------	--------	--------	
				Result	----	----	----	----	
EG020F: Dissolved Metals by ICP-MS - Continued									
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----	
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----	
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----	
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----	
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----	
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----	
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----	
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----	
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----	
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----	
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----	
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----	
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----	
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----	
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----	
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----	
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----	
Lithium	7439-93-2	0.001	mg/L	**0.006**	----	----	----	----	
Manganese	7439-96-5	0.001	mg/L	**0.015**	----	----	----	----	
Molybdenum	7439-98-7	0.001	mg/L	**0.004**	----	----	----	----	
Nickel	7440-02-0	0.001	mg/L	**0.001**	----	----	----	----	
Rubidium	7440-17-7	0.001	mg/L	**0.013**	----	----	----	----	
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----	
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----	
Strontium	7440-24-6	0.001	mg/L	**0.118**	----	----	----	----	
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----	
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----	
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----	
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----	
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----	
Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----	
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----	
Zinc	7440-66-6	0.005	mg/L	**0.011**	----	----	----	----	
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----	
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----	

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC-10	----	----	----	----
				Sampling date / time	02-Mar-2021 14:17	----	----	----	----
Compound	CAS Number	LOR	Unit		EB2105658-001	--------	--------	--------	--------
					Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	----	----	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**5.90**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L		**5.94**	----	----	----	----
ø **Ionic Balance**	----	0.01	%		**0.36**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2108583**	Page	: 1 of 5
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 30-Mar-2021 15:53
Order number	:	Date Analysis Commenced	: 31-Mar-2021
C-O-C number	: 20856	Issue Date	: 07-Apr-2021 15:00
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L9		
Quote number	: BN/1234/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-10	----	----	----	----
			Sampling date / time	30-Mar-2021 14:12	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2108583-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.46**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**537**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**12**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**12**	----	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**4**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**259**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**9**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**34**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**36**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**19**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**6**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.002**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.003**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.004**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0001**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-10	----	----	----	----
			Sampling date / time	30-Mar-2021 14:12	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2108583-001	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.001**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.006**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.007**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.007**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.001**	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.012**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.121**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.007**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC-10	----	----	----	----
				Sampling date / time	30-Mar-2021 14:12	----	----	----	----
Compound	CAS Number	LOR	Unit		EB2108583-001	--------	--------	--------	--------
					Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	----	----	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**5.89**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L		**5.64**	----	----	----	----
ø **Ionic Balance**	----	0.01	%		**2.14**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2111461**	Page	: 1 of 5
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	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	: 2019009_Strategic Woolgar	Date Samples Received	: 28-Apr-2021 17:17
Order number	:	Date Analysis Commenced	: 30-Apr-2021
C-O-C number	: 22105	Issue Date	: 07-May-2021 11:31
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L10		
Quote number	: BN/1234/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Mark Hallas	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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-10	----	----	----	----
			Sampling date / time	28-Apr-2021 09:57	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2111461-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.31**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**622**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**12**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**12**	----	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**4**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**287**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**10**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**38**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**44**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**20**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**7**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.003**	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.004**	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0001**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-10	----	----	----	----
			Sampling date / time	28-Apr-2021 09:57	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2111461-001	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.001**	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.005**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.005**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.008**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.001**	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.012**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.128**	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.001**	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.008**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC-10	----	----	----	----
				Sampling date / time	28-Apr-2021 09:57	----	----	----	----
Compound	CAS Number	LOR	Unit		EB2111461-001	--------	--------	--------	--------
					Result	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.1**	----	----	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**6.50**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L		**6.57**	----	----	----	----
ø **Ionic Balance**	----	0.01	%		**0.53**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2120544**	Page	: 1 of 5
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Carsten Emrich
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2019009_Strategic Woolgar	Date Samples Received	: 22-Jul-2021 17:26
Order number	: -	Date Analysis Commenced	: 24-Jul-2021
C-O-C number	: 20855	Issue Date	: 29-Jul-2021 14:27
Sampler	: ALAN ROBERTSON, VERONICA CANALES		
Site	: 2019009_Strategic Woolgar L11 and L12		
Quote number	: BN/1234/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

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ISO/IEC 17025 - Testing

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-10 L11	KLC 10 L12	----	----	----
			Sampling date / time	22-Jul-2021 10:44	22-Jul-2021 10:44	----	----	----
Compound	CAS Number	LOR	Unit	EB2120544-001	EB2120544-002	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.20**	**7.10**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**566**	**488**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**10**	**11**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**10**	**11**	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**255**	**213**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**12**	**8**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**12**	**9**	----	----	----
Magnesium	7439-95-4	1	mg/L	**14**	**13**	----	----	----
Sodium	7440-23-5	1	mg/L	**7**	**5**	----	----	----
Potassium	7440-09-7	1	mg/L	**3**	**2**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.001**	<0.001	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-10 L11	KLC 10 L12	----	----	----
			Sampling date / time	22-Jul-2021 10:44	22-Jul-2021 10:44	----	----	----
Compound	CAS Number	LOR	Unit	EB2120544-001	EB2120544-002	--------	--------	--------
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.002**	**0.001**	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.003**	**0.002**	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.002**	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.004**	**0.003**	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.045**	**0.033**	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC-10 L11	KLC 10 L12	----	----	----
			Sampling date / time	22-Jul-2021 10:44	22-Jul-2021 10:44	----	----	----
Compound	CAS Number	LOR	Unit	EB2120544-001	EB2120544-002	--------	--------	--------
				Result	Result	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.1**	**0.1**	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2130149**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Carsten Emrich
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2021057_Big Vein South	Date Samples Received	: 22-Oct-2021 16:04
Order number	:	Date Analysis Commenced	: 22-Oct-2021
C-O-C number	: 29074	Issue Date	: 02-Nov-2021 09:58
Sampler	: ALAN ROBERTSON		
Site	: 2021057_Big Vein South L		
Quote number	: BN/1234/19		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

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Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
			Sampling date / time	21-Oct-2021 12:00	21-Oct-2021 12:01	21-Oct-2021 12:02	21-Oct-2021 12:04	21-Oct-2021 12:06
Compound	CAS Number	LOR	Unit	EB2130149-001	EB2130149-002	EB2130149-003	EB2130149-004	EB2130149-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.68	7.58	8.37	8.36	4.47
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	388	211	4610	1350	2070
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	13	8	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	41	24	575	377	<1
Total Alkalinity as CaCO3	----	1	mg/L	41	24	588	385	<1
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	3	2	<1	<1	200
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	110	54	1370	175	1160
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	12	7	354	107	16
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	37	19	74	70	217
Magnesium	7439-95-4	1	mg/L	6	3	70	67	132
Sodium	7440-23-5	1	mg/L	13	7	917	158	34
Potassium	7440-09-7	1	mg/L	28	16	14	15	19
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.02	0.08	<0.01	<0.01	4.19
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.016
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.015	0.011	0.038	0.028	0.002
Bismuth	7440-69-9	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	0.010
Boron	7440-42-8	0.05	mg/L	0.06	<0.05	0.07	0.07	0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Strontium	7440-24-6	0.001	mg/L	0.061	0.031	0.480	0.289	1.90
Barium	7440-39-3	0.001	mg/L	0.003	0.003	0.034	0.050	0.038
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.014
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.046
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
				Sampling date / time	21-Oct-2021 12:00	21-Oct-2021 12:01	21-Oct-2021 12:02	21-Oct-2021 12:04	21-Oct-2021 12:06
Compound	CAS Number	LOR	Unit		EB2130149-001	EB2130149-002	EB2130149-003	EB2130149-004	EB2130149-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	**0.0004**	**0.0001**	**0.205**
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L		**0.001**	<0.001	**0.002**	**0.002**	**0.598**
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.003**
Uranium	7440-61-1	0.001	mg/L		**0.003**	**0.001**	**0.030**	**0.008**	**0.145**
Caesium	7440-46-2	0.001	mg/L		<0.001	**0.002**	**0.002**	<0.001	**0.003**
Chromium	7440-47-3	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
Copper	7440-50-8	0.001	mg/L		**0.003**	**0.001**	**0.006**	**0.007**	**0.416**
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.014**
Rubidium	7440-17-7	0.001	mg/L		**0.042**	**0.023**	**0.009**	**0.015**	**0.071**
Lithium	7439-93-2	0.001	mg/L		**0.005**	**0.002**	**0.017**	**0.011**	**0.043**
Lutetium	7439-94-3	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
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.039**
Manganese	7439-96-5	0.001	mg/L		**0.022**	**0.007**	**0.073**	**0.107**	**13.3**
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.027**
Molybdenum	7439-98-7	0.001	mg/L		**0.002**	<0.001	**0.596**	**0.184**	**0.001**
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.006**
Nickel	7440-02-0	0.001	mg/L		**0.002**	<0.001	**0.005**	**0.006**	**1.72**
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.009**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.092**
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.002**
Antimony	7440-36-0	0.001	mg/L		**0.011**	**0.005**	**0.014**	**0.172**	**0.005**
Thulium	7440-30-4	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
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.008**
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	**0.007**	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.086**
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	**0.026**	**0.038**	**11.0**
Iron	7439-89-6	0.05	mg/L		**0.11**	**0.05**	<0.05	<0.05	**55.4**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
			Sampling date / time	21-Oct-2021 12:00	21-Oct-2021 12:01	21-Oct-2021 12:02	21-Oct-2021 12:04	21-Oct-2021 12:06
Compound	CAS Number	LOR	Unit	EB2130149-001	EB2130149-002	EB2130149-003	EB2130149-004	EB2130149-005
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.9**	**0.5**	**16.0**	**1.5**	**0.8**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**3.45**	**1.80**	**50.2**	**14.4**	**24.6**
ø **Total Cations**	----	0.01	meq/L	**3.62**	**1.91**	**49.7**	**16.3**	**23.6**
ø **Ionic Balance**	----	0.01	%	**2.46**	**----**	**0.56**	**6.24**	**1.96**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 16	KLC 17	----	----	----
			Sampling date / time	21-Oct-2021 12:08	21-Oct-2021 12:09	----	----	----
Compound	CAS Number	LOR	Unit	EB2130149-006	EB2130149-007	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.70**	**7.88**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1020**	**659**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**98**	**76**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**98**	**76**	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**3**	**2**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**334**	**199**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**12**	**11**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**80**	**55**	----	----	----
Magnesium	7439-95-4	1	mg/L	**17**	**11**	----	----	----
Sodium	7440-23-5	1	mg/L	**31**	**20**	----	----	----
Potassium	7440-09-7	1	mg/L	**129**	**73**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.01**	**0.01**	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.004**	**0.005**	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.394**	**0.198**	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.033**	**0.013**	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 16	KLC 17	----	----	----
			Sampling date / time	21-Oct-2021 12:08	21-Oct-2021 12:09	----	----	----
Compound	CAS Number	LOR	Unit	EB2130149-006	EB2130149-007	--------	--------	--------
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Cadmium	7440-43-9	0.0001	mg/L	**0.0003**	**0.0001**	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	----	----	----
Uranium	7440-61-1	0.001	mg/L	**0.002**	**0.003**	----	----	----
Caesium	7440-46-2	0.001	mg/L	**0.004**	**0.002**	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.001**	**0.005**	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.314**	**0.156**	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.011**	**0.007**	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.069**	**0.038**	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.019**	**0.007**	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	**0.001**	<0.001	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	----	----	----
Antimony	7440-36-0	0.001	mg/L	**0.006**	**0.006**	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.006**	<0.005	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	**0.06**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 16	KLC 17	----	----	----
			Sampling date / time	21-Oct-2021 12:08	21-Oct-2021 12:09	----	----	----
Compound	CAS Number	LOR	Unit	EB2130149-006	EB2130149-007	--------	--------	--------
				Result	Result	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**1.6**	**1.0**	----	----	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**9.25**	**5.97**	----	----	----
ø **Total Cations**	----	0.01	meq/L	**10.0**	**6.39**	----	----	----
ø **Ionic Balance**	----	0.01	%	**4.09**	**3.36**	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2135898**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Carsten Emrich
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2021057 Big Vein South	Date Samples Received	: 09-Dec-2021 16:49
Order number	: ----	Date Analysis Commenced	: 15-Dec-2021
C-O-C number	: ----	Issue Date	: 21-Dec-2021 10:18
Sampler	: PRIYA RAJENDRAN		
Site	: ----		
Quote number	: BN/1234/19		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
			Sampling date / time	09-Dec-2021 00:00	09-Dec-2021 00:00	09-Dec-2021 00:00	09-Dec-2021 00:00	09-Dec-2021 00:00
Compound	CAS Number	LOR	Unit	EB2135898-001	EB2135898-002	EB2135898-003	EB2135898-004	EB2135898-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.03	7.56	8.77	8.54	5.60
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	252	202	2860	649	728
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	65	18	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	13	44	521	256	2
Total Alkalinity as CaCO3	----	1	mg/L	13	44	586	274	2
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	4	3	<1	<1	4
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	69	45	735	76	364
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	14	6	131	13	5
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	16	20	28	18	45
Magnesium	7439-95-4	1	mg/L	7	5	36	24	63
Sodium	7440-23-5	1	mg/L	9	6	620	102	9
Potassium	7440-09-7	1	mg/L	22	15	10	10	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.06	0.03	0.01	0.02	0.11
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.003	0.010	0.049	0.020	<0.001
Bismuth	7440-69-9	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
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.10	0.07	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.024	0.034	0.200	0.097	0.319
Barium	7440-39-3	0.001	mg/L	0.001	0.002	0.019	0.023	0.005
Gadolinium	7440-54-2	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
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
				Sampling date / time	09-Dec-2021 00:00	09-Dec-2021 00:00	09-Dec-2021 00:00	09-Dec-2021 00:00	09-Dec-2021 00:00
Compound	CAS Number	LOR	Unit		EB2135898-001	EB2135898-002	EB2135898-003	EB2135898-004	EB2135898-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	**0.0002**	<0.0001	**0.0144**
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L		**0.001**	**0.001**	<0.001	<0.001	**0.061**
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	**0.028**	**0.002**	**0.005**
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	<0.001	<0.001
Indium	7440-74-6	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	**0.003**	**0.001**	**0.029**
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.008**	**0.018**	**0.004**	**0.008**	**0.011**
Lithium	7439-93-2	0.001	mg/L		**0.002**	**0.016**	**0.013**	**0.006**	**0.006**
Lutetium	7439-94-3	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
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.001**
Manganese	7439-96-5	0.001	mg/L		**0.053**	**1.12**	**0.003**	**0.005**	**2.49**
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.003**	**0.584**	**0.189**	<0.001
Praseodymium	7440-10-0	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	**0.002**	**0.001**	**0.153**
Samarium	7440-19-9	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	**0.013**
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L		<0.001	**0.007**	**0.029**	**0.137**	<0.001
Thulium	7440-30-4	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
Ytterbium	7440-64-4	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
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.003**
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.006**	<0.005	<0.005	**0.863**
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	**0.12**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
			Sampling date / time	09-Dec-2021 00:00	09-Dec-2021 00:00	09-Dec-2021 00:00	09-Dec-2021 00:00	09-Dec-2021 00:00
Compound	CAS Number	LOR	Unit	EB2135898-001	EB2135898-002	EB2135898-003	EB2135898-004	EB2135898-005
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.1**	**0.9**	**25.4**	**1.9**	<0.1

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 16	KLC 17	----	----	----
			Sampling date / time	09-Dec-2021 00:00	09-Dec-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2135898-006	EB2135898-007	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.24**	**7.62**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**242**	**167**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**38**	**17**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**38**	**17**	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**72**	**53**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**8**	**2**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**13**	**9**	----	----	----
Magnesium	7439-95-4	1	mg/L	**8**	**5**	----	----	----
Sodium	7440-23-5	1	mg/L	**9**	**8**	----	----	----
Potassium	7440-09-7	1	mg/L	**19**	**12**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.12**	**0.10**	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	**0.002**	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.047**	**0.030**	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.002**	**0.001**	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 16	KLC 17	----	----	----
			Sampling date / time	09-Dec-2021 00:00	09-Dec-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2135898-006	EB2135898-007	--------	--------	--------
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.002**	<0.001	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	----	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.045**	**0.023**	----	----	----
Lithium	7439-93-2	0.001	mg/L	**0.002**	**0.002**	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.024**	**0.033**	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.001**	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**KLC 16**	**KLC 17**	**----**	**----**	**----**
			Sampling date / time	09-Dec-2021 00:00	09-Dec-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB2135898-006**	**EB2135898-007**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	**----**	**----**	**----**
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.3**	**0.1**	**----**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2200248**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Carsten Emrich
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2021057 Big Vein South	Date Samples Received	: 06-Jan-2022 16:09
Order number	: ----	Date Analysis Commenced	: 08-Jan-2022
C-O-C number	: ----	Issue Date	: 13-Jan-2022 14:54
Sampler	: PRIYA RAJENDRAN		
Site	:		
Quote number	: BN/1234/19		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
			Sampling date / time	06-Jan-2022 00:00	06-Jan-2022 00:00	06-Jan-2022 00:00	06-Jan-2022 00:00	06-Jan-2022 00:00
Compound	CAS Number	LOR	Unit	EB2200248-001	EB2200248-002	EB2200248-003	EB2200248-004	EB2200248-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.81**	**7.32**	**8.16**	**7.77**	**5.77**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**251**	**192**	**2850**	**1100**	**778**
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	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**15**	**55**	**288**	**85**	**4**
Total Alkalinity as CaCO3	----	1	mg/L	**15**	**55**	**288**	**85**	**4**
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**6**	**4**	<1	**3**	**5**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**95**	**35**	**1030**	**501**	**443**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	**5**	**49**	**23**	**4**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**26**	**18**	**30**	**72**	**35**
Magnesium	7439-95-4	1	mg/L	**8**	**5**	**27**	**54**	**83**
Sodium	7440-23-5	1	mg/L	**8**	**5**	**649**	**106**	**8**
Potassium	7440-09-7	1	mg/L	**7**	**14**	**11**	**14**	**3**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.04**	**0.01**	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	**0.005**	**0.017**	**0.029**	**0.015**	**0.001**
Bismuth	7440-69-9	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
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	**0.11**	**0.06**	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.039**	**0.042**	**0.180**	**0.242**	**0.237**
Barium	7440-39-3	0.001	mg/L	**0.001**	**0.003**	**0.029**	**0.048**	**0.005**
Gadolinium	7440-54-2	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
Beryllium	7440-41-7	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	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
				Sampling date / time	06-Jan-2022 00:00	06-Jan-2022 00:00	06-Jan-2022 00:00	06-Jan-2022 00:00	06-Jan-2022 00:00
Compound	CAS Number	LOR	Unit		EB2200248-001	EB2200248-002	EB2200248-003	EB2200248-004	EB2200248-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	**0.0049**
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.018**
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	**0.066**	**0.008**	<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	<0.001	<0.001
Indium	7440-74-6	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	**0.002**	**0.001**	**0.007**
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.008**	**0.021**	**0.004**	**0.012**	**0.008**
Lithium	7439-93-2	0.001	mg/L		**0.001**	**0.025**	**0.016**	**0.004**	**0.002**
Lutetium	7439-94-3	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
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.047**	**1.60**	**0.030**	**0.056**	**1.73**
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.003**	**0.627**	**0.457**	**0.007**
Praseodymium	7440-10-0	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	**0.002**	**0.002**	**0.047**
Samarium	7440-19-9	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	**0.006**
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L		**0.002**	**0.005**	**0.024**	**0.136**	**0.001**
Thulium	7440-30-4	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
Ytterbium	7440-64-4	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
Yttrium	7440-65-5	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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	**0.203**
Iron	7439-89-6	0.05	mg/L		**0.05**	**0.19**	<0.05	<0.05	**0.08**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
			Sampling date / time	06-Jan-2022 00:00	06-Jan-2022 00:00	06-Jan-2022 00:00	06-Jan-2022 00:00	06-Jan-2022 00:00
Compound	CAS Number	LOR	Unit	EB2200248-001	EB2200248-002	EB2200248-003	EB2200248-004	EB2200248-005
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.8**	**18.7**	**2.8**	**0.1**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**2.33**	**1.97**	**28.6**	**12.8**	**9.42**
ø **Total Cations**	----	0.01	meq/L	**2.48**	**1.88**	**32.2**	**13.0**	**9.00**
ø **Ionic Balance**	----	0.01	%	**----**	**----**	**6.00**	**0.88**	**2.24**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 16	KLC 17	----	----	----
			Sampling date / time	06-Jan-2022 00:00	06-Jan-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2200248-006	EB2200248-007	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.95**	**7.08**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**338**	**239**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**22**	**24**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**22**	**24**	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**124**	**86**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**4**	**2**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**24**	**14**	----	----	----
Magnesium	7439-95-4	1	mg/L	**11**	**10**	----	----	----
Sodium	7440-23-5	1	mg/L	**10**	**8**	----	----	----
Potassium	7440-09-7	1	mg/L	**27**	**14**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.07**	**0.06**	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.003**	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.092**	**0.048**	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.004**	**0.002**	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC 16	KLC 17	----	----	----
				Sampling date / time	06-Jan-2022 00:00	06-Jan-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit		EB2200248-006	EB2200248-007	--------	--------	--------
					Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	----	----	----
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	----	----	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	----	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	----	----	----
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	----	----	----
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	----	----	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	----	----	----
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	----	----	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	----	----	----
Rubidium	7440-17-7	0.001	mg/L		**0.067**	**0.029**	----	----	----
Lithium	7439-93-2	0.001	mg/L		**0.003**	**0.004**	----	----	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	----	----	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	----	----	----
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.028**	**0.113**	----	----	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.005**	**0.002**	----	----	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	----	----	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	----	----	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	----	----	----
Antimony	7440-36-0	0.001	mg/L		**0.003**	**0.008**	----	----	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	----	----	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	----	----	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	----	----	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	----	----	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 16	KLC 17	----	----	----
			Sampling date / time	06-Jan-2022 00:00	06-Jan-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2200248-006	EB2200248-007	--------	--------	--------
				Result	Result	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.5**	**0.3**	----	----	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**3.13**	**2.33**	----	----	----
ø **Total Cations**	----	0.01	meq/L	**3.23**	**2.23**	----	----	----
ø **Ionic Balance**	----	0.01	%	**1.48**	**----**	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2202793**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Carsten Emrich
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2021057 Big Vein South	Date Samples Received	: 03-Feb-2022 15:48
Order number	: ----	Date Analysis Commenced	: 04-Feb-2022
C-O-C number	: ----	Issue Date	: 11-Feb-2022 09:48
Sampler	: PRIYA RAJENDRAN		
Site	: ----		
Quote number	: BN/1234/19		
No. of samples received	: 7		
No. of samples analysed	: 7		

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, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane 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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
			Sampling date / time	03-Feb-2022 00:00	03-Feb-2022 00:00	03-Feb-2022 00:00	03-Feb-2022 00:00	03-Feb-2022 00:00
Compound	CAS Number	LOR	Unit	EB2202793-001	EB2202793-002	EB2202793-003	EB2202793-004	EB2202793-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.74	7.72	8.44	7.97	6.18
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	227	204	2410	1170	787
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	12	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	12	70	265	76	4
Total Alkalinity as CaCO3	----	1	mg/L	12	70	278	76	4
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	5	6	<1	5	5
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	82	27	876	549	423
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	2	5	11	4	4
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	24	21	27	76	38
Magnesium	7439-95-4	1	mg/L	5	5	18	54	75
Sodium	7440-23-5	1	mg/L	9	6	517	96	8
Potassium	7440-09-7	1	mg/L	5	14	9	14	3
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.03	<0.01	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.004	0.016	0.022	0.016	0.001
Bismuth	7440-69-9	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
Boron	7440-42-8	0.05	mg/L	0.11	0.07	0.10	0.06	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.031	0.046	0.130	0.232	0.171
Barium	7440-39-3	0.001	mg/L	<0.001	0.004	0.021	0.042	0.004
Gadolinium	7440-54-2	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
Beryllium	7440-41-7	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	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
				Sampling date / time	03-Feb-2022 00:00	03-Feb-2022 00:00	03-Feb-2022 00:00	03-Feb-2022 00:00	03-Feb-2022 00:00
Compound	CAS Number	LOR	Unit		EB2202793-001	EB2202793-002	EB2202793-003	EB2202793-004	EB2202793-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	**0.0002**	**0.0002**	**0.0035**
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.011**
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	**0.062**	**0.008**	<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	<0.001	<0.001
Indium	7440-74-6	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	**0.003**
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.006**	**0.021**	**0.003**	**0.011**	**0.007**
Lithium	7439-93-2	0.001	mg/L		**0.001**	**0.039**	**0.016**	**0.004**	**0.002**
Lutetium	7439-94-3	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
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.032**	**1.76**	**0.027**	**0.050**	**1.50**
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.003**	**0.498**	**0.411**	**0.003**
Praseodymium	7440-10-0	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	**0.028**
Samarium	7440-19-9	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	**0.004**
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L		**0.001**	**0.003**	**0.015**	**0.114**	**0.001**
Thulium	7440-30-4	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
Ytterbium	7440-64-4	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
Yttrium	7440-65-5	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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	**0.119**
Iron	7439-89-6	0.05	mg/L		<0.05	**0.20**	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 11	KLC 12	KLC 13	KLC 14	KLC 15
			Sampling date / time	03-Feb-2022 00:00	03-Feb-2022 00:00	03-Feb-2022 00:00	03-Feb-2022 00:00	03-Feb-2022 00:00
Compound	CAS Number	LOR	Unit	EB2202793-001	EB2202793-002	EB2202793-003	EB2202793-004	EB2202793-005
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.6**	**16.9**	**2.7**	**0.1**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**2.00**	**2.10**	**24.1**	**13.1**	**9.00**
ø **Total Cations**	----	0.01	meq/L	**2.13**	**2.08**	**25.5**	**12.8**	**8.49**
ø **Ionic Balance**	----	0.01	%	**----**	**----**	**2.91**	**1.13**	**2.89**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 16	KLC 17	----	----	----
			Sampling date / time	03-Feb-2022 00:00	03-Feb-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2202793-006	EB2202793-007	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.26**	**7.43**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**354**	**171**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**22**	**23**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**22**	**23**	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	<1	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**124**	**54**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**3**	<1	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**23**	**11**	----	----	----
Magnesium	7439-95-4	1	mg/L	**11**	**5**	----	----	----
Sodium	7440-23-5	1	mg/L	**10**	**6**	----	----	----
Potassium	7440-09-7	1	mg/L	**25**	**9**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.09**	**0.14**	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.002**	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.077**	**0.032**	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.002**	<0.001	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	KLC 16	KLC 17	----	----	----
				Sampling date / time	03-Feb-2022 00:00	03-Feb-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit		EB2202793-006	EB2202793-007	--------	--------	--------
					Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	----	----	----
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	----	----	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	----	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	----	----	----
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	----	----	----
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	----	----	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	----	----	----
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	----	----	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	----	----	----
Rubidium	7440-17-7	0.001	mg/L		**0.064**	**0.019**	----	----	----
Lithium	7439-93-2	0.001	mg/L		**0.003**	**0.004**	----	----	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	----	----	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	----	----	----
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.025**	**0.040**	----	----	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.005**	**0.002**	----	----	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	----	----	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	----	----	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	----	----	----
Antimony	7440-36-0	0.001	mg/L		**0.002**	<0.001	----	----	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	----	----	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	----	----	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	----	----	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	----	----	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	KLC 16	KLC 17	----	----	----
			Sampling date / time	03-Feb-2022 00:00	03-Feb-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2202793-006	EB2202793-007	--------	--------	--------
				Result	Result	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.5**	**0.2**	----	----	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**3.10**	**1.58**	----	----	----
ø **Total Cations**	----	0.01	meq/L	**3.13**	**1.45**	----	----	----
ø **Ionic Balance**	----	0.01	%	**0.34**	**----**	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2205847**	Page	: 1 of 8
Client	: **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: ALAN ROBERTSON	Contact	: Carsten Emrich
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4107	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3344 1222	Telephone	: +61 7 3552 8616
Project	: 2021057 Big Vein South	Date Samples Received	: 03-Mar-2022 14:05
Order number	: ----	Date Analysis Commenced	: 08-Mar-2022
C-O-C number	: ----	Issue Date	: 11-Mar-2022 09:16
Sampler	: PRIYA RAJENDRAN		
Site	:		
Quote number	: BN/1234/19		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	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.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	WKLC 11	WKLC 12	WKLC 13	WKLC 14	WKLC 15
				Sampling date / time	03-Mar-2022 00:00	03-Mar-2022 00:00	03-Mar-2022 00:00	03-Mar-2022 00:00	03-Mar-2022 00:00
					EB2205847-001	EB2205847-002	EB2205847-003	EB2205847-004	EB2205847-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**6.56**	**7.63**	**8.47**	**7.90**	**6.15**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**171**	**236**	**1740**	**903**	**714**
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	**16**	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**12**	**94**	**293**	**85**	**5**
Total Alkalinity as CaCO3	----	1	mg/L		**12**	**94**	**309**	**85**	**5**
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		**2**	**3**	<1	**2**	**4**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**62**	**17**	**519**	**382**	**376**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**2**	**4**	**3**	**1**	**3**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**15**	**22**	**14**	**52**	**26**
Magnesium	7439-95-4	1	mg/L		**4**	**6**	**9**	**40**	**72**
Sodium	7440-23-5	1	mg/L		**6**	**6**	**356**	**68**	**6**
Potassium	7440-09-7	1	mg/L		**5**	**17**	**7**	**12**	**2**
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.07**	<0.01	**0.01**	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.006**	**0.011**	**0.031**	**0.021**	**0.002**
Bismuth	7440-69-9	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
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	**0.08**	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**0.023**	**0.069**	**0.070**	**0.182**	**0.138**
Barium	7440-39-3	0.001	mg/L		**0.001**	**0.006**	**0.014**	**0.030**	**0.004**
Gadolinium	7440-54-2	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
Beryllium	7440-41-7	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	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WKLC 11	WKLC 12	WKLC 13	WKLC 14	WKLC 15
				Sampling date / time	03-Mar-2022 00:00	03-Mar-2022 00:00	03-Mar-2022 00:00	03-Mar-2022 00:00	03-Mar-2022 00:00
Compound	CAS Number	LOR	Unit		EB2205847-001	EB2205847-002	EB2205847-003	EB2205847-004	EB2205847-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		**0.0001**	<0.0001	**0.0002**	**0.0002**	**0.0028**
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.009**
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	**0.056**	**0.008**	<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	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.012**	<0.001	**0.002**	**0.001**	**0.004**
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.005**	**0.025**	**0.002**	**0.010**	**0.006**
Lithium	7439-93-2	0.001	mg/L		<0.001	**0.068**	**0.012**	**0.004**	**0.002**
Lutetium	7439-94-3	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
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.027**	**2.20**	**0.010**	**0.022**	**1.49**
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.002**	**0.333**	**0.375**	**0.009**
Praseodymium	7440-10-0	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	**0.022**
Samarium	7440-19-9	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	**0.003**
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	**0.021**	**0.184**	<0.001
Thulium	7440-30-4	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
Ytterbium	7440-64-4	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
Yttrium	7440-65-5	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
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	**0.006**	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	**0.100**
Iron	7439-89-6	0.05	mg/L		**0.06**	**0.07**	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WKLC 11	WKLC 12	WKLC 13	WKLC 14	WKLC 15
			Sampling date / time	03-Mar-2022 00:00	03-Mar-2022 00:00	03-Mar-2022 00:00	03-Mar-2022 00:00	03-Mar-2022 00:00
Compound	CAS Number	LOR	Unit	EB2205847-001	EB2205847-002	EB2205847-003	EB2205847-004	EB2205847-005
				Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.1**	**0.6**	**18.5**	**3.1**	**0.2**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**1.59**	**2.34**	**17.1**	**9.68**	**8.01**
ø **Total Cations**	----	0.01	meq/L	**1.47**	**2.29**	**17.1**	**9.15**	**7.54**
ø **Ionic Balance**	----	0.01	%	**----**	**----**	**0.11**	**2.80**	**3.07**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WKLC 16	WKLC 17	----	----	----
			Sampling date / time	03-Mar-2022 00:00	03-Mar-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2205847-006	EB2205847-007	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.07**	**6.98**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**302**	**167**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**23**	**14**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**23**	**14**	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	**2**	**2**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**105**	**58**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2**	<1	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**16**	**9**	----	----	----
Magnesium	7439-95-4	1	mg/L	**9**	**6**	----	----	----
Sodium	7440-23-5	1	mg/L	**9**	**5**	----	----	----
Potassium	7440-09-7	1	mg/L	**26**	**8**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.10**	**0.10**	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.004**	**0.002**	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.065**	**0.036**	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.002**	**0.001**	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WKLC 16	WKLC 17	----	----	----
				Sampling date / time	03-Mar-2022 00:00	03-Mar-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit		EB2205847-006	EB2205847-007	--------	--------	--------
					Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	----	----	----
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	----	----	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	----	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	----	----	----
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	----	----	----
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	----	----	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	----	----	----
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.001**	<0.001	----	----	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	----	----	----
Rubidium	7440-17-7	0.001	mg/L		**0.064**	**0.018**	----	----	----
Lithium	7439-93-2	0.001	mg/L		**0.003**	**0.004**	----	----	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	----	----	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	----	----	----
Cerium	7440-45-1	0.001	mg/L		<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.030**	**0.061**	----	----	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.005**	**0.002**	----	----	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	----	----	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	----	----	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	----	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	----	----	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	----	----	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	----	----	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	----	----	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	----	----	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WKLC 16	WKLC 17	----	----	----
			Sampling date / time	03-Mar-2022 00:00	03-Mar-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2205847-006	EB2205847-007	--------	--------	--------
				Result	Result	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.5**	**0.2**	----	----	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**2.70**	**1.49**	----	----	----
ø **Total Cations**	----	0.01	meq/L	**2.60**	**1.36**	----	----	----

Attachment F

BV1 and BV2 Supplementary Information

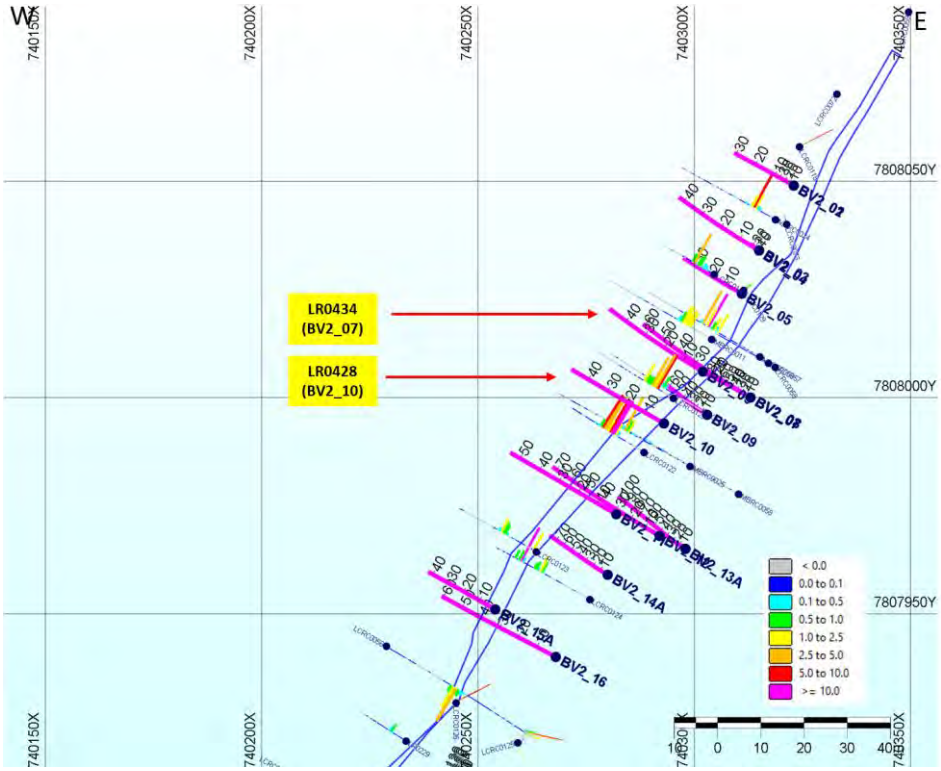


Figure 1: Plan view of the Big Vein 2 prospect showing recent drilling and location of selected holes.

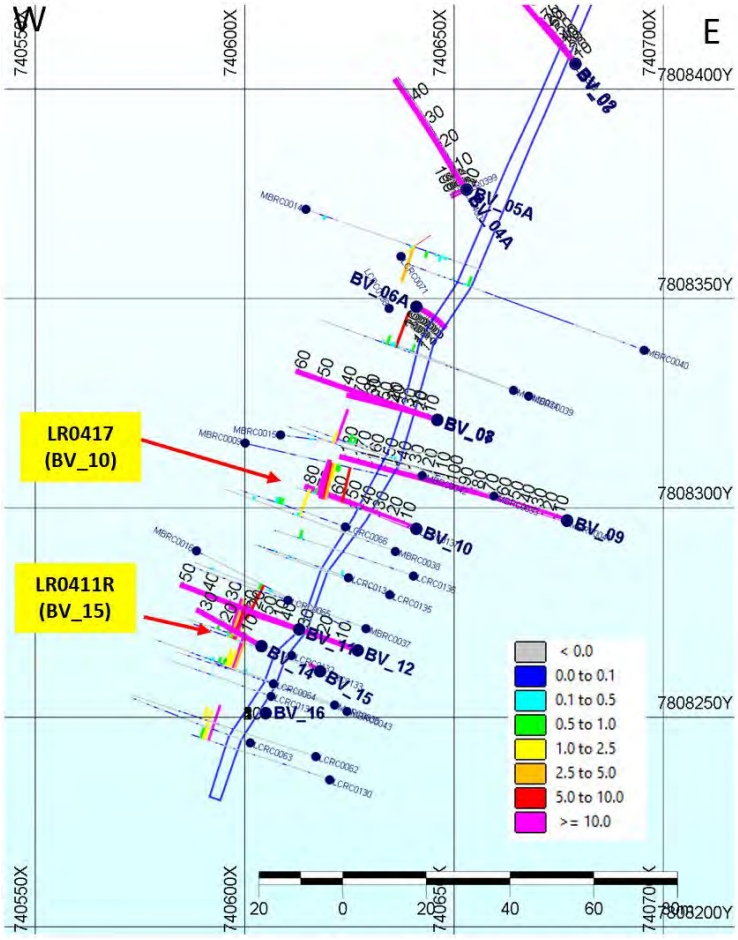


Figure 2: Plan view of the Big Vein 1 prospect showing recent drilling and location of selected holes.

PROSPECT: Big Vein 2

HOLEID: LR0428

PLAN ID: BV2_10

PLAN AZI/DIP: 293/-61

DEPTH: 49m

COMPLETED: 19/09/2021

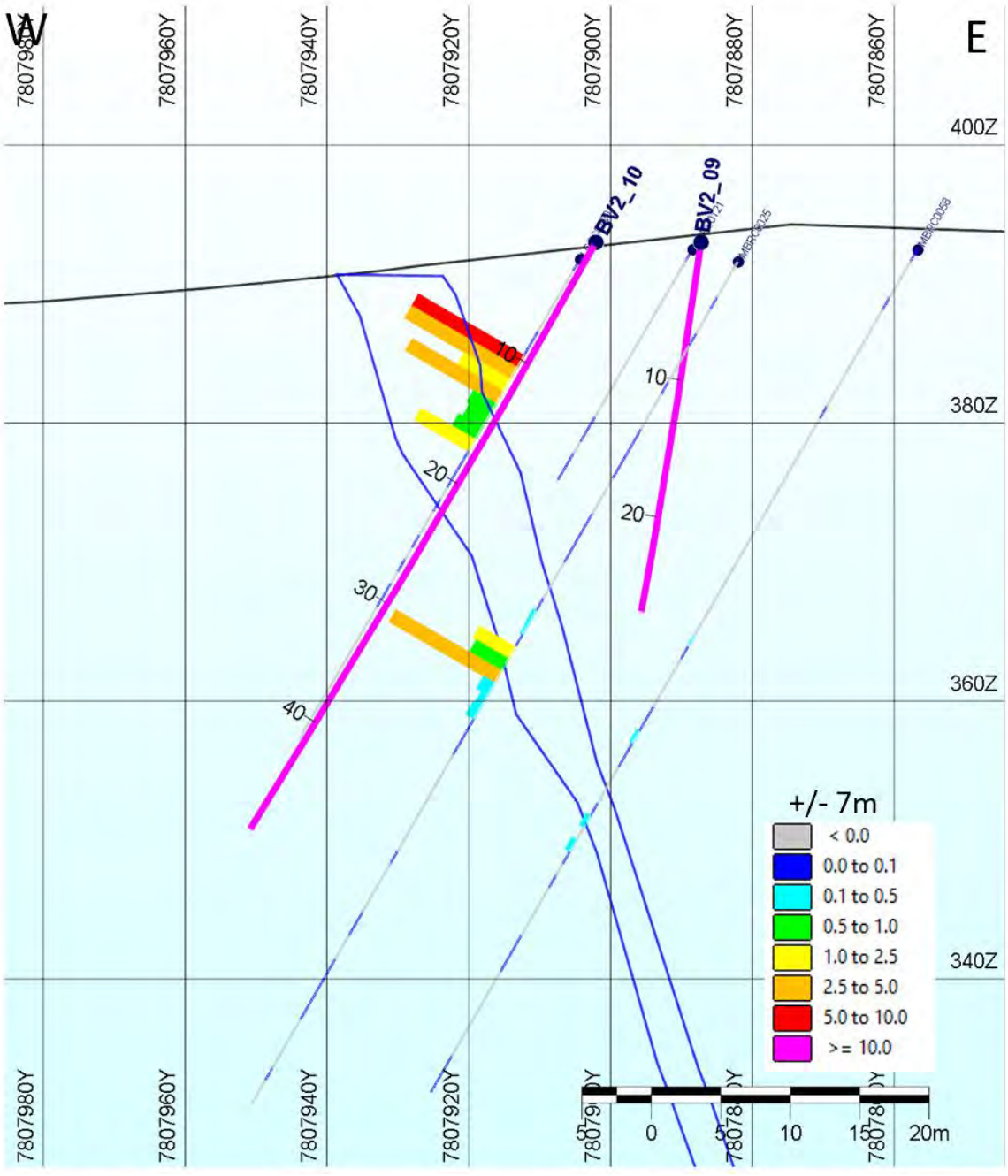


Figure 3: Vertical section (looking north) of selected hole LR0428 (BV2_10)

PROSPECT: Big Vein 2

HOLEID: LR0434

PLAN ID: BV2_07

PLAN AZI/DIP: 293/-61

DEPTH: 61m

COMPLETED: 20/09/21

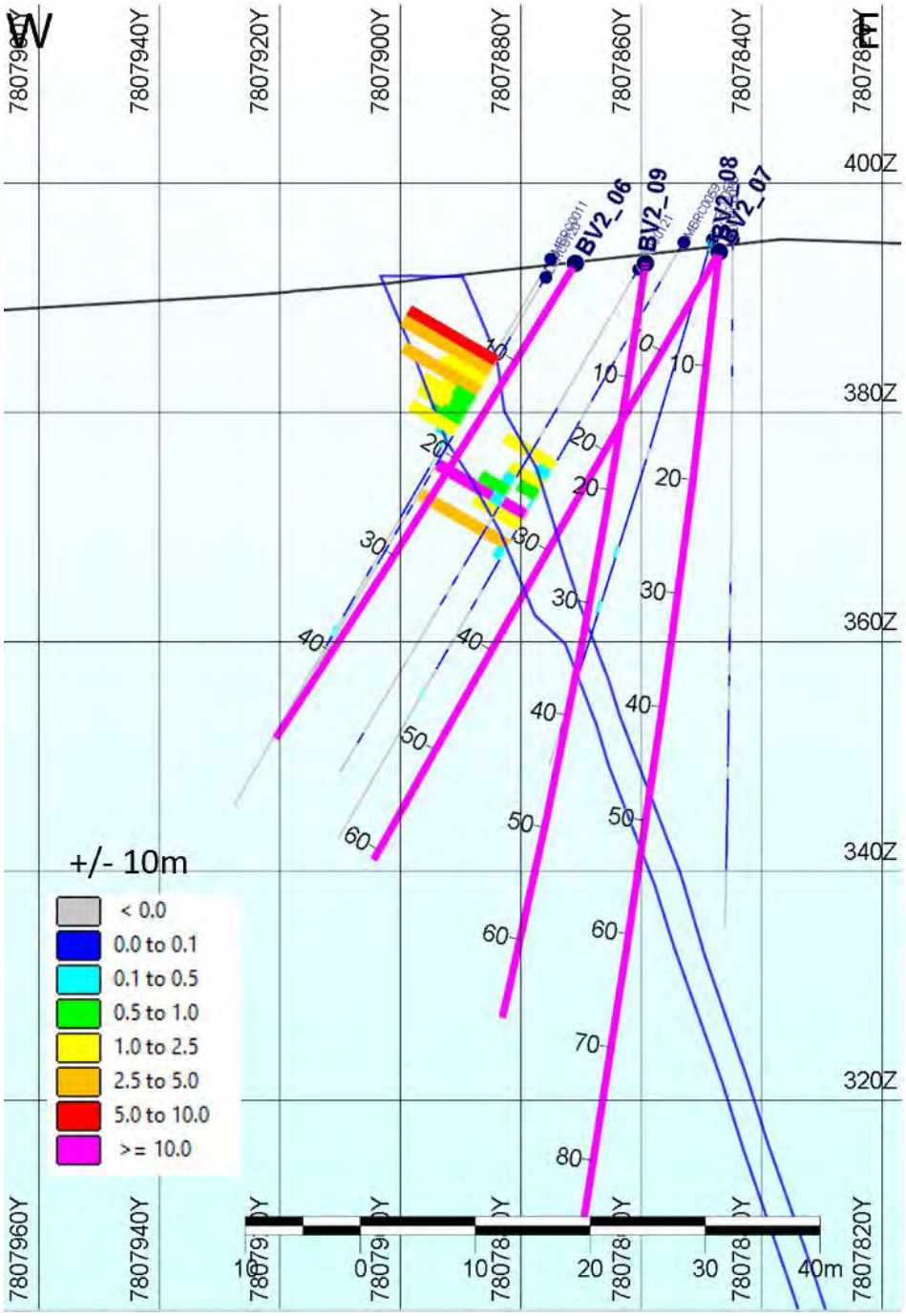


Figure 4: Vertical section (looking north) of selected hole LR0434 (BV2_07)

PROSPECT: Big Vein 1

HOLEID: LR0411R

PLAN ID: BV_15

PLAN AZI/DIP: 290/-70

DEPTH: 70m

COMPLETED: 23/09/21

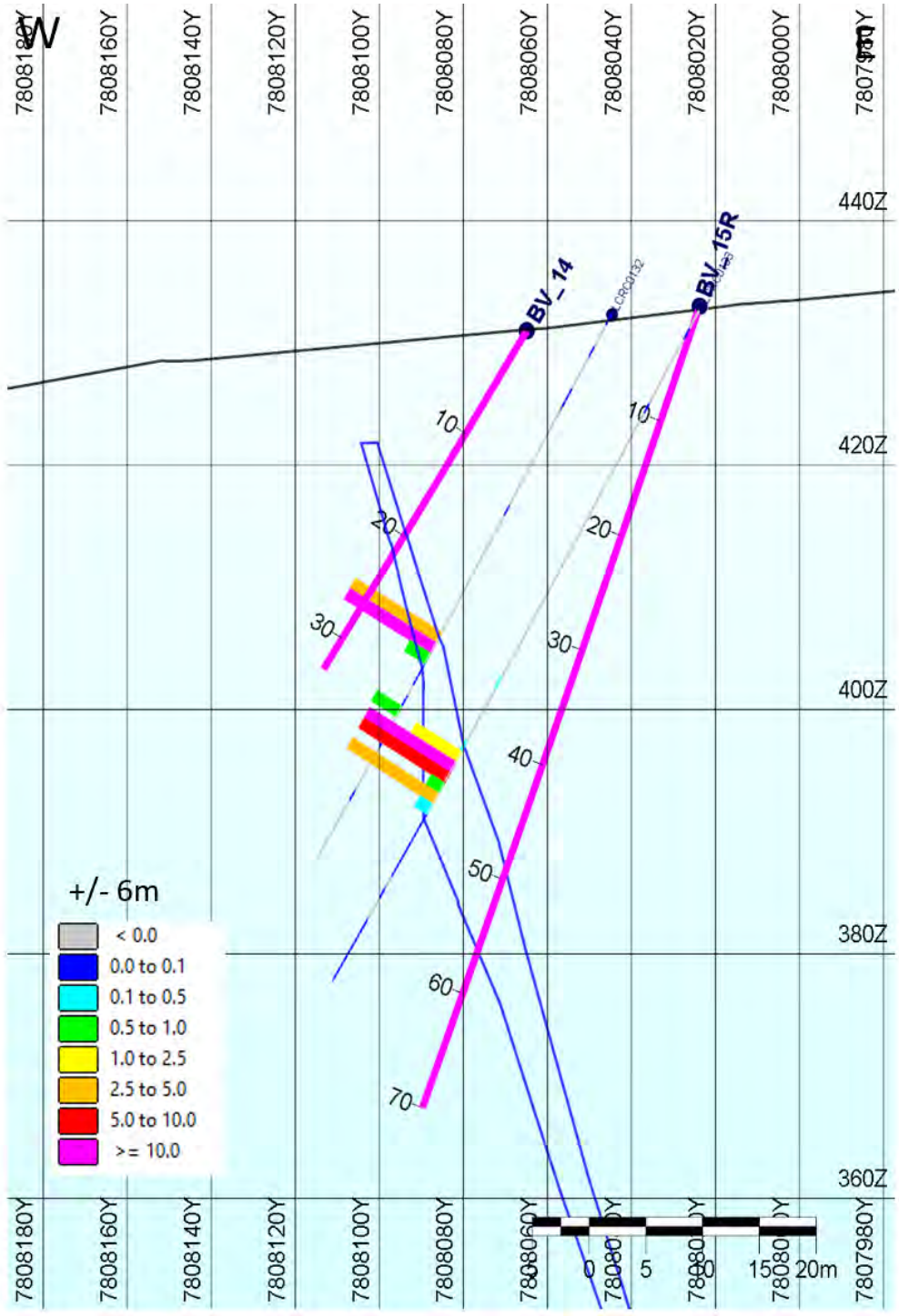


Figure 5: Vertical section (looking north) of selected hole LR0411R (BV_15)

PROSPECT: Big Vein 1

HOLEID: LR0417

PLAN ID: BV_10

PLAN AZI/DIP: 290/-70

DEPTH: 82m

COMPLETED: 25/09/2021

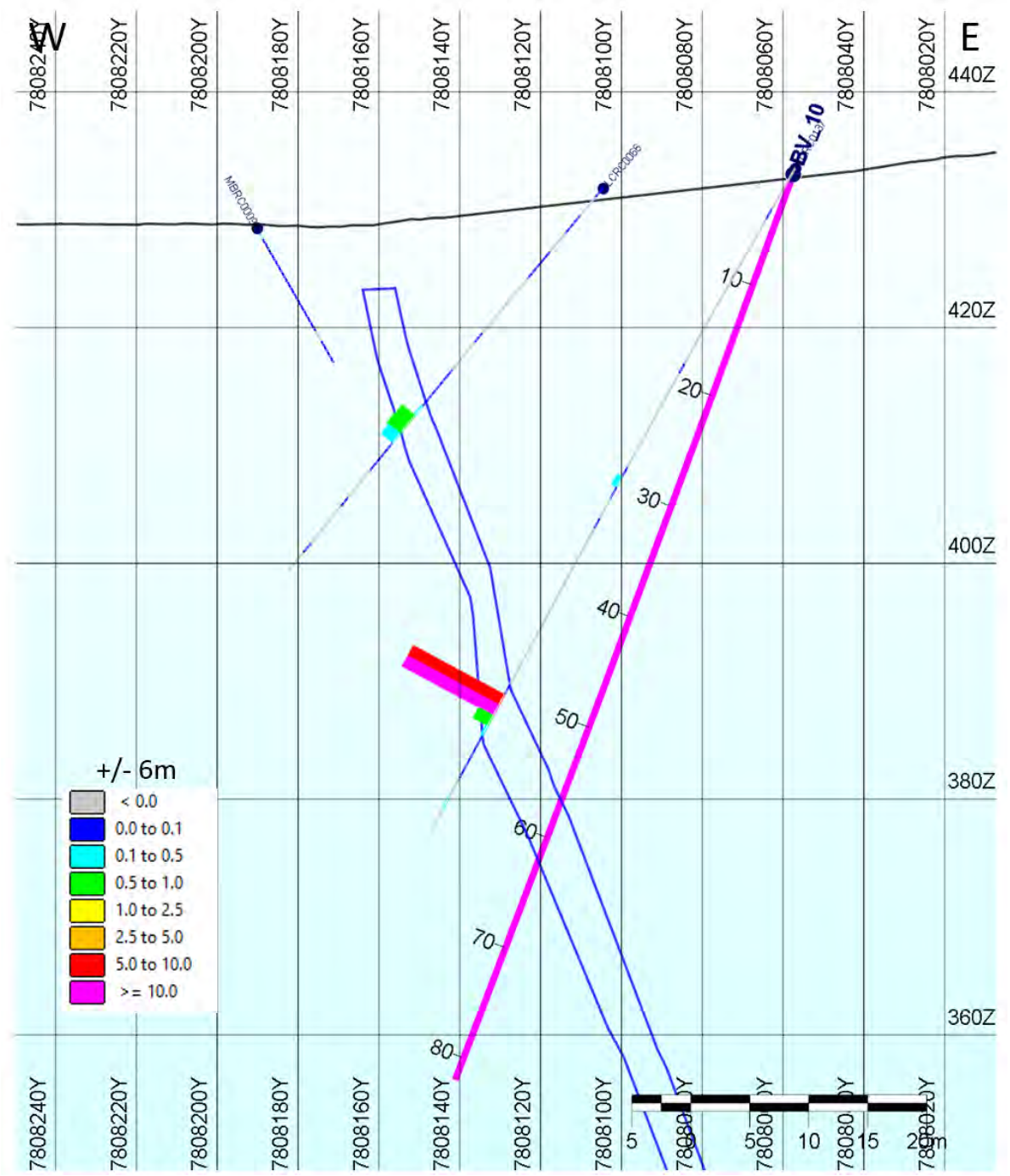
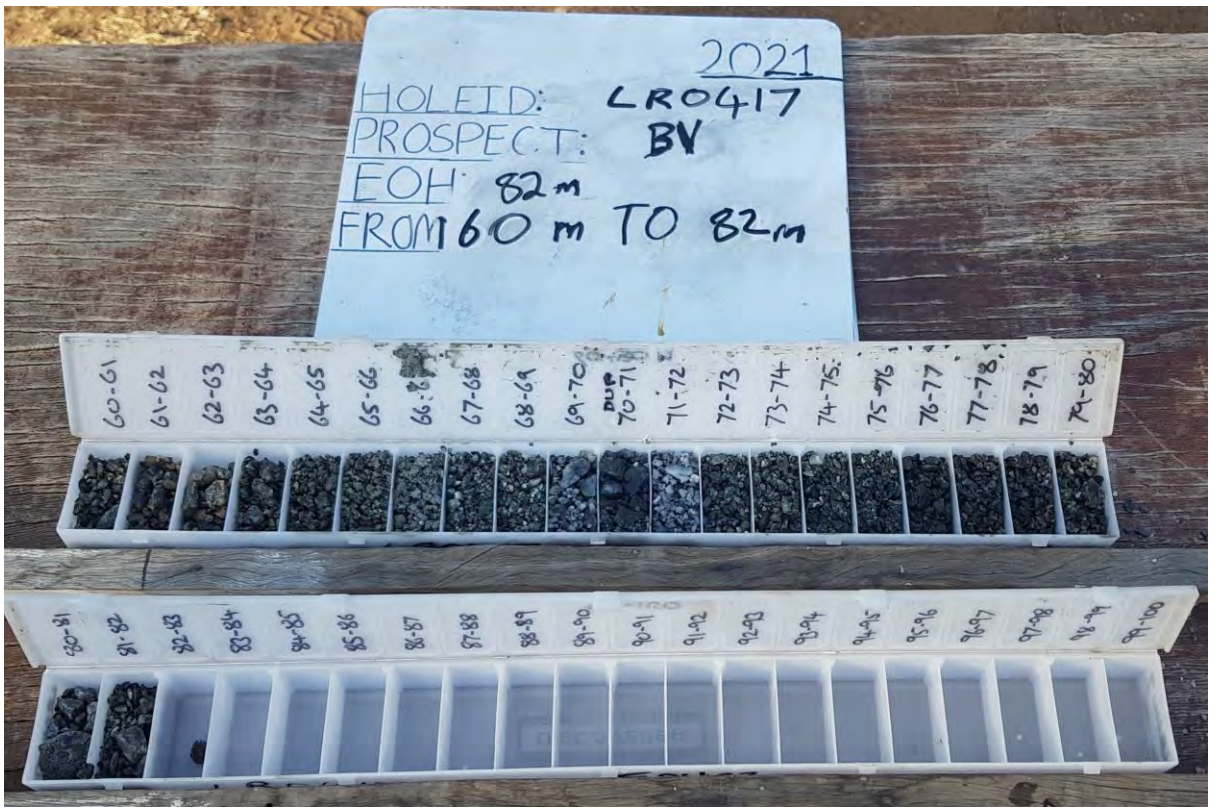


Figure 6 Vertical section (looking north) of selected hole LR0411R (BV_15)


2021
HOLEID: LR0411R
PROSPECT: BV
EOH: 70m
FROM: 0m TO: 60m
0-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
16-17
17-18
18-19
19-20
20-21
21-22
22-23
23-24
24-25
25-26
26-27
27-28
28-29
29-30
30-31
31-32
32-33
33-34
34-35
35-36
36-37
37-38
38-39
39-40
40-41
41-42
42-43
43-44
44-45
45-46
46-47
47-48
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56-57
57-58
58-59
59-60

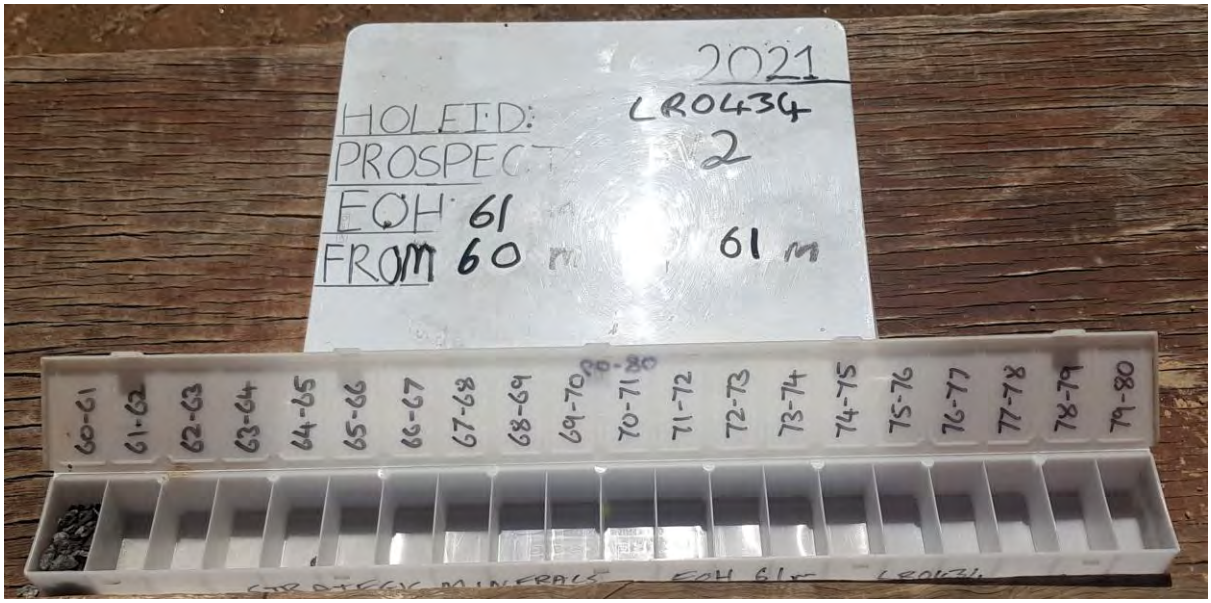

2021
HOLEID: LR0411R
PROSPECT: BV
EOH: 70m
FROM: 60m TO: 70m
60-61
61-62
62-63
63-64
64-65
65-66
66-67
67-68
68-69
69-70
70-71
71-72
72-73
73-74
74-75
75-76
76-77
77-78
78-79
79-80


2021
HOLEID: LR0417
PROSPECT: BV
EOH 82m
FROM 0m TO 60m


2021
HOLEID: LR0417
PROSPECT: BV
EOH 82m
FROM 60m TO 82m


2021
HOLEID: LR0428
PROSPECT: BV2
EOH: 49m
FROM: 0m TO: 49m


2021
HOLEID: LR0434
PROSPECT: BV2
EOH 61 m
FROM 0 m TO 60 m


2021
HOLE ID: LR0434
PROSPECT 2
EOH 61
FROM 60 m
61 m
60-61
61-62
62-63
63-64
64-65
65-66
66-67
67-68
68-69
69-70
70-71
71-72
72-73
73-74
74-75
75-76
76-77
77-78
78-79
79-80



MINE WASTE AND
WATER MANAGEMENT

APPENDIX G

Final Void Stability Report

STRATEGIC MINERALS
CORPORATION

Strategic Minerals Corporation Pty Ltd

Big Vein South Gold Project - Final Void Closure: BVS, BV1 and BV2

PSM3254-024R 2 November 2022

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Appendix B Limit Equilibrium Stability Analysis Results

1. Introduction

This report presents the geotechnical assessment undertaken by PSM to inform Conceptual Level Mine Closure Requirements for three proposed open pits within the Big Vein South Gold Project, namely the Big Vein 1 (BV1), Big Vein 2 (BV2) and Big Vein South (BVS) pits for Strategic Minerals Corporation Pty Ltd (SMC), as per the Queensland Government Progressive Rehabilitation and Closure Plan Guideline (ESR/2019/4964).

This report documents the background information, geotechnical model, adopted criteria and stability analyses used for the geotechnical assessment to inform requirements for mine closure of each pit and largely utilising reporting detailed above.

2. Scope of Work

The scope of work covered in this report includes a Conceptual Level final void pit wall geotechnical stability assessment for BV1, BV2 and BVS open pits for the Environmental Authority (EA) submission for the Big Vein South Project, including:

- Description of proposed final pit void geometries
- Final void geotechnical stability, including assessment with projected final pit lake water levels.

3. Approach

3.1 General

The geotechnical report requirements defined within the Queensland Government Progressive Rehabilitation and Closure Plans (PRC) for the void closure plan are set out within Section 3.6.3 of that document and include the following comments related to the required geotechnical report:

> *"A geotechnical report should focus on how the void will achieve post-closure slopes that will exhibit stability characteristics consistent with the planning and design of the post closure void"*

In mining operations, pit slopes are typically designed to accept a certain level of acceptable risk in regard to pit wall instability during mining operations and for the duration of the mine life. The design is aimed at providing an optimal excavation configuration which balances safety, ore recovery and financial return. A commonly accepted Design Acceptance Criteria (DAC) used to achieve this is to design overall pit slopes to a Factor of Safety (FoS) of 1.2. Whilst higher FoS are utilised by other practitioners for overall slopes, PSM stress that the FoS is dependent on the conservatism adopted in material and strength parameters. As such, the FoS of 1.20 used by PSM for overall slopes has relied on conservative inputs for the stability analyses.

No guidance is provided in the PRC regarding an acceptable DAC for long term stability of pit slopes within final voids. PSM have therefore adopted a DAC of FoS of 1.5, which is the accepted DAC used in civil engineering for "permanent" slopes, as referenced within the Guidelines for Open Pit Slope Design[1]. Civil engineered permanent slopes are designed to a higher FoS of 1.5 to reduce the risk posed to public safety.

In practice, it is uneconomic to design final pit slopes for the Big Vein South Project to meet a DAC of a FoS of 1.5, as pit slope angles will need to be much shallower with significantly more overburden waste rock mined and needing to be stored in out of pit waste rock dumps. This in turn will trigger adverse environmental outcomes, as it requires much larger final voids and larger waste rock dump footprints than necessary, creating significantly more environmental disturbance and greater impact on the surrounding hydrological regime (surface and groundwater).

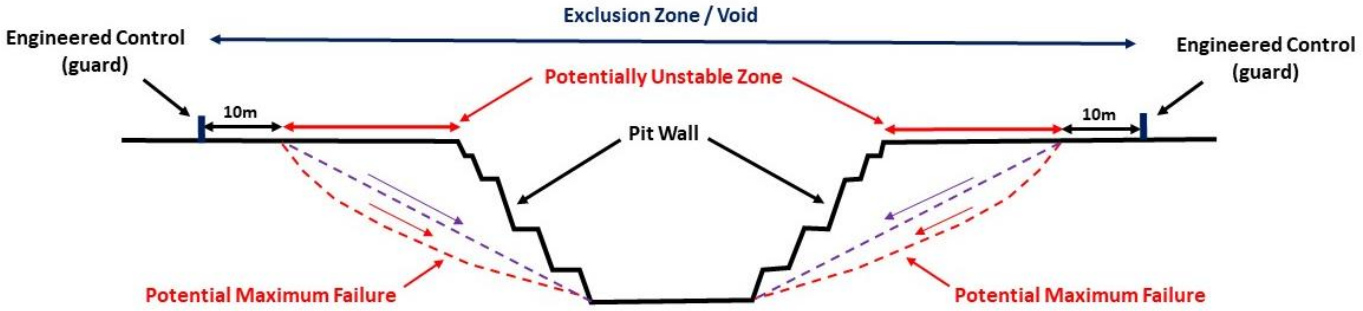
Therefore, the preferred approach to ensure safe and stable final void pit slopes for the Big Vein South Project is to:

1. Design operational pit slopes to DAC of FoS of 1.2.
2. For the final void slopes, identify the extent of the "potential maximum failure" or stable long-term crest location, based on a DAC of FoS of 1.5 (or other relevant DAC as required).
3. Designate the "potential maximum failure" location as an exclusion zone around the perimeter of the final pit crest.

[1] APA (6th ed.) Read, J., Stacey, P., & CSIRO (Australia). (2009). Guidelines for open pit slope design. Collingwood, Vic: CSIRO Publishing.

4. Install a physical barrier or "engineered control (guard)", around the exclusion zone to restrict public access to the exclusion zone. An additional 10 m stand-off from the exclusion zone is included for additional conservatism.

The above approach is illustrated schematically in Inset 1.



Inset 1: Schematic illustration highlighting long-term potential maximum failure, potentially unstable zone, exclusion zone and location of engineered control (guard).

The exclusion zone approach is consistent with reference to Section 3.6.3 of the PRC Guidelines, which state:

> *"If exclusion measures are part of the post-closure void management plan, they should be detailed in the rehabilitation strategy"*

The approach of using an engineered control (guard) to restrict access to the exclusion zone to manage public safety is also endorsed PRC Guidelines, which state:

> *"On achieving sufficient improvement of a NUMA, each of the following is minimised-*
>
> *a) the risk of the area collapsing, eroding or subsiding,*
>
> *b) the need to actively manage the area, and*
>
> *c)* ***access to the area by an animal or person by, for example, fencing the boundary of the area"***

The engineered control (guard) approach is also endorsed in the WA Guidelines[2] which states:

> *"The method preferred to minimise inadvertent public access to abandoned open pits involves the construction of an abandonment bund wall around the perimeter of the open pit voids, outside the area designated as being susceptible to wall collapse"*

The approach detailed above in effect creates a stable "void" within the area that has access restricted by the engineered control (guard), as illustrated in Inset 1. Long-term instability is not anticipated to impact areas outside of the recommended engineered control (guard) location.

3.2 BVS Final Voids Approach

To identify the required exclusion zone and location of the engineered control (guard) for the BVS, BV1 and BV2 final voids in practice, PSM have adopted the following approach:

1. Identification of the long-term stable pit crest location by assessing the extent of the "potential maximum failure" using appropriate stability analysis methods, which in this case includes:
    a. Use of the approach as presented in the Western Australian guidelines for the initial identification of a potentially unstable pit edge zone – detailed in Section 6.1
    b. Limit Equilibrium (LE) stability analyses using a DAC of FoS of 1.5 in most geotechnically adverse locations where infrastructure is near the pit edge (e.g., Diversion Drains), and to check appropriateness of the WA guidelines. This work has been detailed in Section 6.2.

[2] Department of Industry and Resources (1997). Safety Bund Walls Around Abandoned Open Pit Mines, Government of Western Australia, Department of Industry and Resources, Perth.

2. The “potential maximum failure” identifies the long-term post closure “potentially unstable zone” surrounding the void. This has been defined by:
    a. The WA guidelines for the majority of pit areas, with
    b. Further refinement in areas where LE stability analyses have been used as appropriate.
3. To ensure the long-term potentially unstable zone poses no risk to public safety, the zone is defined as an exclusion zone with an engineered control (guard) installed to restrict public access. An additional 10 m offset from the “potential maximum failure” boundary has been included for conservatism and that would allow maintenance of the engineered control (guard) if so required.

4. Pit Design Geometries

Conceptual final pit design geometries for the BVS, BV1 and BV2 have been supplied to PSM by SMC. The designs are illustrated in Figure 1 for BVS, and Figure 2 for BV1 and BV2, and comprise:

- Big Vein South:
  - Elongated oval pit shell, approximately ~750 m wide and ~1900 m long
  - Overall slope angles of approximately 32° in both the foot wall and the hanging wall
  - Maximum pit depth of ~205 m
  - Benched design to meet local stability and operational considerations.
- Big Vein 1 and Big Vein 2:
  - Elongated oval pit shells, approximately ~100 m wide and ~450 m long
  - Overall slope angles of approximately 39° in both the foot wall and the hanging wall
  - Maximum pit depth of ~50 m, however most pit walls are typically less than 35 m
  - Benched design to meet local stability and operational considerations.

Three cross sections are presented in Figures 3, 4 and 5 illustrating the BVS pit design, and with BV1 and BV2 pit design illustrated in Appendix A.

5. Geotechnical Model

5.1 Rock Mass Model

The rock mass model consists of a series of rock mass units (RMUs) which represent broadly similar rock mass quality by grouping areas of similar geotechnical characteristics (logged to PSM classification system) which include degree of weathering, intact strength, alteration and degree of fracturing. The RMUs were developed using available borehole, field mapping and laboratory testing data.

Five rock mass units were identified in BVS, summarised in Table 1 and which are largely based on the SMC lithological domains for the BVS deposit. As evident below, only subtle differences in rock mass quality exist between the Granite Dominated Migmatite, Granofels Dominated Migmatite + Amphibolite and the Mixed Migmatite RMUs. Two further rock mass units, Jurassic Sandstone and Unconformity Zone, are only present within the BV1 and BV2 pit areas.

Table 1 – RMU Summary

RMU	Lithology	Alteration	Weath.	RQD (%)	PSM Field Estimated Strength	PLSI Is50 (Average MPa)		UCS (Average MPa)	Structure				
						Diametral	Axial		Type	Infill	Infill Thick. (mm)	Shape	Rough.
Cover	No Core	Strong	Highly	Highly Variable	R2 & Soil	-	-	-	JN, SH, BG	Fe Oxide	1 – 5	Planar, Undulating	Slightly Rough
Jurassic Sandstone	Sandstone	Weak	Moderately - slightly	-	R3	-	-	-	JN, BG	Fe Oxide	1-5	Undulating	Slightly Rough to Rough
Unconformity Zone	Schist, Micro-Granite, Micro-granodiorite, Clay	Weak to Moderate	Extremely - Highly	-	R2 & Soil	-	-	-	JN, FO, SH	Sericite, Clay, Chlorite	1-5	Planar, Irregular	Smooth to Slightly Rough
Granite Dominated Migmatite "mg"	Schist, Micro-Granite, Micro-granodiorite	Weak, Moderate, Strong	Fresh	90 – 100	R4 – R5	2.22	4.18	68.8	JN, FO, SH	Sericite, Clay, Chlorite	1 – 5	Planar, Irregular	Smooth to Slightly Rough
Granofels Dominate Migmatite + Amphibolite "mf"	Schist, Psammite, Gritstone	Weak to Moderate	Fresh	90 – 100	R4 – R5	1.47	1.41	44.1	JN, FO	Sericite, Fe Oxide, Clay	1 – 5	Planar, Irregular	Smooth to Slightly Rough
Mixed Migmatite – Schist "mm"	Schist, Micro-Granite	Weak, Moderate, Strong	Fresh	90 – 100	R4 – R5	3.24	1.86	30[1]	JN, FO, SH	Sericite, Clay, Chlorite	1 – 5	Planar, Irregular	Smooth to Slightly Rough
Main Lode	Schist	Strong to Moderate	Fresh	90 – 100	R4 – R5	1.64	2.11	25[1]	JN, SH, FRA	Sericite, Chlorite, Clay	1 – 5	Planar, Irregular	Smooth to Slightly Rough

[1] Inferred from Point Load Strength Index (PLSI) testing.

Rock mass and soil strength parameters used for the assessment are listed in Table 2. All material parameters developed for the rock units, excluding Cover, Jurassic Sandstone and Unconformity Zone, are based on available borehole logging, Unconfined Compressive Strength (UCS), Point Load Strength Index (PLSI) and defect shear strength testing, as well as published literature for similar rocks and engineering judgement. Parameters for Cover, Jurassic Sandstone and Unconformity Zone have been estimated based on outcrop field observations and limited core data where available.

Current observed outcrop and core data in the Jurassic Sandstone comprises moderately to slightly weathered material. Extremely or highly weathered sandstone may be encountered within the final pit wall in BV1 and BV2 although it is likely to be of limited thickness.

For the rock units, rock mass shear strengths have been assessed utilising the Hoek–Brown empirical approach.

Table 2 – Material Properties Adopted for Analysis

Domain	Unit Weight (kN/m^3)	Mohr Coulomb Strength Parameters		Hoek-Brown Strength Parameters			
		Cohesion (kPa)	Friction Angle (°)	UCS (MPa)	GSI	*mi*	D[4]
Cover	20	20	30	NA			
Jurassic Sandstone	24	NA		15	50-70[3]	17	0/1
Unconformity Zone	21	30	35	NA			
Granite Dominated Migmatite “mg”	26	NA		68.8[1]	66	29	0/1
Granofels Dominate Migmatite + Amphibolite “mf”				44.1[1]	62	26	
Mixed Migmatite – Schist “mm”				30[2]	64	12	
Main Lode	24			25[2]	54	19	

1 Mean from UCS testing for BVS.

2 PLSI testing, geotechnical logging and judgement utilised.

3 A range of GSI is presented for Jurassic Sandstone. Observed outcrop indicates that the sandstone becomes of poorer rock mass quality in proximity to the Big Vein structure and therefore a lower bound GSI parameter should be adopted here.

4 Disturbance factor for analysis will be applied as D = 0 for short term stability immediately post mining and adopting a more conservative D = 1 for long term stability owing to stress relaxation of the rock mass.

5.2 Structural Model

The structural model for each pit has been summarised below.

5.2.1 Big Vein South Pit

The structural data at BVS indicates that foliation and faults/shears are typically oriented near parallel to the footwall, and are oriented favourably for the hanging wall, i.e. into the slope. For this assessment, a lower bound fault dip of 32° has been utilised for a fault dipping parallel with the footwall, which aligns with the lower bound dip of faults logged in orientated borehole imaging (ATV) data. Lower bound defect shear strength parameters of zero cohesion and 24° friction angle have been utilised in the stability analyses for the faults.

5.2.2 Big Vein 1 and Big Vein 2 Pits

Data in BV1 and BV2 is limited to small exposure in outcrop as no borehole data was available at the time of reporting. Due to the similarities in the rock mass with BVS, the fault parameters adopted at BVS have also been applied to BV1 and BV2.

5.3 Hydrology and Hydrogeology

Modelling of the final void lake water levels has been conducted by Engeny and the results are presented in the Environmental Assessment Report (EAR) Surface Water Report. The predicted final void water levels are as follows:

- BVS – post-mining quasi-equilibrium lake level approximately 230 mRL
- BV1 - final void post-mining will be intermittently dry but with maximum water level of 397 mRL
- BV2 - final void post-mining will be intermittently dry but with maximum water level of 374.5 mRL

PSM have assessed two groundwater scenarios for each void:

1. "Final Mining" – which represents conditions immediately post mining.
2. "Long term" – which represents conditions when the void is filled to the final lake level detailed above for each pit.

A conservative Hu of 1 has been used to assess hydrostatic conditions.

6. Stable Long-Term Pit Slope Stability Assessment

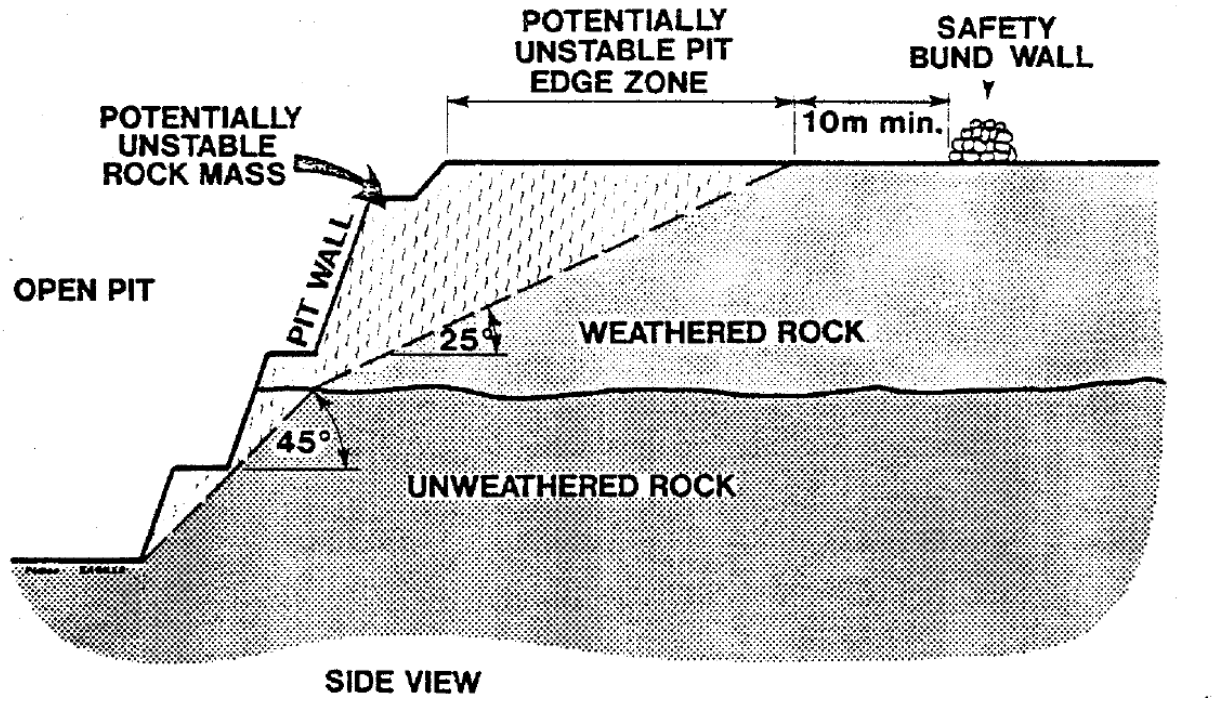
6.1 WA Guidelines - Assessment of Maximum Area of Potentially Unstable Rock Mass

The Western Australian guidelines[2] provide a methodology for assessing the long-term slope stability following mine closure and identify an exclusion zone for the placement of engineered guard/closure bund around the perimeter of the pits. These guidelines were used as the preliminary assessment for the location of the engineered guard/closure bund for each pit.

The WA guidelines recommend the identification of a potentially unstable pit edge zone, with the engineered guard/closure bund location thereafter nominated 10 m (at minimum) outside of this zone to restrict access. The overall angle defining the maximum potentially unstable rock mass, is primarily dependant on whether the pit wall consists of weathered rock or unweathered (i.e. fresh) rock. The maximum potentially unstable pit edge zone for failure through each class of rock is defined by two separate design angles as follows:

- 25° for weathered rock, and
- 45° for unweathered rock.

Inset 2 presents a schematic section from DIR (1997) showing the placement of an engineered guard/closure bund 10 m beyond the potentially unstable pit edge zone.



Inset 2: Schematic cross-section presenting the recommended Western Australia guidelines for the placement of closure bunds from DIR (1997).

The location of the potentially unstable pit edge zone varies around the pit due to the varying pit depths, pit slope angles and weathering profile. PSM have used the base of partial oxidation (BOPO) provided by SMC in 2017 to define the base of weathered rock as per the WA guidelines.

For BVS, PSM have defined the potentially unstable pit edge zone by where the BOPO intersects the proposed pit wall and project 25° from this point to surface and adding 10 m from that intersection to identify the location of the engineered guard/closure bund. PSM note the recommended 45° through fresh rock is not applicable at BVS as the final overall slope angle is typically lower at 32°. The location of the engineered guard/closure bund ranges from 10 m to 30 m from the pit crest for BVS.

For BV1 and BV2, as with BVS, the 45° through fresh rock is not applicable as the overall design slope angles are less than 45°. Therefore, the approach has been to project the 25° weathered line from the base of cover sequence, which results in an engineered guard/closure bund location of 18 m from the footwall crest, and 29 m from the hanging wall crest.

6.2 Limit Equilibrium (LE) Stability Analyses

Limit Equilibrium (LE) stability analyses have been completed to further refine and confirm the boundary in the footwall (west wall) and hanging wall (east wall) of each pit, as well as a general “check” on the appropriateness of the WA guideline engineered control boundary. The analyses have been used to identify the location where a FoS of 1.50 is achieved beyond the pit crest, which defines the location of the stable long-term pit crest as referenced within the Guidelines for Open Pit Slope Design[1]. The location of the engineered guard/closure bund is to be offset 10 m further from the location where a FoS of 1.50 is achieved.

2-dimensional LE stability analyses have been completed on Section A, Section B and Section C in BVS, with cross section locations presented in Figure 1 and cross sections presented in Figures 3, 4 and 5 respectively. For BV1 and BV2, one cross section through BV1 was analysed for the footwall and two cross sections (one each for BV1 and BV2) were analysed for the hanging walls, representing the most geotechnically adverse locations.

The LE stability analyses were completed using the Rocscience software program *Slide2,* using both block search and path search mechanisms and the GLE-Morgenstern Price method. Slide2 is a 2-dimensional limit equilibrium slope stability software program for evaluating the safety factor or probability of failure, of circular or non-circular failure surfaces in soil or rock slopes.

The controlling failure mechanisms analysed are defined as:

- Footwall:
  - Anisotropy has been applied to all the basement units to account for a persistent shear dipping sub-parallel to the footwall. An angle of 32° has been utilised for this based off ATV data for BVS – this is considered a very conservative and “worst case” scenario
  - Block search method has been applied to assess sliding along the shear and with rock mass breakout in the toe are.
- Hanging Wall:
  - Rock mass controlled failure
  - Optimised path search has been applied to assess failure through rock mass.

A disturbance factor (D) of 1 has been used to reflect rock mass degradation for the long-term stability scenario. PSM stress this is a very conservative assumption but appropriate for Conceptual Level planning.

Section A represents the most geotechnically adverse locations in BVS, comprising the highest/steepest part of pit wall and where the lowest FoS would be expected. Sections B and C are spaced along the pit and represent more favourable geotechnical conditions.

The results of the 2-dimensional LE stability analyses for each pit are presented in Appendix B. The global FOS obtained for each section, as well as the distance (plus 10 m) where the FoS = 1.50 behind the pit crest and a comparison to the WA guideline offset is summarised in Table 3 for each pit.

Table 3 – Summary of Limit Equilibrium Stability Analysis

Pit	Pit Wall	Cross Section	Groundwater Case[1]	Minimum Global FOS	FoS of 1.5 Crest Set Back (m)	Engineered Guard location (FOS = 1.50 (+10 m)	Engineered Guard location WA Guidelines (m)
BVS	Footwall	A	Final Mining	1.20	55	65	15
			Long-term	1.07	92	**102**	
		B	Final Mining	1.36	13	23	18
			Long-term	1.06	70	**80**	
		C	Final Mining	1.48	1	11	18
			Long-term	1.20	70	**80**	
	Hanging Wall	A	Final Mining	3.67	-	10	**11**
			Long-term	2.96	-	10	
		B	Final Mining	3.59	-	10	**18**
			Long-term	2.91	-	10	
		C	Final Mining	3.76	-	10	**16**
			Long-term	2.87	-	10	
BV1 and BV2	Footwall	BV1 CL-2	Final Mining	0.82[2]	15	**25**	18
			Long-term	0.83[2]	15	**25**	18
BV1	Hanging Wall	BV1 CL-2	Final Mining	1.68	-	10	**18**
			Long-term	1.69	-	10	**18**
BV2		BV2 CL-2	Final Mining	1.55	-	10	**29**
			Long-term	1.55	-	10	**29**

[1] Final Mining defines immediate post mining conditions, Long-term defines conditions with post-mining maximum lake level.

[2] Failure mechanism considered unlikely for operational design.

The results in Table 3 show that the WA Guidelines generally provide:

- A suitable (conservative) standoff distance for the hanging wall (marginally higher than indicated by the stability analyses)
- An unsuitable standoff distance for the footwall, where structural failure controls stability
- PSM highlight the bolded values in Table 3 present the furthest location of the engineered guard location.

7. Conclusion

The conclusions for the engineered guard/closure bund location for final void closure have been illustrated in Figure 6 for BVS, and Figure 7 for BV1 and BV2, and are summarised in Table 4 and below.

- BVS:
  - Footwall - LE stability analysis defines the offset of the engineered guard/closure bund, with pit crest offsets ranging from 80 m to 102 m required
  - Hanging wall - WA Guidelines define the offset of the engineered guard/closure bund, with pit crest offsets ranging from 10 m to 30 m required. Note PSM have interpreted offsets as appropriate in areas away from the cross-section locations.

- BV1 and BV2:
  - Footwall – LE stability analyses defines the offset of the engineered guard/closure bund, and with pit crest offsets of 25 m required
  - Hanging wall - WA guidelines define the offset of the engineered guard/closure bund, with pit crest offsets of 18m for BV1 and 29 m for BV2 required.

Table 4 – Summary of Required Pit Crest Offsets for Engineered Guard/Closure Bund location

Pit	Wall	Controlling Assessment	Engineered Guard/Closure Bund Pit Crest Offset (m)
BVS	Footwall	LE Stability Analysis	**80 to 102**
	Hanging Wall	WA Guidelines	**10 to 30**
BV1 and BV2	Footwall	LE Stability Analysis	**25**
BV1	Hanging Wall	WA Guidelines	**18**
BV2	Hanging Wall	WA Guidelines	**29**

The closure bund offsets summarised in Table 4 are considered to be at a Conceptual Level and require reassessment during mining, when more geotechnical data is available, and the understanding of the Geotechnical conditions is better understood. Additionally, any changes in pit designs from those analysed within this report will also require a closure reassessment. This may result in modifications to the conceptual pit crest offset distances provided.

8. Closure

We trust that this document is in keeping with your immediate requirements. Please don't hesitate to contact the undersigned for clarification on any of the above.

Yours Sincerely





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738800E
739000E
739200E
739400E
739600E
739800E
740000E
7807000N
7806800N
7806600N
7806400N
7806200N
7806000N
7805800N
7805600N
7805400N
7805200N
366 mRL
368 mRL
370 mRL
372 mRL
374 mRL
376 mRL
378 mRL
380 mRL
A
A'
B
B'
C
C'

LEGEND

Topography 2017 - 1m Contours

Pit Design (Final Void Rev 2 Max Case) - 10m Contours

Section Location

0 50 100 150 200
Scale (m)

PSM

Strategic Minerals
Big Vein South Gold Project
Final Void Closure: BVS, BV1 and BV2

BVS PLAN

PSM3254-024R | Figure 1

740000E
740200E
740400E
740600E
740800E
7808800N
7808600N
7808400N
7808200N
7808000N
7807800N
7807600N
390 mRL
400 mRL
410 mRL
420 mRL
420 mRL
430 mRL
BV1
430 mRL
420 mRL
410 mRL
400 mRL
390 mRL
380 mRL
390 mRL
400 mRL
410 mRL
420 mRL
430 mRL
BV2
430 mRL
420 mRL
410 mRL
400 mRL
390 mRL
380 mRL

LEGEND

Topography 2021 5m Contours

Pit Outlines BV1-Grading1 and BV2-Grading1

0 50 100 150 200

Scale (m)

Strategic Minerals
Big Vein South Gold Project
Final Void Closure: BVS, BV1 and BV2

BV1 and BV2 PLAN

PSM3254-024R | Figure 2

A

A'

RL400m

RL300m

RL200m

RL100m

RL0m

LD0318 Offset 33mN

LD0324 Offset 22mN

LD0323 Offset 42mS

LD0317 Offset 11mN

LEGEND

- Topography 2017
- Pit Design (Final Void Rev 2 Max Case)
- Simplified Lithological Boundaries
- Base of Partial Weathering (2017)
- LD0318 Diamond Boreholes

Simplified Lithology Domains

- Cover
- Granite Dominated Migmatite
- Granofels Dominated Migmatite + Amphibolite
- Mixed Migmatite - Schist
- Mineralisation
- Dolerite Dyke

0 50 100

Scale (m)

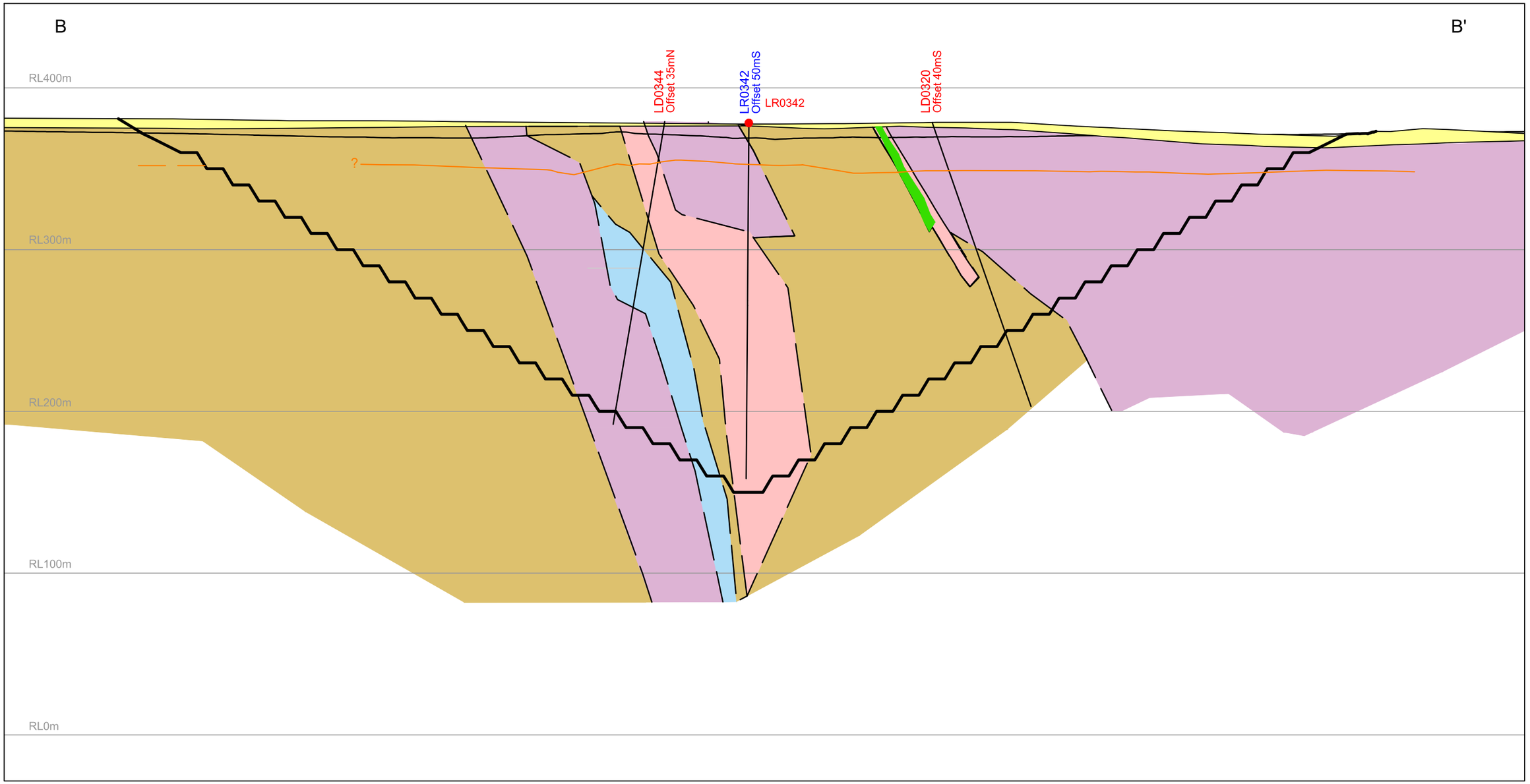
Strategic Minerals

Big Vein South Gold Project

Final Void Closure: BVS, BV1 and BV2

GEOTECHNICAL SECTION A-A'

PSM3254-024R | Figure 3



LEGEND

- Topography 2017
- Pit Design (Final Void Rev 2 Max Case)
- Simplified Lithological Boundaries
- Base of Partial Weathering (2017)
- LD0344 Diamond Boreholes
- LR0342 RC Boreholes

Simplified Lithology Domains

- Cover
- Granite Dominated Migmatite
- Granofels Dominated Migmatite + Amphibolite
- Mixed Migmatite - Schist
- Mineralisation
- Dolerite Dyke

0 50 100
Scale (m)

P S M

Strategic Minerals
Big Vein South Gold Project
Final Void Closure: BVS, BV1 and BV2

GEOTECHNICAL SECTION B-B'

PSM3254-024R | Figure 4

C

C'

RL400m

RL300m

RL200m

RL100m

RL0m

LD0345
Offset 16mS

LD0346
Offset 17mN

?

LEGEND

- Topography 2017
- Pit Design (Final Void Rev 2 Max Case)
- Simplified Lithological Boundaries
- Base of Partial Weathering (2017)
- LD0345 Diamond Boreholes

Simplified Lithology Domains

- Cover
- Granite Dominated Migmatite
- Granofels Dominated Migmatite + Amphibolite
- Mixed Migmatite - Schist
- Mineralisation
- Dolerite Dyke

0 50 100
Scale (m)

Strategic Minerals
Big Vein South Gold Project
Final Void Closure: BVS, BV1 and BV2

GEOTECHNICAL SECTION C-C'

PSM3254-024R | Figure 5

738800E
739000E
739200E
739400E
739600E
739800E
740000E
7807000N
7806800N
7806600N
7806400N
7806200N
7806000N
7805800N
7805600N
7805400N
7805200N
80 m
10 m
102 m
30 m
80 m
18 m
80 m
16 m
20 m

LEGEND

Topography 2017 - 1m Contours

Pit Design (Final Void Rev 2 Max Case) - 10m Contours

Engineered Guard Location

XX m Offset of Engineered Guard

0 50 100 150 200
Scale (m)

PSM

Strategic Minerals
Big Vein South Gold Project
Final Void Closure: BVS, BV1 and BV2

BVS - ENGINEERED GUARD LOCATION

PSM3254-024R | Figure 6

740000E
740200E
740400E
740600E
740800E
7808800N
7808600N
7808400N
7808200N
7808000N
7807800N
7807600N
390 mRL
400 mRL
410 mRL
420 mRL
430 mRL
380 mRL
25m
18m
BV1
25m
29m
BV2

LEGEND

Topography 2021 5m Contours

Pit Outlines BV1-Grading1 and BV2-Grading1

BV1 and BV2 Engineering Guard Location

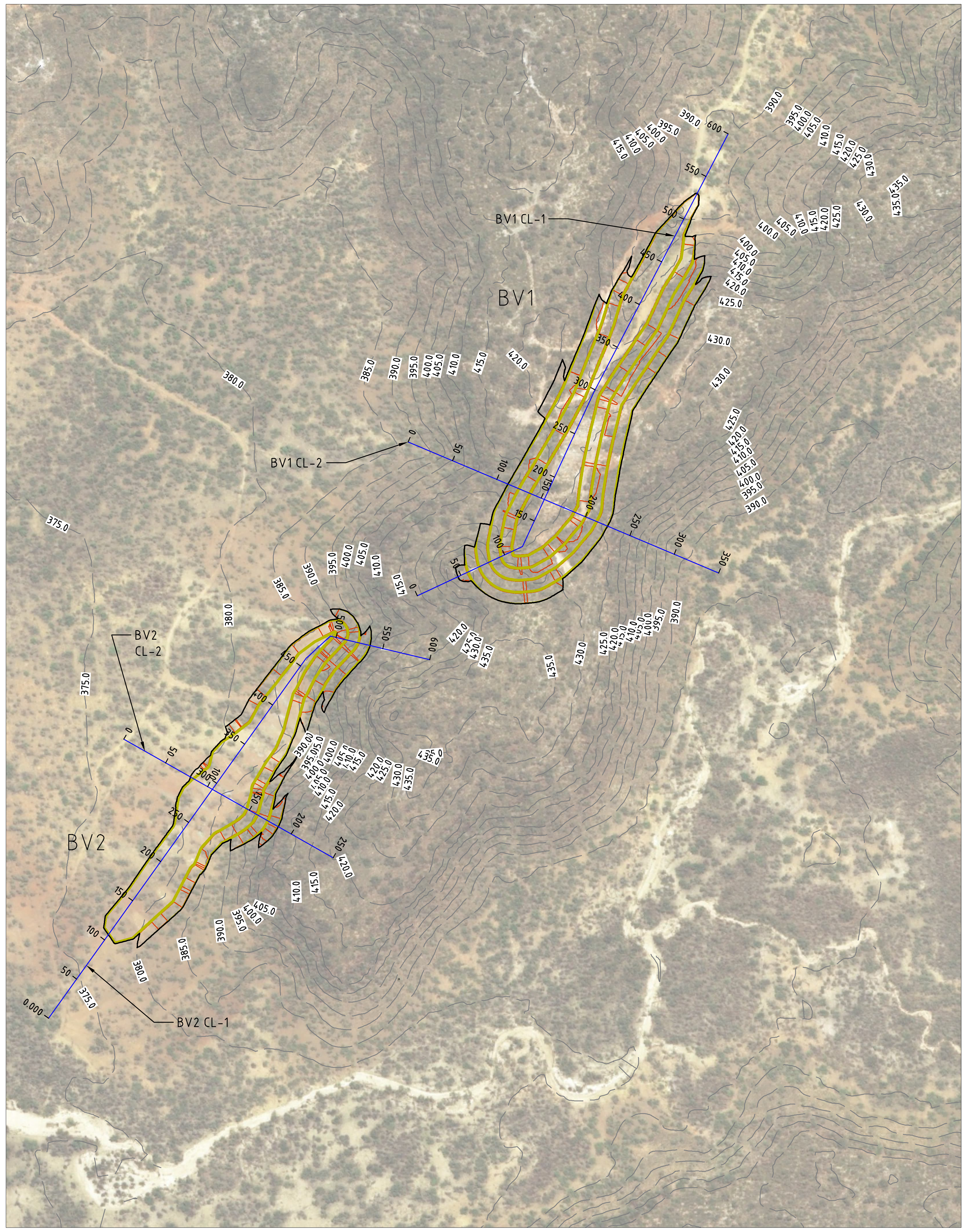
0 50 100 150 200

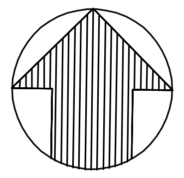
Scale (m)

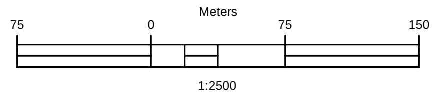
Strategic Minerals
Big Vein South Gold Project
Final Void Closure: BVS, BV1 and BV2
BV1 and BV2
ENGINEERING GUARD LOCATION

PSM3254-024R | Figure 7

Appendix A
BV1 and BV2 Pit Design



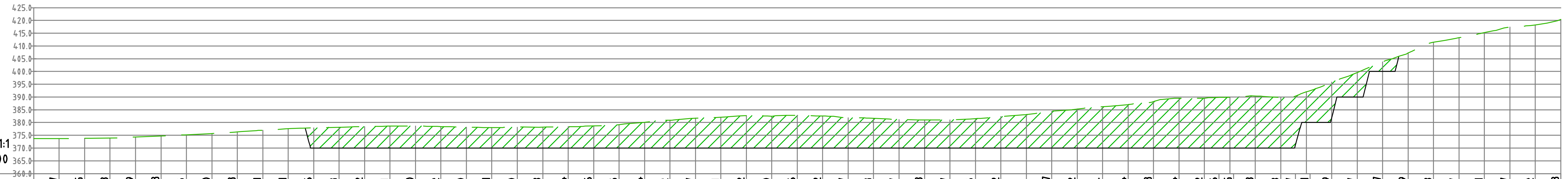




PIT PLAN - GRADING 1 (BENCHED FROM BASE)

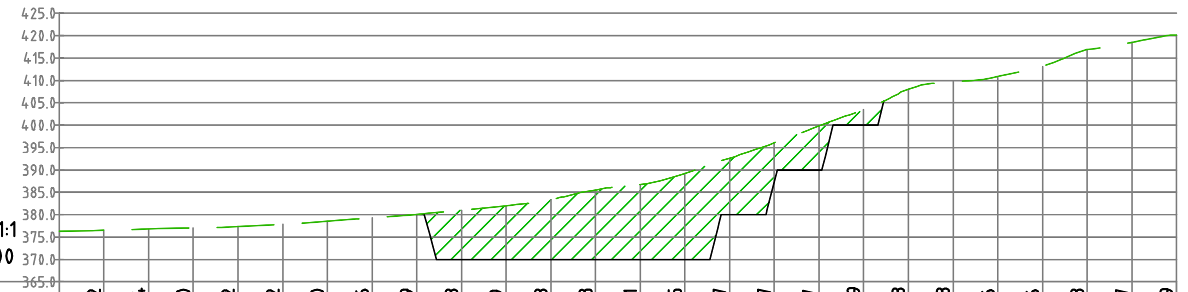
Pit volumes:

Index	Surface	Cut
1	BV1-GRADING1	609735.825 Cu. M.
2	BV2-GRADING1	245190.913 Cu. M.



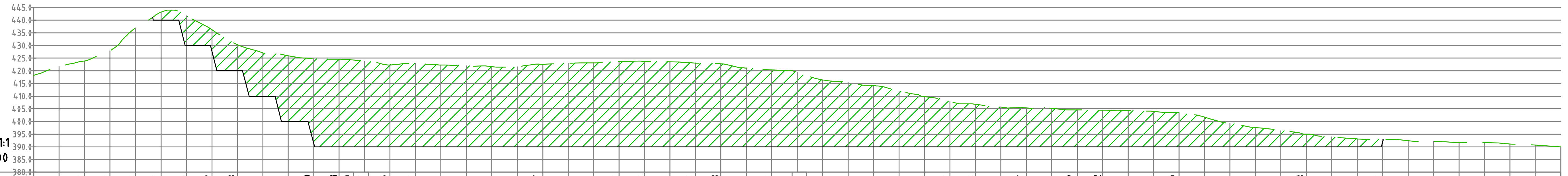
CHAINAGE	EXISTING LEVELS	DESIGN LEVELS	DEPTH
0.000			
10.000	373.697		
20.000	373.805		
30.000	373.958		
40.000	374.299		
50.000	374.743		
60.000	375.196		
70.000	375.660		
80.000	376.303		
90.000	377.001		
100.000	377.581		
106.680		377.836	
110.000	377.926	370.000	7.926
120.000	378.183	370.000	8.183
130.000	378.372	370.000	8.372
140.000	378.611	370.000	8.611
150.000	378.580	370.000	8.580
160.000	378.412	370.000	8.412
170.000	378.180	370.000	8.180
180.000	378.071	370.000	8.071
190.000	378.180	370.000	8.180
200.000	378.198	370.000	8.198
210.000	378.394	370.000	8.394
220.000	378.646	370.000	8.646
230.000	379.146	370.000	9.146
240.000	380.024	370.000	10.024
250.000	380.912	370.000	10.912
260.000	381.687	370.000	11.687
270.000	382.121	370.000	12.121
280.000	382.662	370.000	12.662
290.000	382.510	370.000	12.510
300.000	382.766	370.000	12.766
310.000	382.592	370.000	12.592
320.000	381.877	370.000	11.877
330.000	381.653	370.000	11.653
340.000	381.147	370.000	11.147
350.000	380.978	370.000	10.978
360.000	381.067	370.000	11.067
370.000	381.506	370.000	11.506
380.000	382.322	370.000	12.322
390.000	383.111	370.000	13.111
400.000	384.427	370.000	14.427
410.000	385.272	370.000	15.272
420.000	386.194	370.000	16.194
430.000	387.004	370.000	17.004
440.000	388.243	370.000	18.243
450.000	389.524	370.000	19.524
459.955	389.552	370.000	19.552
460.000	389.556	370.000	19.556
470.000	389.865	370.000	19.865
480.000	390.398	370.000	20.398
490.000	389.818	370.000	19.818
493.995	389.717	370.000	19.717
500.000	392.001	380.000	12.001
510.000	395.839	381.992	13.847
520.000	399.617	390.000	9.617
530.000	403.737	400.000	3.737
536.391		405.932	
540.000	407.209		
550.000	411.468		
560.000	413.217		
570.000	415.251		
580.000	417.357		
590.000	418.282		
600.000	420.463		

BV2 CL-1 LONG SECTION



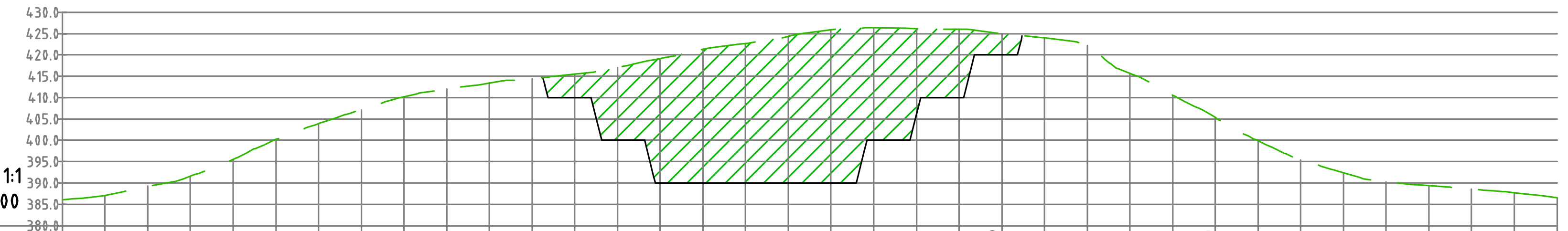
CHAINAGE	EXISTING LEVELS	DESIGN LEVELS	DEPTH
0.000			
10.000	376.522		
20.000	376.804		
30.000	377.000		
40.000	377.322		
50.000	377.832		
60.000	378.520		
70.000	379.266		
80.000	380.029	380.000	0.029
90.000	380.988	370.000	10.988
100.000	381.949	370.000	11.949
110.000	383.388	370.000	13.388
120.000	385.533	370.000	15.533
130.000	386.771	370.000	16.771
140.000	389.225	370.000	19.225
150.000	392.637	380.000	12.637
160.000	396.037	387.343	8.693
170.000	399.817	390.000	9.817
180.000	403.449	400.000	3.449
184.524		405.399	
190.000	407.978		
200.000	409.728		
210.000	410.866		
220.000	413.056		
230.000	416.848		
240.000	418.507		
250.000	420.089		

BV12 CL-2 LONG SECTION



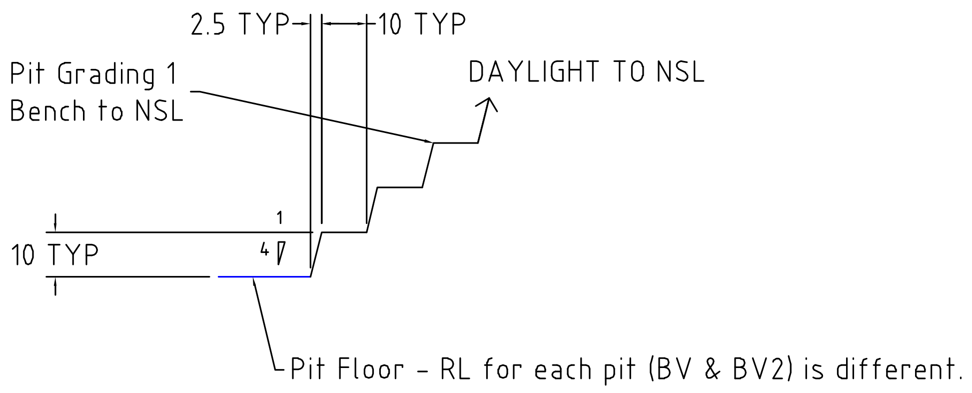
CHAINAGE	EXISTING LEVELS	DESIGN LEVELS	DEPTH
0.000			
10.000	421.720		
20.000	423.905		
30.000	427.976		
40.000	436.875		
50.000	443.167	440.002	3.165
60.000	441.742	430.000	11.742
70.000	436.220	428.002	8.218
80.000	430.288	420.000	10.288
90.000	427.081	410.000	17.081
100.000	425.936	400.000	25.936
110.000	424.849	391.588	33.261
120.000	424.563	390.000	34.563
120.536	424.569	390.000	34.569
130.000	423.841	390.000	33.841
140.000	422.330	390.000	32.330
150.000	422.836	390.000	32.836
160.000	422.295	390.000	32.295
170.000	421.937	390.000	31.937
180.000	421.661	390.000	31.661
190.000	421.614	390.000	31.614
200.000	422.577	390.000	32.577
210.000	423.015	390.000	33.015
220.000	423.142	390.000	33.142
230.000	423.603	390.000	33.603
240.000	423.773	390.000	33.773
250.000	423.539	390.000	33.539
260.000	423.079	390.000	33.079
270.000	422.778	390.000	32.778
280.000	421.116	390.000	31.116
290.000	420.386	390.000	30.386
297.958	420.019	390.000	30.019
300.000	419.351	390.000	29.351
310.000	416.352	390.000	26.352
320.000	415.402	390.000	25.402
330.000	414.130	390.000	24.130
340.000	411.985	390.000	21.985
350.000	409.852	390.000	19.852
360.000	407.875	390.000	17.875
370.000	406.806	390.000	16.806
380.000	405.717	390.000	15.717
390.000	405.327	390.000	15.327
400.000	405.190	390.000	15.190
410.000	404.597	390.000	14.597
420.000	404.452	390.000	14.452
430.000	404.317	390.000	14.317
440.000	403.985	390.000	13.985
450.000	403.489	390.000	13.489
460.000	401.708	390.000	11.708
470.000	399.262	390.000	9.262
480.000	397.580	390.000	7.580
490.000	396.362	390.000	6.362
500.000	394.978	390.000	4.978
510.000	393.873	390.000	3.873
520.000	393.133	390.000	3.133
530.000	392.970	391.913	1.057
530.269		392.953	
540.000	392.405		
550.000	392.123		
560.000	391.714		
570.000	391.645		
580.000	391.079		
590.000	390.668		
600.000	390.002		

BV1 CL-1 LONG SECTION



CHAINAGE	EXISTING LEVELS	DESIGN LEVELS	DEPTH
0.000			
10.000	387.064		
20.000	389.239		
30.000	391.576		
40.000	395.462		
50.000	400.201		
60.000	403.917		
70.000	407.130		
80.000	410.237		
90.000	412.028		
100.000	413.415		
110.000	414.426		
112.549		414.671	
120.000	415.526	410.000	5.526
130.000	417.044	400.000	17.044
140.000	419.161	390.000	29.161
150.000	421.342	390.000	31.342
160.000	422.709	390.000	32.709
170.000	424.361	390.000	34.361
180.000	425.876	390.000	35.876
190.000	426.362	400.000	26.362
200.000	426.126	405.957	20.169
210.000	426.018	410.000	16.018
220.000	424.980	420.000	4.980
224.777		424.496	
230.000	424.013		
240.000	422.194		
250.000	415.693		
260.000	410.592		
270.000	405.343		
280.000	399.940		
290.000	395.363		
300.000	392.359		
310.000	390.214		
320.000	389.439		
330.000	388.545		
340.000	387.738		
350.000	386.547		

BV1 CL-2 LONG SECTION



TYPICAL WALL BENCH SECTION

Appendix B
Limit Equilibrium Stability Analysis Results

Appendix B

Limit Equilibrium

Stability Analyses Results

Big Vein South

Material Properties

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	UCS (kPa)	GSI	mi	D	Water Surface	Hu Type	Hu	Generalized Anisotropic
Cover		20	Mohr-Coulomb	20	30					Water Surface	Custom	1	
Granite Dominated Migmatite		26	Generalized Hoek-Brown			55000	66	29	1	Water Surface	Custom	1	
Granofels Dominated Migmatite		26	Generalized Hoek-Brown			25000	62	26	1	Water Surface	Custom	1	
Mixed Migmatite		26	Generalized Hoek-Brown			30000	64	12	1	Water Surface	Custom	1	
Mineralisation		24	Generalized Hoek-Brown			25000	54	19	1	Water Surface	Custom	1	
Granite Dominated Migmatite - aniso		26	Generalized Anisotropic							Water Surface	Custom	1	User Defined 1
Granofels Dominated Migmatite - aniso		26	Generalized Anisotropic							Water Surface	Custom	1	User Defined 2
Mixed Migmatite - aniso		26	Generalized Anisotropic							Water Surface	Custom	1	User Defined 3
Fault		20	Mohr-Coulomb	0	24					Water Surface	Custom	1	

Note: D value of 0 has been used for short term stability. This is increased to D = 1 for long term stability due to degradation of the rock mass

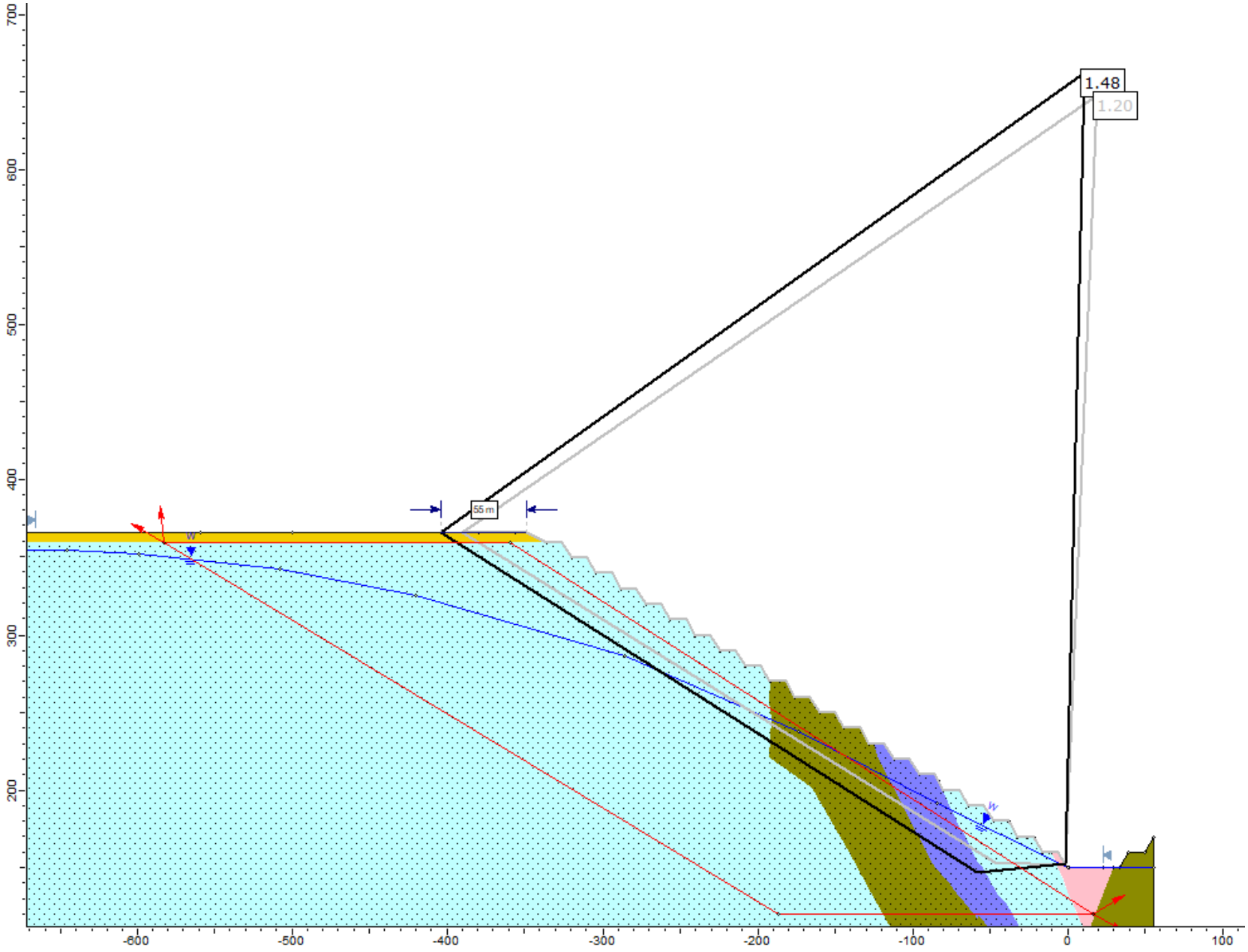
DAC

Design Acceptance Criteria for placement of Engineered Guard Location

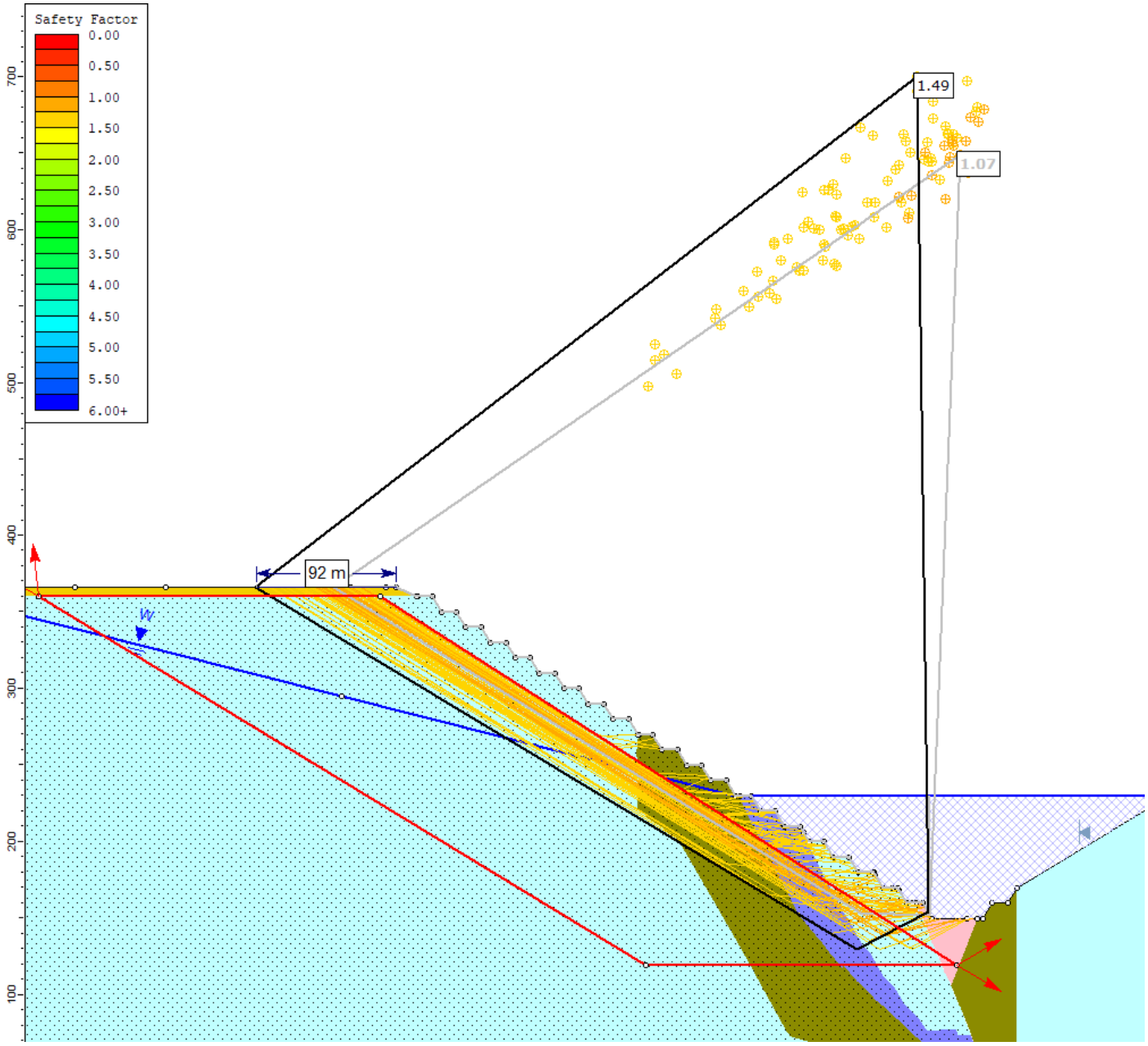
Results of stability analysis interrogated to find potential failure surface with FOS of 1.50 that places scarp at furthest distance from the pit crest.

FOS of 1.50 is in keeping with world recognised Open Pit Guidelines, Read & Stacey - Overall slopes and Major consequence for failure

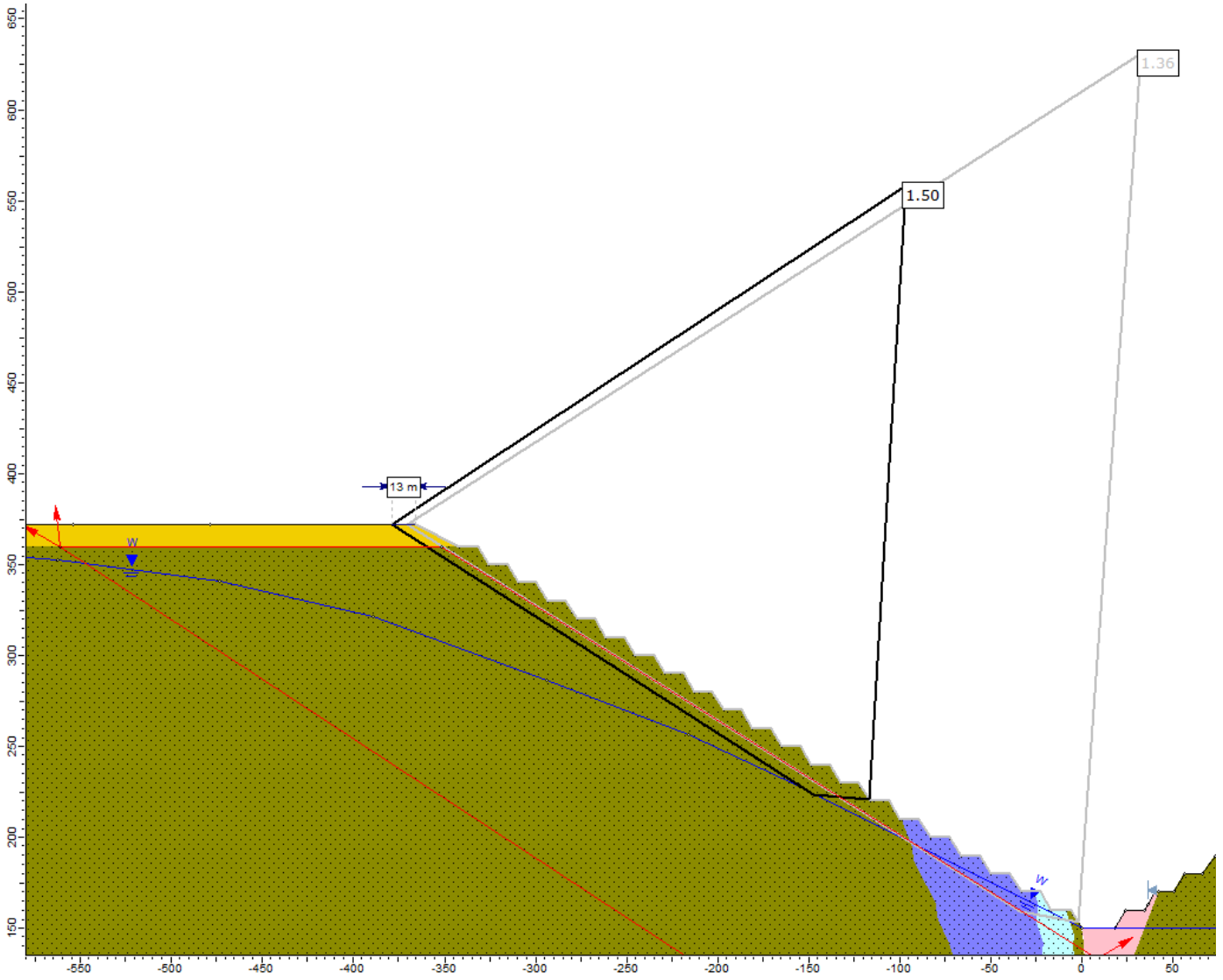
Section A – Footwall – Final Mining



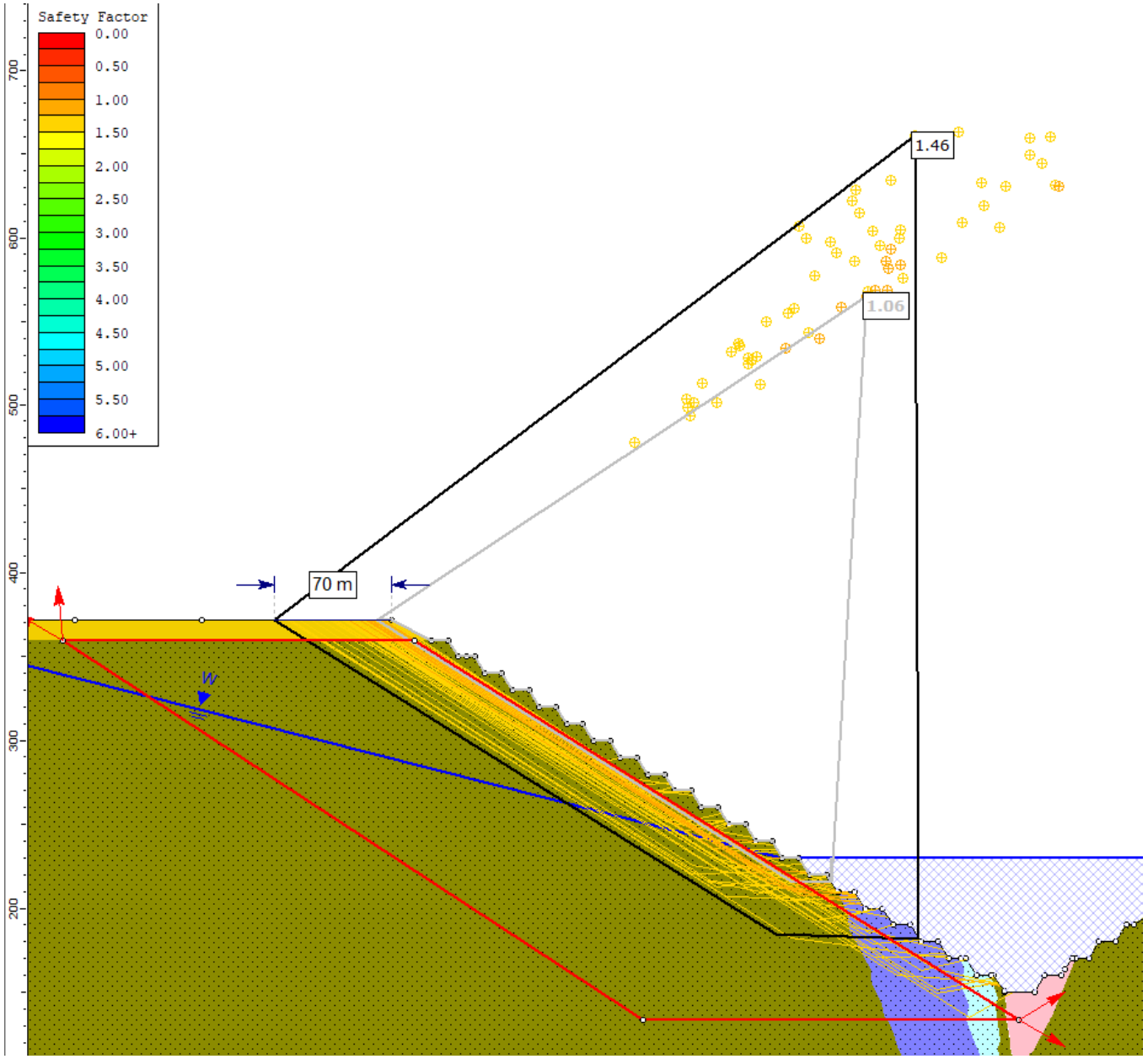
Section A – Footwall – Long Term



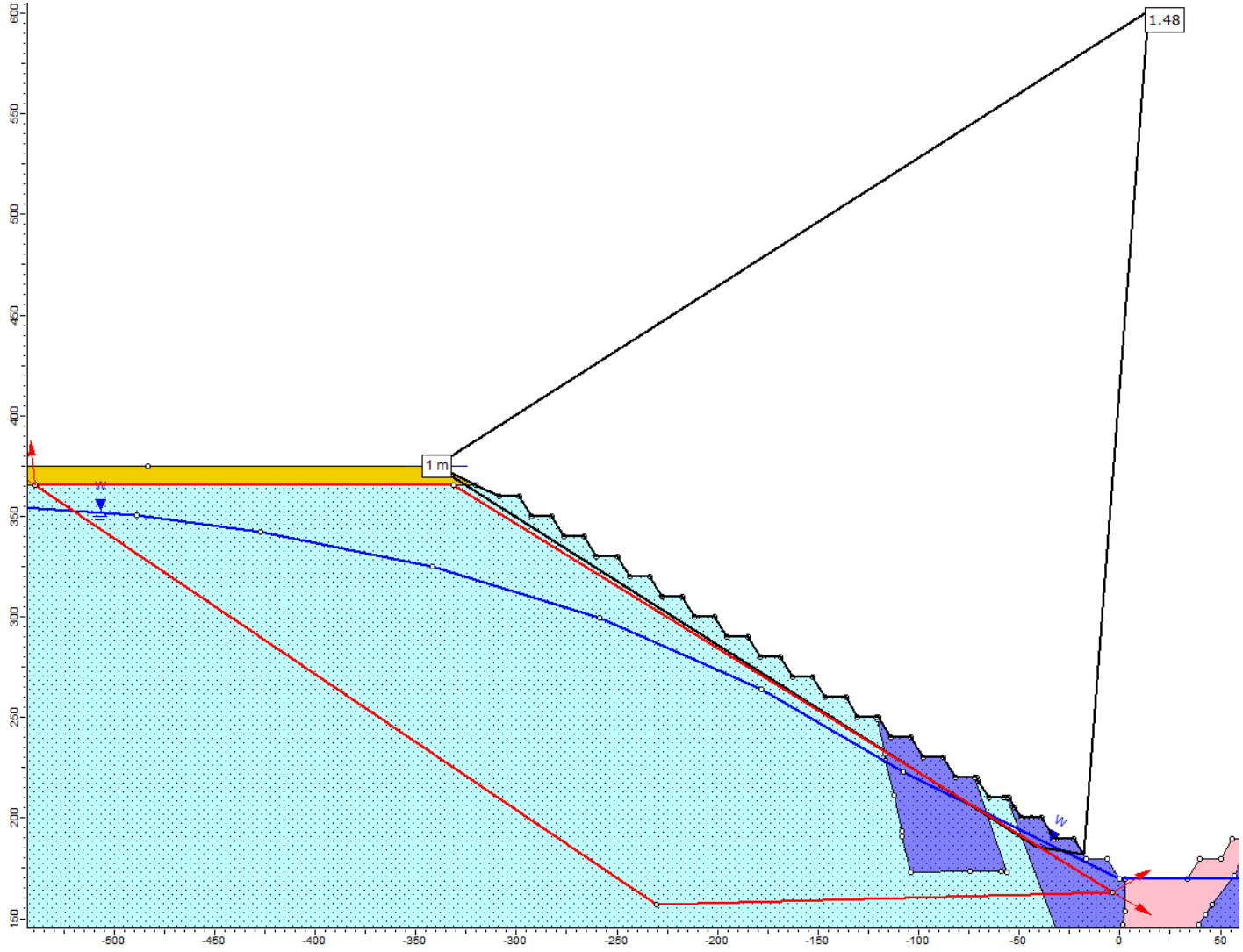
Section B – Footwall – Final Mining



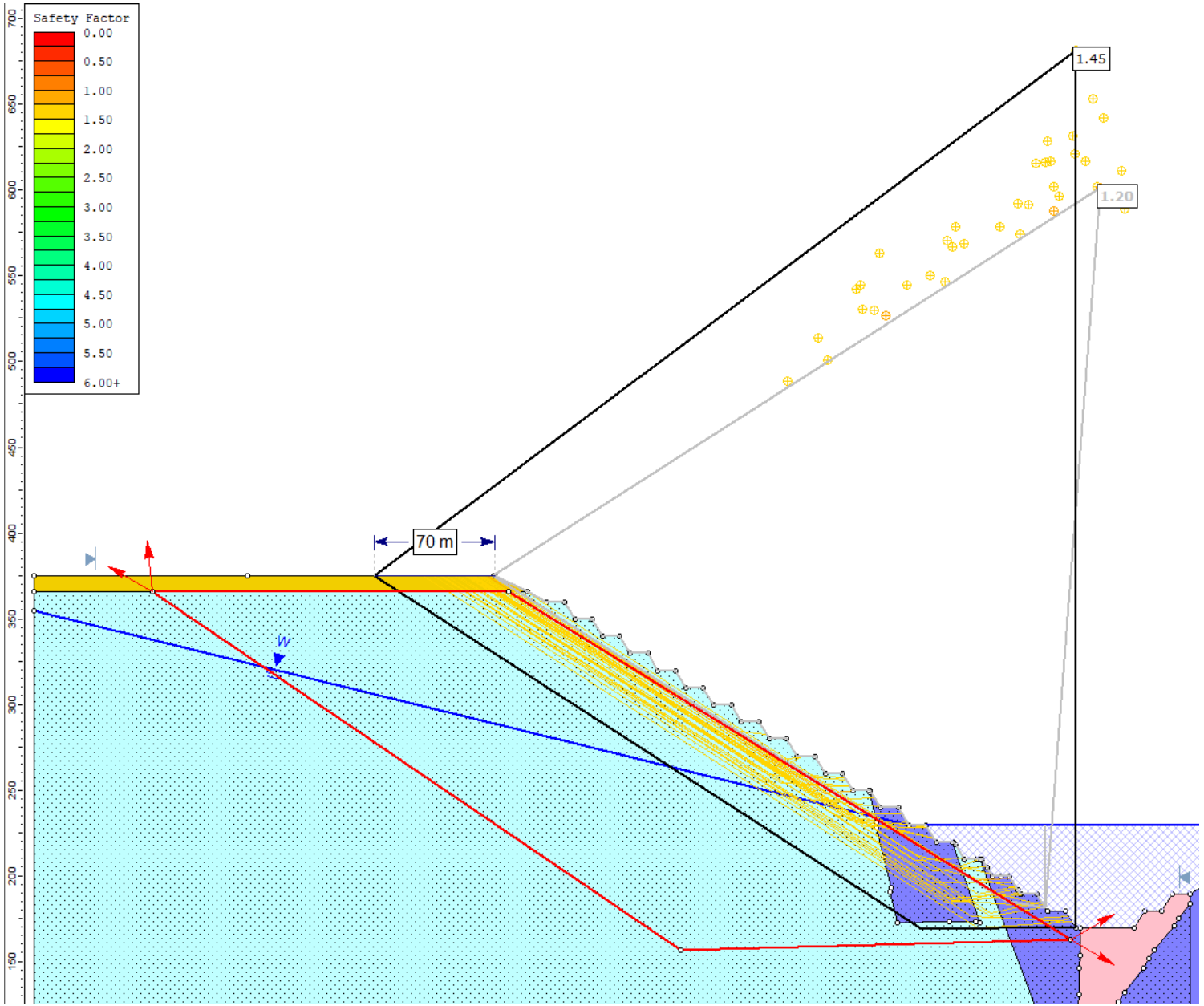
Section B – Footwall – Long Term



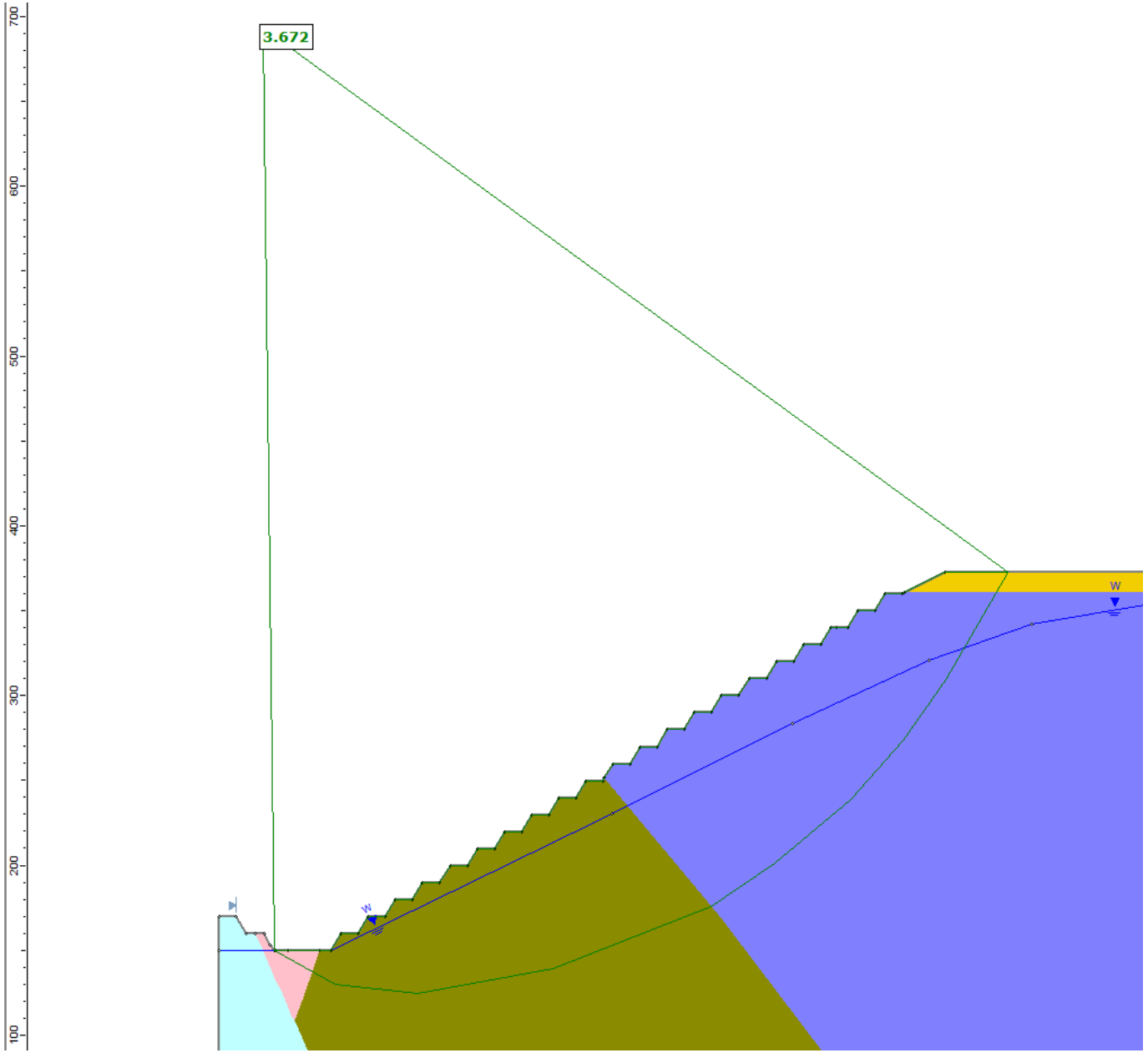
Section C – Footwall – Final Mining



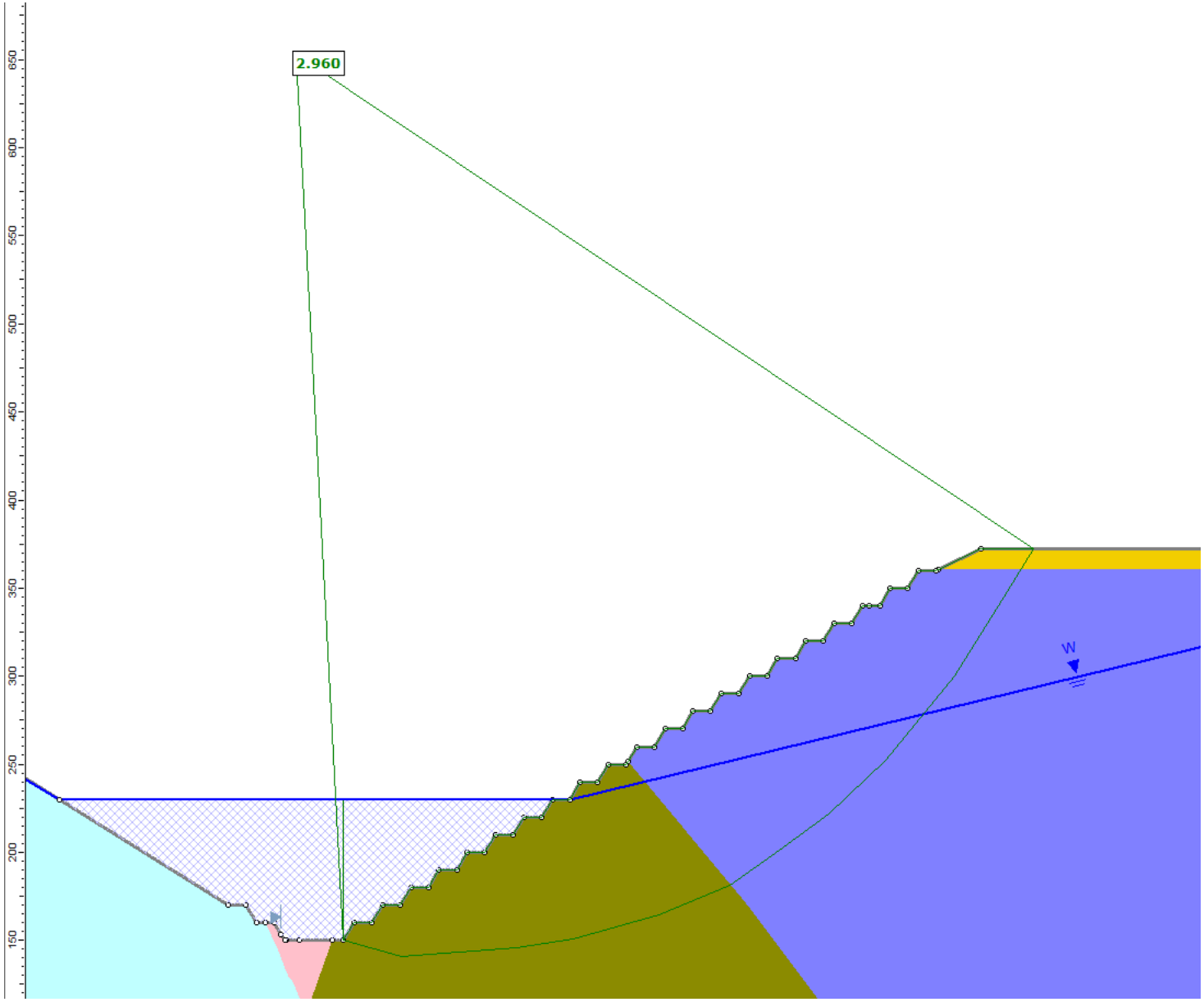
Section C – Footwall – Long Term



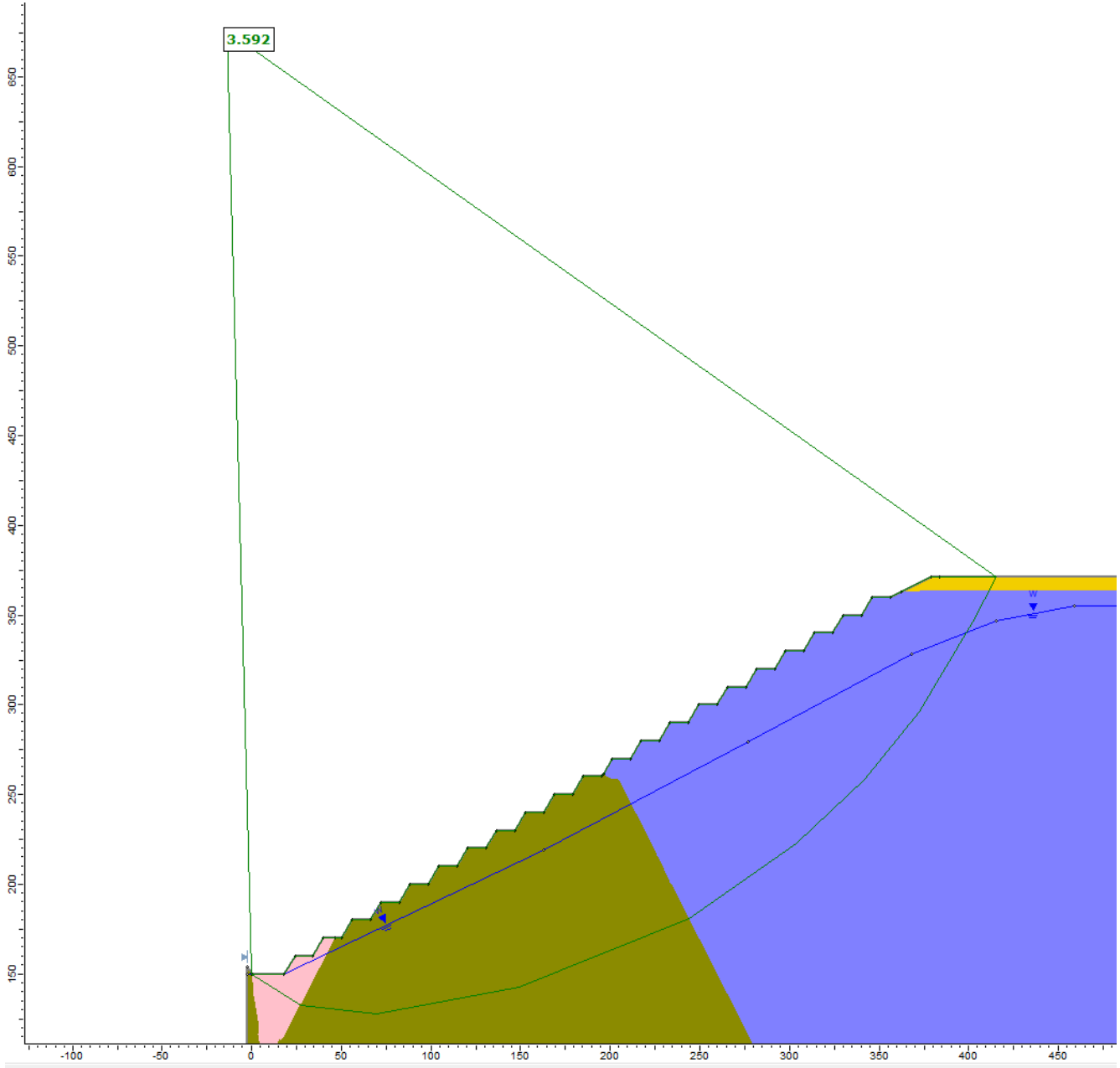
Section A – Hanging Wall Final Mining



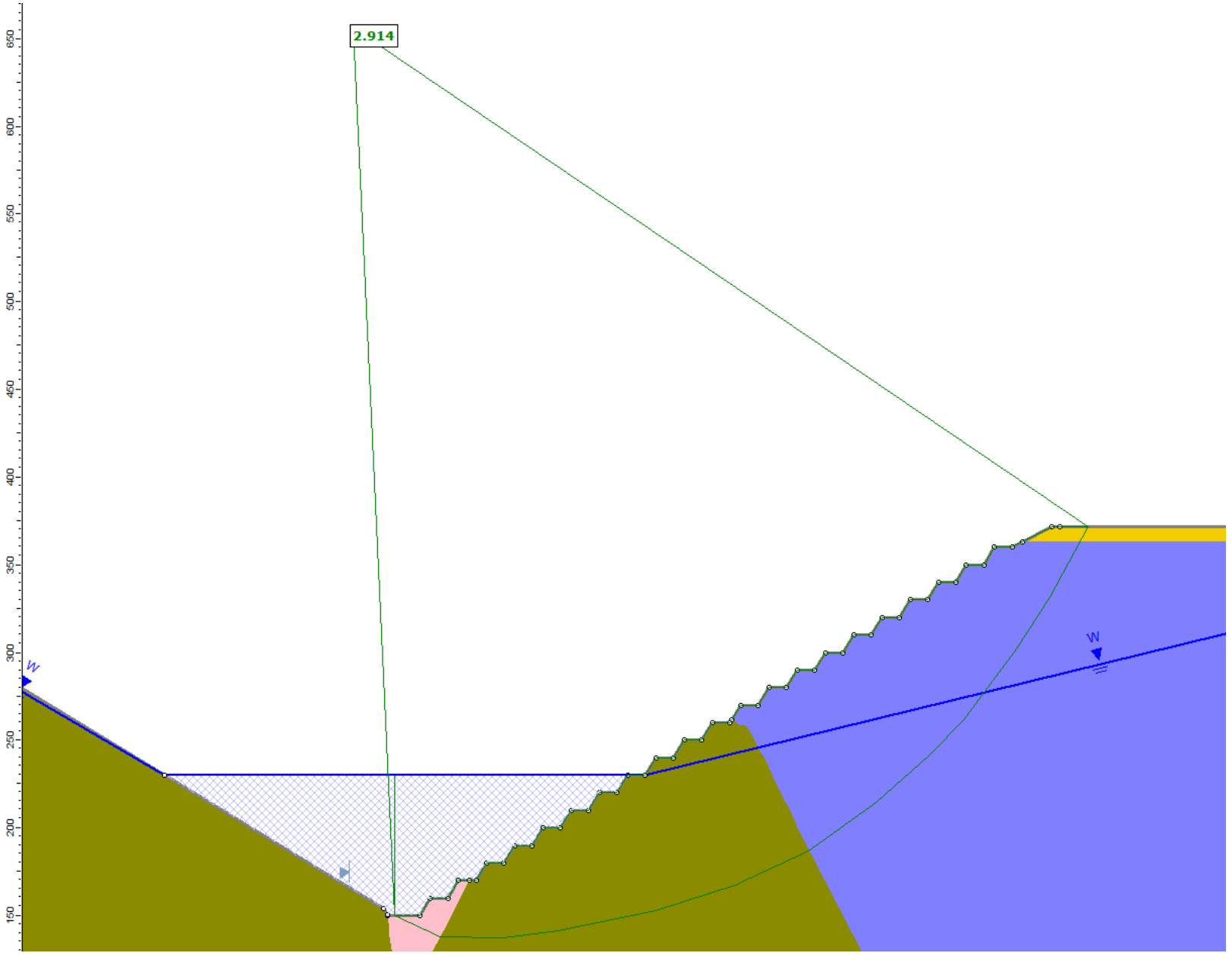
Section A – Hanging Wall – Long term



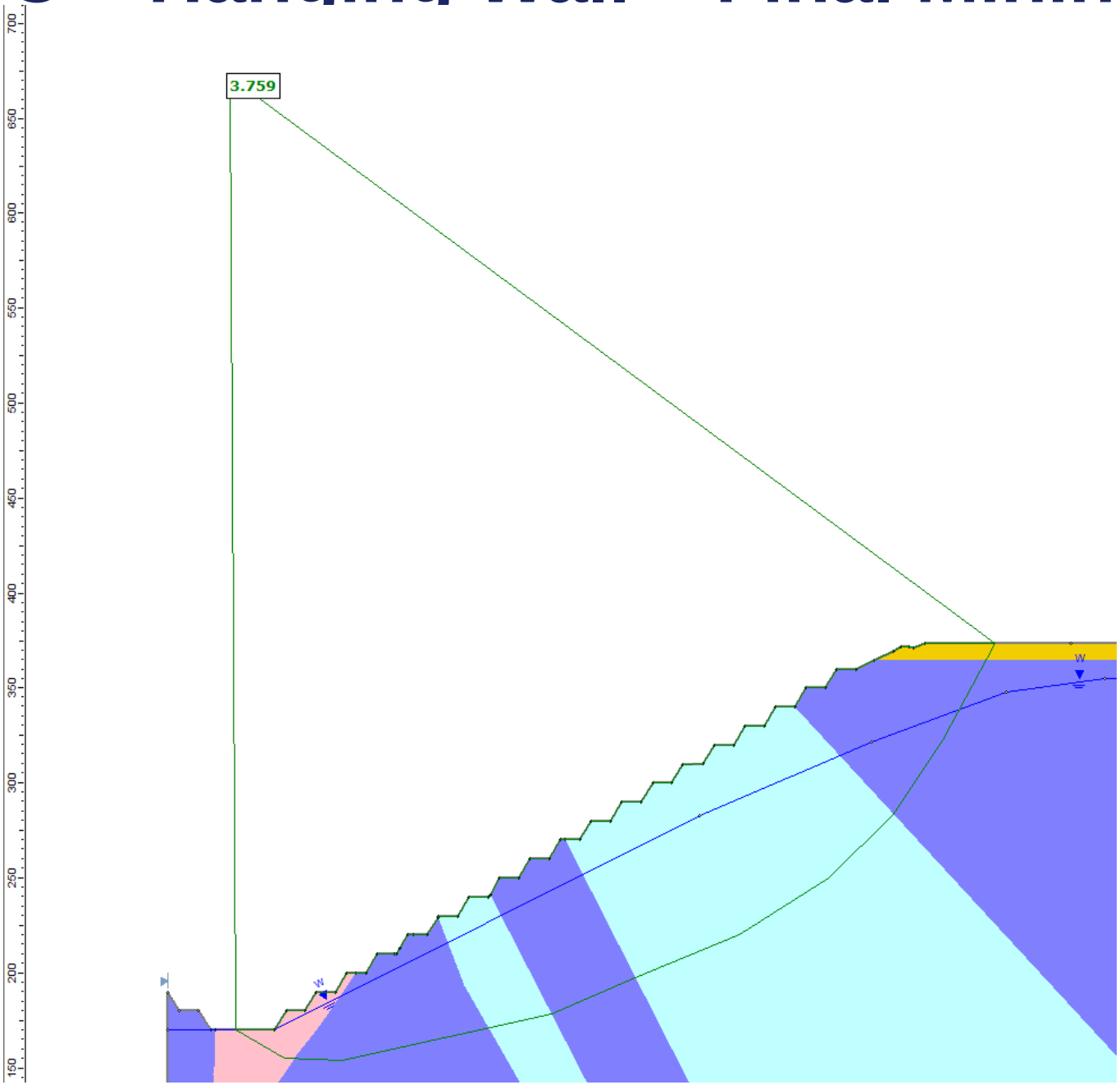
Section B – Hanging Wall – Final Mining



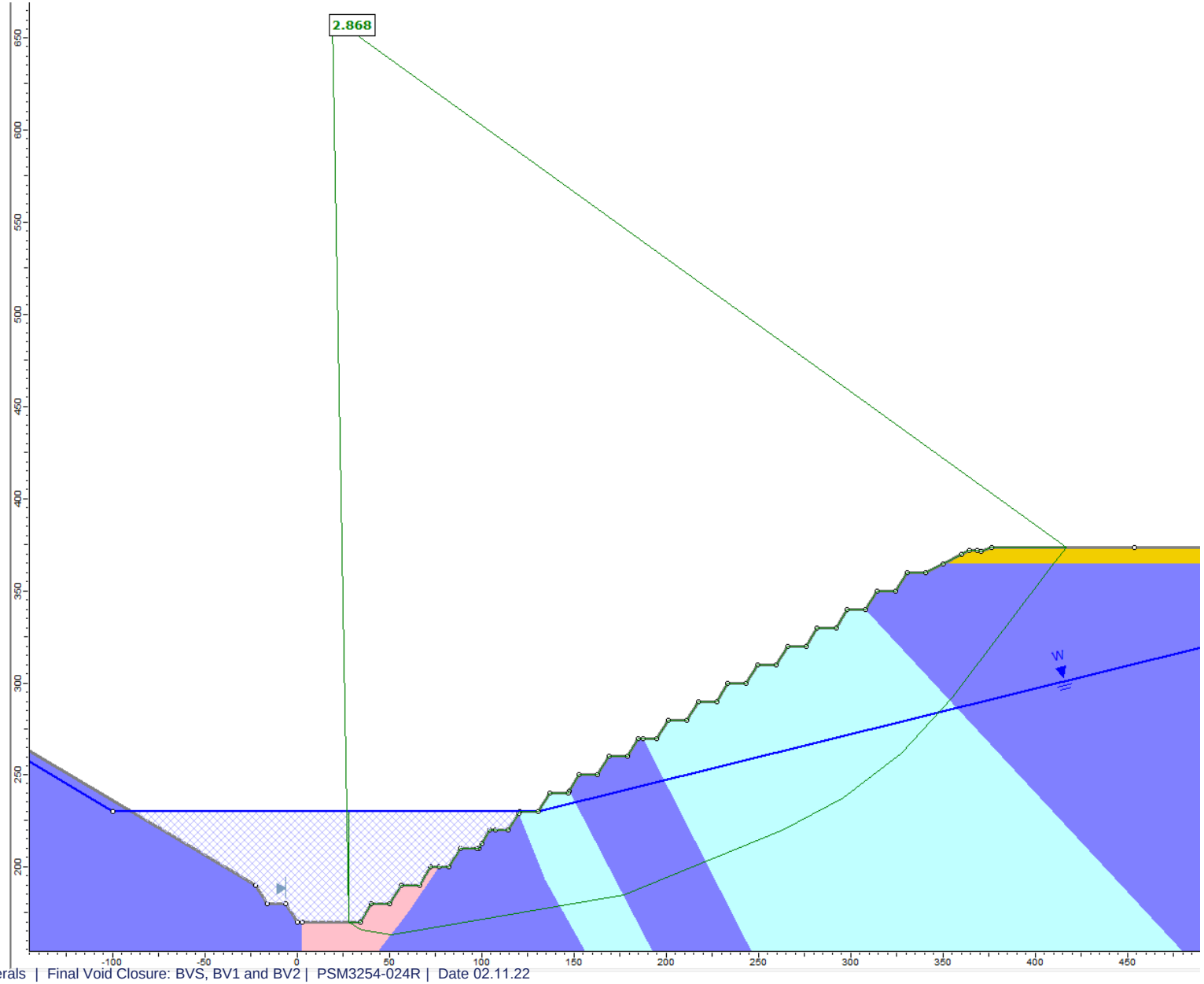
Section B – Hanging Wall - Long Term



Section C – Hanging Wall – Final Mining



Section C – Hanging Wall – Long Term

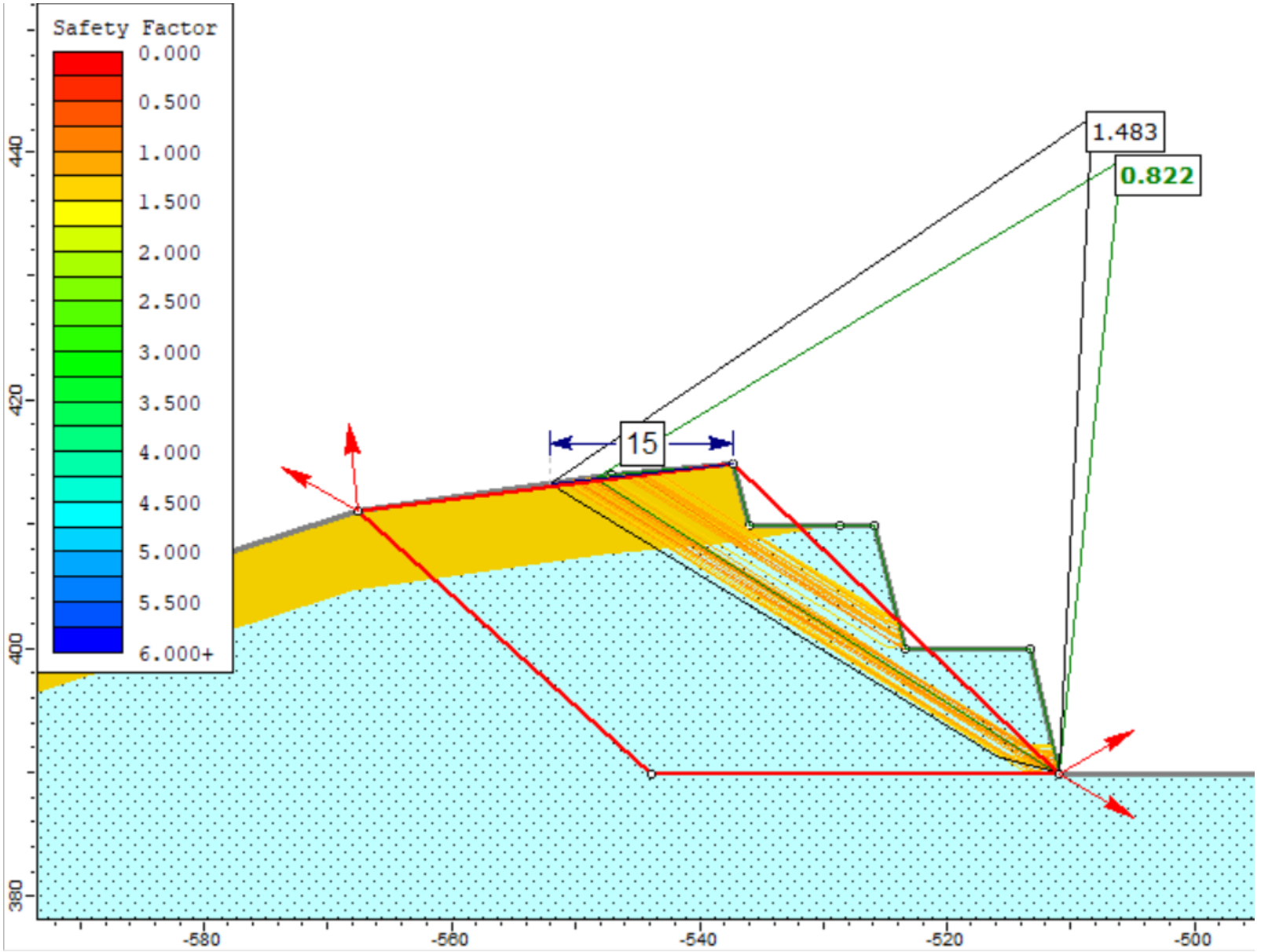


Limit Equilibrium Stability Analysis Results

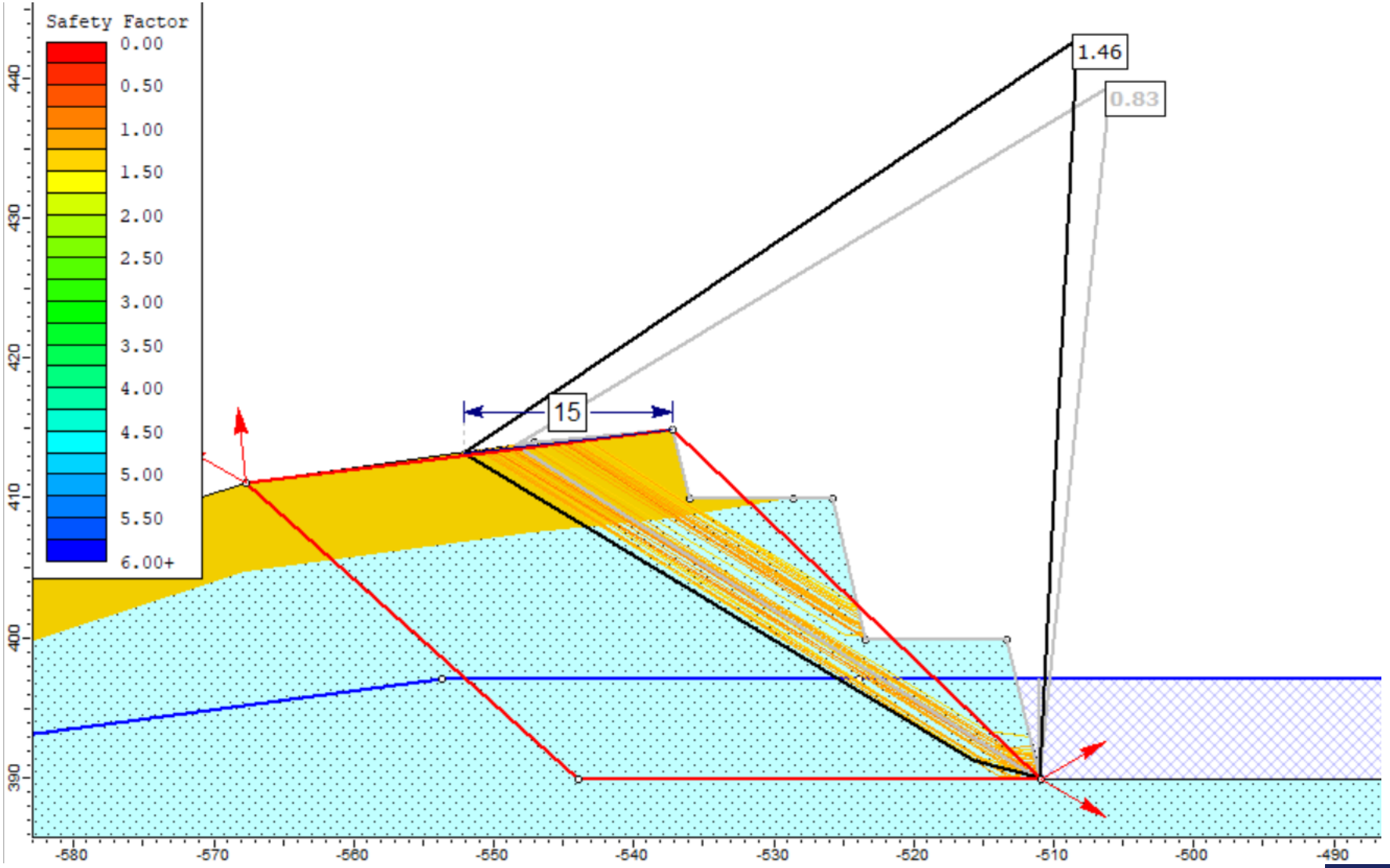
Big Vein 1 and Big Vein 2

BV1 – Footwall – Final Mining

Final GW Level @ 361.2 mRL

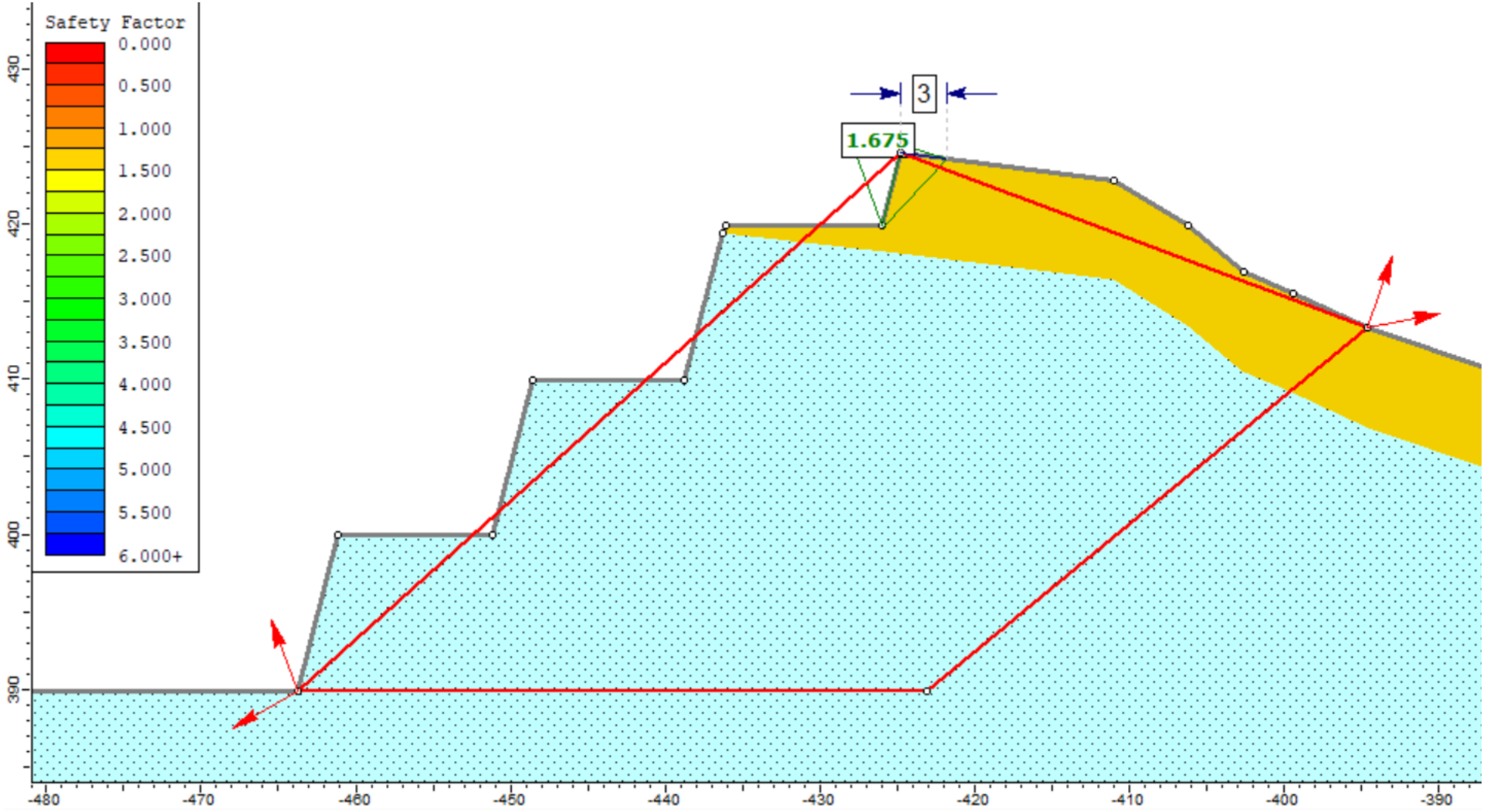


BV1 – Footwall – Long Term

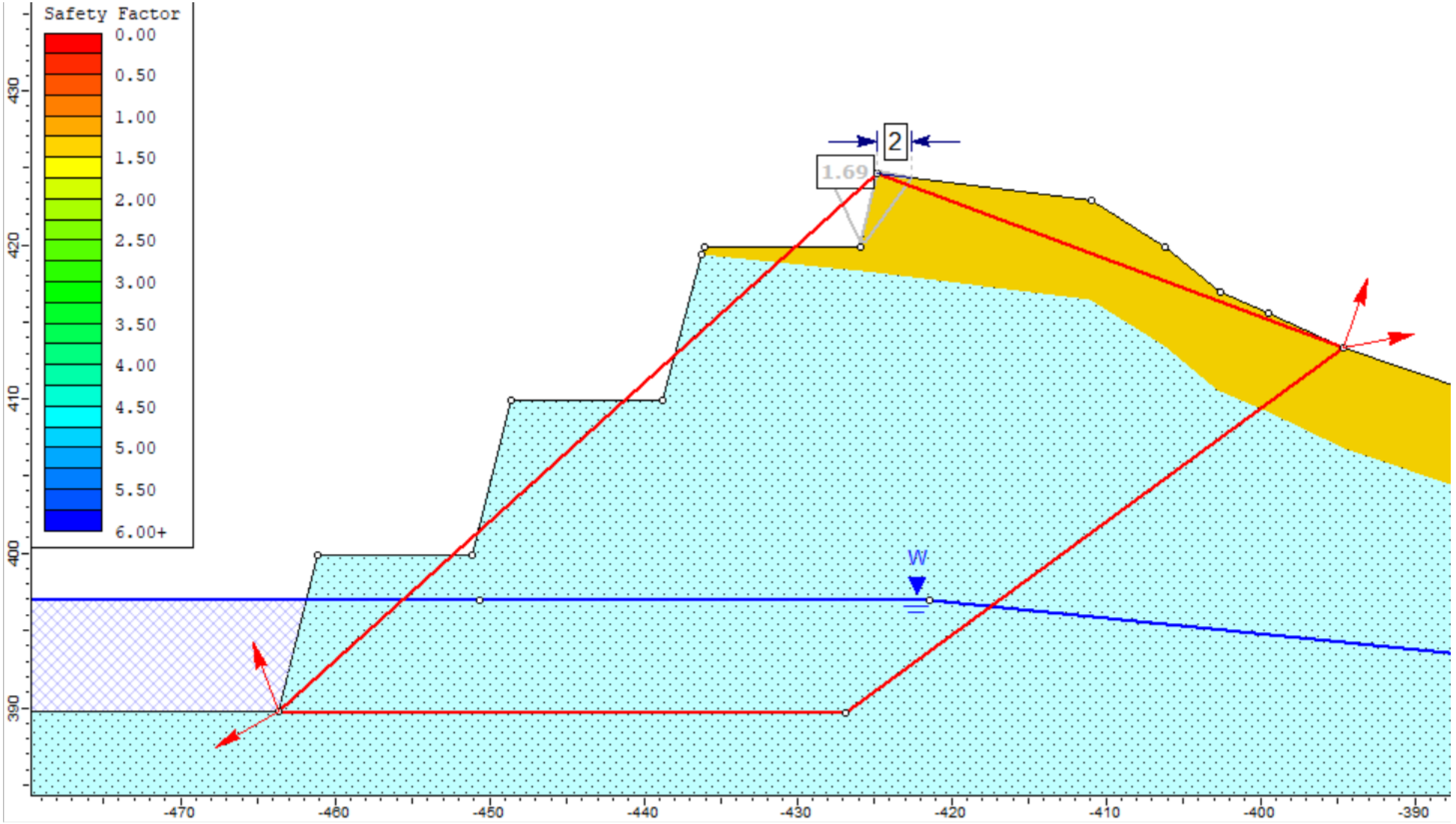


BV1 – Hanging Wall – Final Mining

Final GW Level @ 361.2 mRL

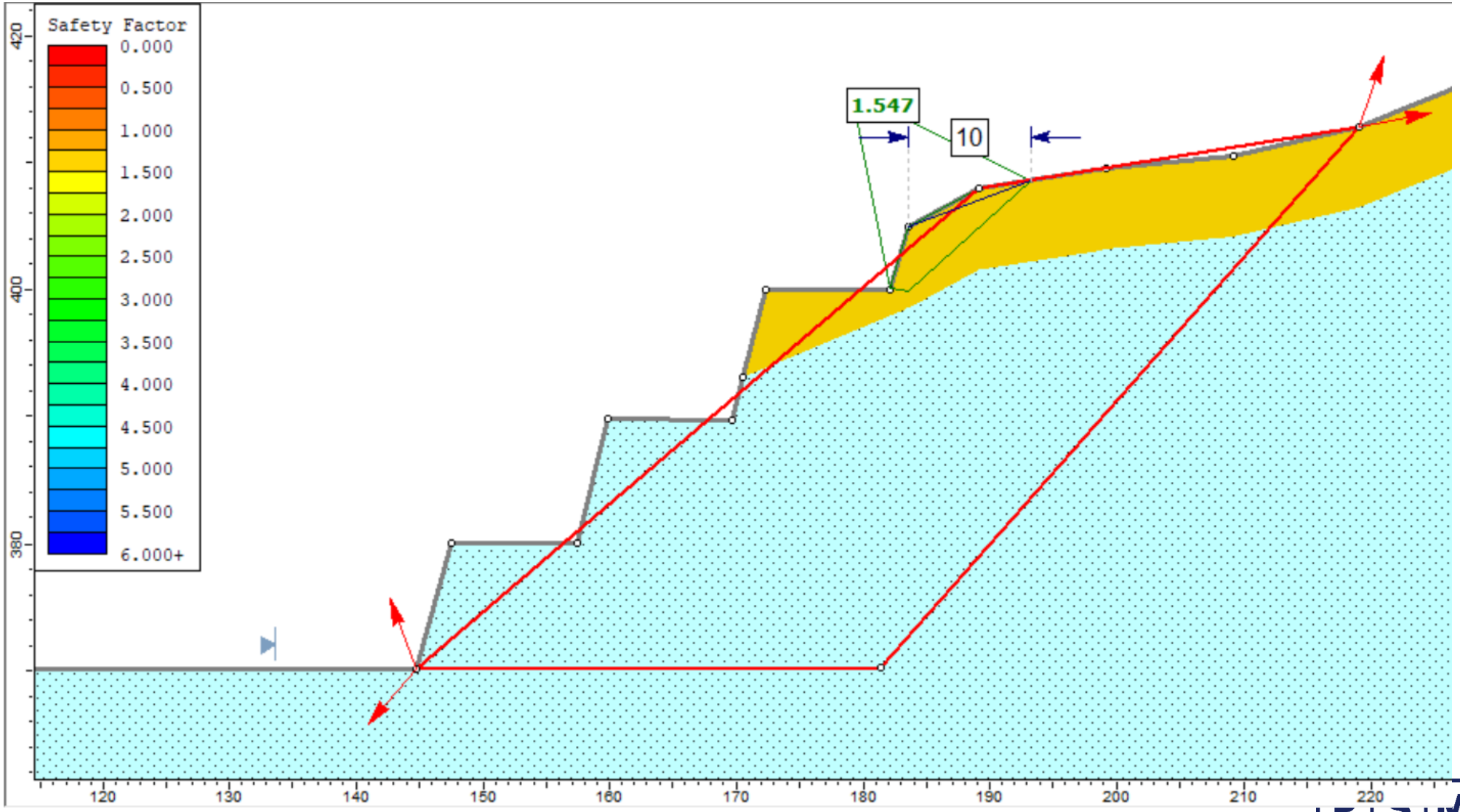


BV1 – Hanging Wall – Long Term



BV2 – Hanging Wall – Final Mining

Final GW Level @ 350 mRL



BV2 – Hanging Wall – Long Term

