LEADERS IN MINING GEOCHEMISTRY

Geochemical Characterisation of Overburden and Interburden at Kogan Creek Coal Mine

Report Prepared for:

CS ENERGY LIMITED

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DOCUMENT CONTROL

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EXECUTIVE SUMMARY

ES1 Background

RGS was commissioned by CS Energy Limited (CS Energy) to complete a geochemical assessment of mine waste from Kogan Creek Coal Mine (KCCM). KCCM is located in the western Darling Downs of Queensland near the town of Chinchilla. The coal mine delivers approximately 2.8Mtpa of Run-of-Mine (ROM) raw coal from to the power station. The coal is not washed and subsequently no wash plant is required and no coal reject or tailing is produced.

Overburden is removed to access the coal seams and is then transferred to the spoil dumps, which progressively refill the void after the coal has been mined, allowing for rehabilitation of the land. The mine has a shallow overburden thickness and coal starts from approximately 15 to 30 metres below the surface. The three main seams of coal (M, N and O) have a total thickness of 12 metres and dip gently to the south west. The coal sits in relatively flat 0.1 metre to 3 metre thick seams with parting layers of rock and clay between each coal seam. The coal is selectively mined from the parting and transported to the Run of Mine (ROM) pad, where it is loaded into the crusher and conveyed directly to the power station. The waste parting bands (interburden) are hauled to the spoil dumps.

RGS Environmental Pty Ltd (RGS) was commissioned by CS Energy to complete an assessment of the geochemical characteristics of the overburden and interburden spoil materials at KCCM. This work follows on from previous work completed by RGS in 2014/15 as part of an evaluation of the merits of co-disposal of ash within spoil. The proposed mining area under consideration is located to the east of the mining area (Eastern Area) previously studied by RGS. The objective is to confirm that the spoil materials generated from removal of overburden and interburden materials at the Eastern Area are geochemically benign and do not require any special management measures.

ES2 Scope of Work

The scope of work involved completing a geochemical assessment of overburden, interburden and uneconomical coal seam (parting, roof and floor) spoil materials from the Eastern Area in accordance with relevant industry guidelines (COA, 2016a,b). The scope of work was developed by RGS based upon information provided to RGS by CS Energy and previous site experience, and was completed in two stages.

***Stage 1*:**

- Data and document review including geochemical, geological, resource assessment, and surface water and groundwater quality information;
- Design and implementation of a sampling protocol to align with available drill core from the drilling program;
- Provision of written instructions for CS Energy regarding samples selection and collection;
- Provision of a detailed “stand-alone” technical report suitable as an Appendix to any subsequent regulatory approval documentation; and
- Provision of a brief monthly update report, to include confirmation of progress against the work schedule and performance against budget.

***Stage 2*:**

- Selection of appropriate samples and sample mixtures to complete kinetic leach columns (KLC);
- KLC testing on relevant mine materials (overburden/interburden/coal seam) over a period of six months;
- Collation and interpretation of KLC test results and comparison of leachate chemistry with relevant water quality guideline data; and,
- Production of a technical report describing the test methodology, results, findings and conclusions with recommendation for further work, if required.

ES3 Sampling and Testing Program

The sampling methodology used to obtain representative samples of overburden and interburden spoil from the KCCM Eastern Area was undertaken in accordance with guidelines documents. Whilst there are no specific regulatory requirements regarding the number of samples required, existing risk-based technical guidelines for the geochemical assessment of mine rock in Australia (AMIRA, 2002; and COA, 2016a) and worldwide (INAP, 2009) were utilised by RGS as a framework for the sampling program.

RGS worked closely with the supervising geologist (Xenith Consulting) and provided a sampling protocol as part of the associated proposal (Kogan Creek Mine: Proposal and Sampling Protocol). The sampling protocol was developed to utilise samples of drill core and drill chip material from a Xenith drilling program which commenced in January, 2016. It is understood that approximately 33 drill holes were completed with a drill hole spacing of approximately 125m in an area of the open cut pit proposed to be mined over the next few years (Eastern Area). Drill core and drill chip materials were sampled from up to six drill holes with a drill hole spacing of approximately 250m for the geochemical assessment program.

A total of 66 overburden samples and 55 uneconomical coal seam (roof, floor and parting) samples were collected from the drilling program. The samples were subjected to a range of static and kinetic geochemical tests at ALS Brisbane and RGS in-house laboratory.

The geochemical test program was designed to assess the degree of risk from the presence of reactive sulfides, acid generation, and leaching of soluble metals/metalloids and salts. The assessment also included characterisation of standard soil parameters including salinity, cation exchange capacity and exchangeable sodium percentage.

ES4 Conclusions

The results from geochemical testing of the overburden and interburden materials sampled from KCCM Eastern Area indicate that:

- Most materials have negligible sulfur, low to high Acid Neutralising Capacity (ANC), and are classified as Non Acid Forming – Barren (NAF-Barren). There is therefore a high factor of safety and low risk of acid generation from most of these materials;
- Some of the weathered claystone overburden material may initially release some existing acidity into contact water;
- All materials have low concentrations of metal(loid)s that do not present a significant risk to the environment with respect to total metal(loid) concentrations in solids;
- Most materials generate pH neutral to slightly alkaline contact water with low salinity and low concentrations of dissolved metals/metalloids and therefore poses negligible risk of potential impact on the quality of surface and groundwater resources;
- Some of the weathered claystone overburden material may initially generate slightly acidic pH contact water; however, leachate salinity and dissolved metal(loid)s concentrations are likely to be low;
- Some materials may require some fertiliser addition to provide a reasonable growth medium for vegetation roots if used as a rehabilitation medium; and
- Most materials are likely to be sodic and may have an increased risk of being susceptible to dispersion and erosion.

ES5 Recommendations

As a result of the geochemical assessment work completed on the material it is recommended that CS Energy considers:

- Decommission the KLC tests;
- Post KLC testing of selected sample materials after decommissioning of the KLC tests. The testing should comprise Acid Base Accounting (pH, EC, total sulfur, ANC and acidity/alkalinity), whole-rock metal analysis, and X-ray diffraction (XRD) mineralogical analysis;
- Additional geochemical testing of representative samples of weathered claystone material comprising Acid Base Accounting (pH, EC, total sulfur, ANC and acidity/alkalinity), whole-rock metal analysis, and XRD mineralogical analysis; and
- Field trials during the operational phase of mining to determine the best rehabilitation option for mine waste materials (including sodic/dispersive materials) at the project site both progressively and at mine closure.

Surface water and seepage from the proposed mining areas should be monitored to ensure that key water quality parameters remain within appropriate criteria. It is therefore recommended that CS Energy:

- Monitors surface run-off and seepage from the proposed areas for pH, EC, total suspended solids (TSS) on a quarterly basis and the suite of water quality analyses described in **Table C5** (**Attachment C**) of this report opportunistically and at least on an annual basis.

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GLOSSARY OF TERMS AND ACRONYMS

Acidity	A measure of hydrogen ion (H^+) concentration; generally expressed as pH.
Alkalinity	A measure of the capacity of a water to neutralise acids.
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.
AMD	Acid and metalliferous drainage caused by exposure of sulfide minerals in mine waste materials to oxygen and water. Typically characterised by low pH and elevated concentrations of salts, sulfate and metals.
ANC	Acid neutralising capacity of a sample as kg H_2SO_4 per tonne of sample. Commonly referred to as the buffering capacity.
ANC:MPA Ratio	Ratio of the acid neutralising capacity and maximum potential acidity of a sample. Used to assess the risk of a sample generating acid conditions.
Dispersive	Dispersive soil and rock materials are structurally unstable and disperse into basic particles such as sand, silt and clay in water. When a dispersive soil is wet, the basic structure has a tendency to collapse, whereas when it is dry it is prone to surface sealing and crusting.
EC	Electrical Conductivity, expressed as µS/cm, is a measure of electrical conductance.
eCEC	Effective cation exchange capacity provides a measure of the amount of exchangeable cations (Ca, Mg, Na and K) in a sample.
ESP	Exchangeable sodium percentage provides a measure of the sodicity of a materials and propensity to erode.
KLC test	Kinetic leach column tests are procedures used to measure the geochemical/ weathering behaviour of a sample of mine material over time, and are a recognised laboratory method of replicating natural processes affecting in-situ mine material.
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-Barren	Non-acid forming and barren of sulfur (i.e. less than or equal to 0.1% sulfur). 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	Net acid producing potential expressed as kg H_2SO_4 per tonne. NAPP is the balance between the capacity of a sample to generate acidity (MPA) minus its capacity to neutralise acidity (ANC).

NMD	Neutral mine drainage typically caused by exposure of sulfide minerals in mine waste materials to oxygen and water and then neutralisation by gangue minerals. Typically characterised by neutral pH and elevated concentrations of salts, sulfate and metals.
Ore	Material that has been mined with sufficient value to warrant processing.
PAF	Potentially acid forming. Geochemical classification criterion for a sample that has the potential to generate acid conditions.
PSD	Particle size distribution of a sample material measured by hydrometer.
%S	Percent sulfur. A measurement unit for the sulfur content of a sample material.
Scr	Chromium reducible sulfur test measures the sulfide sulfur content of a sample material.
Sodic	Sodic soil and rock materials are characterized by a disproportionately high concentration of sodium (Na) in their cation exchange complex and are innately unstable, exhibiting poor physical and chemical properties, which impede water infiltration, water availability, and ultimately plant growth.
Static test	Procedure for characterising the geochemical nature of a sample at one point in time. Static tests may include measurements of mineral and chemical composition of a sample and the Acid Base Account.
Total Sulfur	Total sulfur content of a sample generally measured using a 'Leco' analyser expressed as % S.
TSS	Total suspended solids is a measurement of the suspended solids concentration in a water sample.
Waste Rock	Material that surrounds an ore body and must be removed to mine the ore.

1.0 INTRODUCTION

1.1 Project Description

RGS was commissioned by CS Energy Limited (CS Energy) to complete a geochemical assessment of mine waste from Kogan Creek Coal Mine. The mine is referred to as Kogan Creek Coal Mine (KCCM) in this report and is located in the western Darling Downs of Queensland near the town of Chinchilla (**Figure 1-1, Attachment A**). The coal mine delivers approximately 2.8Mtpa of Run-of-Mine (ROM) raw coal from to the power station. The coal is not washed and subsequently no wash plant is required and no coal reject or tailing is produced.

Overburden is removed to access the coal seams and is then transferred to the spoil dumps, which progressively refill the void after the coal has been mined, allowing for the rehabilitation of the land. The mine has a shallow overburden thickness and coal starts from approximately 15 to 30 metres below the surface. The three main seams of coal (M, N and O) have a total thickness of 12 metres and dip gently to the south west. The coal sits in relatively flat 0.1 metre to 3 metre thick seams with parting layers of rock and clay between each coal seam. The coal is selectively mined from the parting and transported to the Run of Mine (ROM) pad, where it is loaded into the crusher and conveyed directly to the power station. The waste parting bands (interburden) are hauled to the spoil dumps.

RGS Environmental Pty Ltd (RGS) has been retained by CS Energy to assist in an assessment of the geochemical characteristics of the overburden and interburden spoil materials at KCCM. This work follows on from previous work completed by RGS in 2014/15 as part of an evaluation of the merits co-disposal of ash within spoil (RGS, 2015). The proposed mining area under consideration is located to the east of the mining area (Eastern Area) previously studied by RGS. The objective is to determine whether the spoil materials generated from removal of overburden and interburden materials at the Eastern Area are geochemically benign.

1.2 Climate

The climate is humid sub-tropical according to the Köppen climate classification (Cfa), and has two distinct seasons characterised with a hot, wet summer period generally from December to February and a relatively cool dry winter period from June to August. January is the hottest month with a mean maximum temperature of 32.4°C and mean minimum of 18.7°C, while July is the coolest with a mean maximum temperature of 19.6°C and mean minimum temperature of 4.0°C. Rainfall is variable with a mean monthly rainfall varying between 20.2mm and 96.4mm, with the majority of rainfall generally over the summer months. Daily evaporation is in the order of 10mm in summer and approximately 3mm in winter months.

1.3 Geology

The geological description below was sourced from Xenith (2014).

1.3.1 Regional Geology

KCCM is located on the north-eastern margin of the Early Jurassic to Early Cretaceous Surat Basin. The Surat Basin extends from the Moreton Basin East of the Kumbarilla Ridge to Roma in the West and as far North as Taroom, covering a total area of 270,000 km^2 (Xenith, 2014). The Surat Basin occurs stratigraphically above the north-south trending Permian to Triassic Sydney-Gunnedah-Bowen Basin system; with the Gunnedah Basin underlying in the east and the Bowen Basin in the northeast.

Structure

The Surat Basins' extents are limited by the New England Fold Belt towards the easternmost part of the Basin. The Nebine Ridge delineates the boundary between the Surat Basin and the Eromanga Basin to the west. In Queensland the Kumbarilla Ridge divides the Surat Basin from the Clarence-Moreton Basin to the east. The northern and southern extents of the Surat Basin are limited by the

outcropping of its stratigraphic succession (NSW Trade & Investment, 2013). Similar to the Bowen Basin, the deposits within the Surat Basin are typically flat-lying, with dips increasing in areas proximal to interpreted faulting. The deposits are laterally restricted, resulting in sub-basins, approximately 10 km in length.

Stratigraphy

Sediments within the Surat Basin consist of Jurassic to Cretaceous fluvial, lacustrine and marginal marine sediments, and coal-bearing successions. The deposits are laterally restricted (NSW Trade & Investment, 2013). The economically mineable coal seams within KCCM are restricted to the upper portion of the Juandah Coal Measures of the Walloon Subgroup, and are the equivalents of the Macalister and Nangram seams (**Figure, Attachment A**). The Juandah Coal Measures are unconformably overlain by the Springbok Sandstone and overlie the Tangalooma Sandstone, which in turn overlie the Taroom Coal Measures. The Walloon Subgroup is mostly composed of siltstones and silty sandstones, and only relatively small intervals of coal (approximately 10%) which have been deposited by swamps or lakes.

1.3.2 Local Geology

Stratigraphy

The stratigraphic units in KCCM are the upper portion of the Late Jurassic Springbok Sandstone and the Middle Jurassic Juandah Coal Measures. Historically, six distinct coal intervals have been defined in the Juandah Coal Measures; including, from the top of the sequence: Kogan, Macalister, Nangram, Wambo, Iona and Argyle. These seams occur as numerous thin coal plies within a fine grained sediment unit, separated by relatively massive alluvial channel and point bar sandstone units. Limited information suggests that the Kogan Seam has often been eroded by the unconformably overlying Springbok Sandstone, and in some cases the minor coal seams in the Springbok Sandstone may have been misinterpreted as the Kogan Seam in the Juandah Coal Measures. Generally, the Springbok Sandstone consists of an upper sandstone unit, a middle fine-grained unit often containing thin, relatively dirty coal seams, and a lower sandstone unit.

Coal Seams

The coal seams in the KCCM area have been informally named into major seams, in descending order K, M, N, O, R, S, T and U (**Figure 1-3, Attachment A**). The M, N and O seams are correlative to the Macalister and Nangram seams; whereas the R, S and T seams are correlative to the Wambo Seam.

The seams have then been further subdivided into plies which represent the mining method which is used in the open cut mine, with the seam correlations made based on geophysical log signatures. A minimum thickness of 0.10 m was used to define a coal seam, with any coaly sections less than 0.10 m incorporated into a parting band and given a stone band name. Any stone bands less than 0.10 m thick were incorporated into the coal seam that existed above or below it.

Odd-numbered plies are the coal bands, while even-numbered plies represent the interburden or parting stone bands. The current resource estimate model has incorporated a “parent-child” relationship and these relationships are present in the lower plies of the M Seam (M9-17), the upper and lower plies of the N Seam (N1-3 and N7-11), all plies of the O Seam (O1-3 and O5-7), and the middle plies of the T Seam (T3-5). The seams are subdivided as follows, and shown in **Figure 1-3 (Attachment A**):

- M Seam consists of plies M1 – M18
- N Seam consists of N1 – N12
- Seam consists of O1 – O8
- R Seam consists of plies R – RS
- S Seam consists of plies S1 – S6, and
- T Seam Consists of plies T1 – T7.

The geochemical assessment included units from surface to through to the base of the R seam. The coal seams within KCCM show some variation on a ply basis in terms of seam thickness and quality characteristics. Seam splitting and coalescence is common, as is deterioration into stony-coal material over relatively short distances.

Soft tuffaceous mudstone bands do exist within the coal seams or can sometimes be greater than 0.10 m thickness, in which case they are named separately. These soft bands are interpreted to be reworked ash fall tuffs.

1.3.2 Structural Framework

Faults

The general structure of KCCM shows a gentle dip to the South with the seams sub-cropping along the northern and eastern margin of the deposit (**Figure 1-4, Attachment A**). Seam dips range from 1 degree up to a maximum of 5 degrees in the vicinity of the interpreted fault lines.

Within the deposit, three major faults have been interpreted with the general North-South trend. These faults are regarded as being a moderate size with throws ranging from 2 m up to 20 m along the western-most fault.

These faults have been interpreted but have not been modelled, as further definition drilling will be required to assist interpretation as to how they may be related to sedimentary washouts.

Base of Weathering

The base of weathering has been logged in the majority of the holes within KCCM drilling database. This horizon represents the upper cut-off for the coal seams. Depth of weathering ranges from a minimum of 8 m to a maximum of 42 m in the southeast of the topographical high area.

Depth of Cover

Due to the shallow dip of the seams to the South, the general depth of cover to the M Seam increases from the sub-crop zone in the North of the deposit (approximately 15 m) to approximately 60 m at the southern lease boundary (**Figure 1-5, Attachment A**). The overburden thickness is related to the topographic high areas across the deposit.

1.4 Scope of Work

The scope of work involved completing a geochemical assessment of overburden, interburden and uneconomical coal seam (parting, roof and floor) spoil materials from the Eastern Area in accordance with relevant industry guidelines (DME, 1995, DEHP, 2013; COA, 2016a,b; and INAP, 2009). The scope of work was developed by RGS based upon information provided to RGS by CS Energy and previous site experience. The work was undertaken in two stages and is outlined below:

***Stage 1*:**

- Data and document review including geochemical, geological, resource assessment, and surface water and groundwater quality information;
- Design and implementation of a sampling protocol to align with available drill core from the drilling program;
- Provision of written instructions for CS Energy/Xenith personnel regarding samples selection and collection;
- Provision of a detailed “stand-alone” technical report suitable as an Appendix to any subsequent regulatory approval documentation; and
- Provision of a brief monthly update report, to include confirmation of progress against the work schedule and performance against budget.

***Stage 2*:**

- Selection of appropriate samples and sample mixtures to complete kinetic leach columns (KLC);
- KLC testing on relevant mine materials (overburden/interburden/coal seam) over a period of six months;
- Collation and interpretation of KLC test results and comparison of leachate chemistry with relevant water quality guideline data; and,
- Production of a technical report describing the test methodology, results, findings and conclusions with recommendation for further work, if required.

1.5 Geochemical Assessment and Report Structure

The geochemical test program used for the project was designed to obtain and characterise representative samples of overburden and interburden spoil materials at KCCM, particularly for the Eastern Area. This is inclusive of uneconomical coal seams (parting, roof and floor) material which also report as spoil.

The detailed methodology used for the sampling and testing program is described in **Section 2.0**.

Representative samples of overburden and interburden materials, associated with KCCM Eastern Area, were collected and transferred to ALS Brisbane laboratory (ALS) for static geochemical testing. Selected samples were then subjected to additional static geochemical tests also at ALS. Based on the results of the initial testing, samples were selected for KLC testing at RGS in-house laboratory.

The overburden and interburden waste characterisation work program was completed in accordance with mine closure guidelines where applicable (COA, 2016b).

The geochemical results obtained from the geochemical test program on these sample materials are presented at **Section 3.0.**

The main conclusions and potential management measures for overburden and interburden materials generated from the project are presented at **Section 4.0**. A complete list of references relied upon to complete this report are presented at **Section 5.0**.

2.0 METHODOLOGY

RGS personnel (Dr Alan Robertson) worked closely with CS Energy (geological and environmental personnel) and Xenith to facilitate the development of an appropriate sampling and geochemical testing strategy for overburden and interburden materials associated with KCCM Eastern Area.

2.1 Sampling and Characterisation Program

2.1.1 Sampling Program

The sampling methodology used to obtain representative samples of overburden and interburden spoil from the KCCM Eastern Area was undertaken in accordance with relevant guidelines documents. Whilst there are no specific regulatory requirements regarding the number of samples required, existing risk-based technical guidelines for the geochemical assessment of mine rock in Australia (AMIRA, 2002; COA, 2016a) and worldwide (INAP, 2009) have been utilised by RGS as a framework for the sampling program.

The sampling strategy was based on:

- Existing knowledge of the geology/stratigraphy and geochemistry of the site and expected low potential for any significant environmental or health impacts;
- Size of operation;
- Sample representation requirements;
- Material volumes;
- Level of confidence in predictive ability; and
- Cost.

CS Energy provided a suitable qualified person (Xenith geologist) to collect representative samples of the required range of overburden and interburden materials. RGS worked closely with the supervising geologist and provided a sampling protocol as part of the associated proposal (Kogan Creek Mine: Proposal and Sampling Protocol). The sampling protocol was developed to utilise samples of drill core and drill chip material from a Xenith drilling program which commenced in January, 2016. Approximately 33 drill holes were completed with a target drill hole spacing of 125m in an area of the open cut pit proposed to be mined over the next few years (Eastern Area). Drill core and drill chip materials were sampled from up to six drill holes with a drill hole spacing of approximately 250m (**Figure 2-1, Attachment A**).

A total of 66 overburden samples and 55 uneconomical coal seam (roof, floor and parting) samples were collected from the drilling program. The samples were subjected to a range of static and kinetic geochemical tests at ALS Brisbane as described at **Section 2.1.2**.

The location of the drill holes used for sampling and characterisation is provided in **Figure 2-1 (Attachment A)** and the distribution of the samples and drill holes by location is provided in **Table 2-1**.

Table 2-1: Summary of Drill Holes and Samples Collected for Characterisation by Location

Sample Type	No. Drill Holes	No. Samples
Overburden	6	66
Coal Seam Roof	6	6
Coal Seam Parting	6	44
Coal Seam Floor	6	5
Total	**6**	**121**

The number of samples was selected to provide a good statistical representation of the amount and types of overburden/interburden materials expected to be generated at KCCM Eastern Area. The drill core samples were collected by CS Energy geological personnel (Xenith), who dispatched the samples to ALS Brisbane laboratory for sample preparation and characterisation.

2.1.2 Characterisation Program

The waste rock drill core samples received by ALS Brisbane were prepared by crushing to pass 5 mm, subsampling and pulverising to ≤ 75 µm particle size. 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.

A series of static and kinetic geochemical tests were completed on the samples. The geochemical test program was designed to assess the degree of risk from the presence of reactive sulfides, acid generation, and leaching of soluble metals/metalloids and salts. The assessment also included characterisation of standard soil parameters including salinity, cation exchange capacity and exchangeable sodium percentage.

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

Static Tests

Static geochemical tests provide a 'snapshot' of the characteristics of a sample material at a single point in time. These tests were completed to screen all samples before selecting individual samples for more detailed static test, kinetic tests, and physical tests.

The Acid Base Account (ABA) was used as a screening procedure whereby the acid neutralising and acid generating characteristics of a sample material were assessed. All 121 samples (66 overburden samples and 55 interburden samples) were screened using ABA. The ABA screening procedure included static geochemical testing for the following parameters:

- pH (1:5 w:v, sample:deionised water);
- Electrical conductivity (EC) (1:5 w:v, sample:deionised water);
- Total sulfur [Portable handheld X-ray fluorescence; pXRF];
- Total sulfur [Leco method]; and
- Acid neutralising capacity (ANC) [AMIRA, 2002 method].

From the total sulfur and ANC results, the maximum potential acidity (MPA) and net acid producing potential (NAPP) values of the sample materials were calculated.

The initial ABA test results indicated that total sulfur content was greater than average crustal abundance (0.1%) (INAP, 2009) in only five of the 121 samples, therefore, these five samples were subjected to further sulfur speciation testing. The samples were tested for chromium reducible sulfur (Scr) [AS 4969.7-2008 method]. Scr data (for fresh samples) generally provides a more accurate representation of the MPA that could theoretically be generated, as acid generation primarily occurs from oxidation of reactive sulfides (eg. pyrite), whereas total sulfur includes other forms of sulfur such as sulfate and organic sulfur, which generally produce negligible acidity.

After the results of the ABA screening tests were received and interpreted, 10 select composite samples were subjected to multi-element analysis. The samples were selected based on material type, location, lithology and geochemical characteristics. The selected samples underwent multi-element testing on both the solid and soluble fractions and were specifically tested for:

- Total acidity and alkalinity (automatic titrator measured as $CaCO_3$);

- Total metals/metalloids (Al, As, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Sb, Se, Th, U, V and Zn) in solids [HCl and HNO_3 acid digest followed by FIMS and/or ICP-AES/MS];
- Total cations (Ca, Mg, Na and K) [HCl and HNO_3 acid digest followed by ICP-AES/MS];
- Soluble metals/metalloids (Al, As, B, Ba, Be, Cd, Cr, Co, Cu, Fe, Hg, Pb, Mn, Mo, Ni, Sb, Se, Th, U, V and Zn) [ICP-AES/MS and FIMS (1:5 w:v water extracts)];
- Major cations (Ca, Mg, Na and K) [ICP-AES/MS (1:5 w:v water extracts)];
- Major anions (Cl, F, SO_4 and PO_4) [ICP-AES/MS and PC Titrator (1:5 w:v water extracts)];
- Exchangeable Cations (Ca, Mg, Na, K) [by ICP-AES/MS]; and
- Effective Cation Exchange Capacity (eCEC) and Exchangeable Sodium Percentage (ESP).

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

Kinetic Tests

Following receipt and interpretation of the static geochemical test results, four Kinetic Leach Column (KLC) tests were set up at the RGS in-house laboratory using crushed samples. The KLC tests comprised composite samples of overburden and interburden materials. The KLC tests commenced in April 2016 and were operated under a monthly watering and leaching cycle for six months to October 2016.

Approximately 1.5 kg of each selected sample was accurately weighed and used in the KLC tests with the sample weight varying according to sample bulk density.

Heat lamps were used on a daily basis to simulate sunshine and ensure that the KLC test materials were unsaturated and subject to oxidising conditions, between leaching events (essentially an assumed 'worst case' scenario for sulfide oxidation and potential acid/salt generation). A schematic diagram of the KLC test arrangement is provided in **Attachment B**.

The KLC test material comprised crushed material passing through a nominal 5 mm sieve size. All leachate samples collected from the KLC tests were sent to ALS Brisbane for analysis of various parameters including:

- pH and EC (probes and meter);
- Acidity and alkalinity [Automatic titrator];
- Dissolved metals/metalloids (Al, As, B, Ba, Be, Cd, Cr, Co, Cu, Fe, Hg, Pb, Mn, Mo, Ni, Sb, Se, V and Zn) [ICP-AES and FIMS];
- Dissolved major cations (Ca, Mg, Na and K) [ICP-AES]; and
- Dissolved major anions (Cl, F, PO_4, SO_4) [ICP-AES].

KLC test results are presented in **Attachment C** and a copy of the geochemical results received from ALS Brisbane for the KLC tests is provided in **Attachment D.**

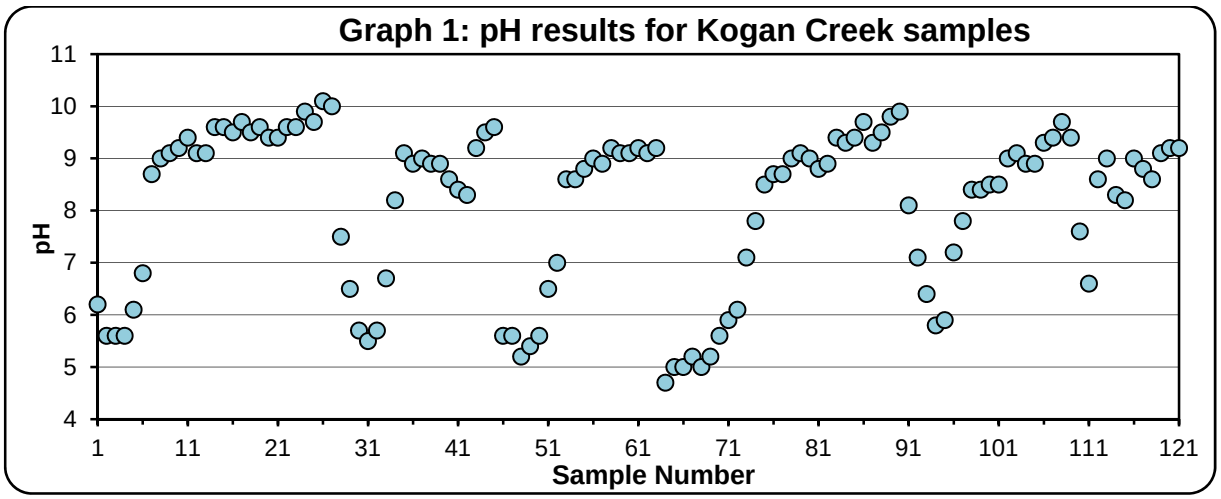
3.0 GEOCHEMICAL TEST RESULTS

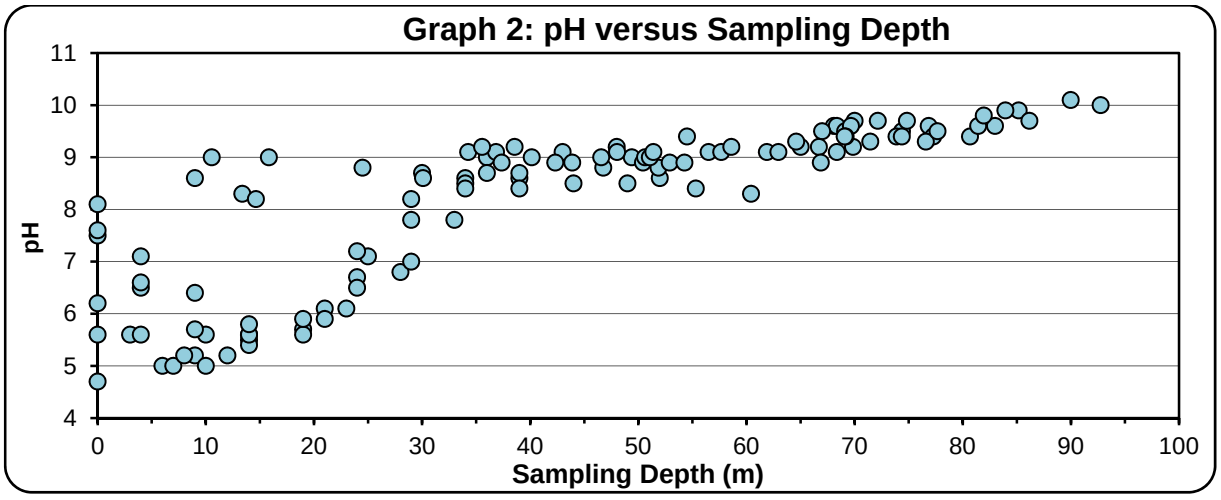
The ABA results for the 121 overburden/interburden samples from the KCCM Eastern Area included in the geochemical assessment program are provided in **Table C-1 (Attachment C).** An explanation of the methodology used in this section, including a description of the ABA screening method, is provided in **Section 2.1.2** and a glossary of terms and acronyms used is listed on **Pages VII** and **VIII**.

3.1 Acid Base Account Results

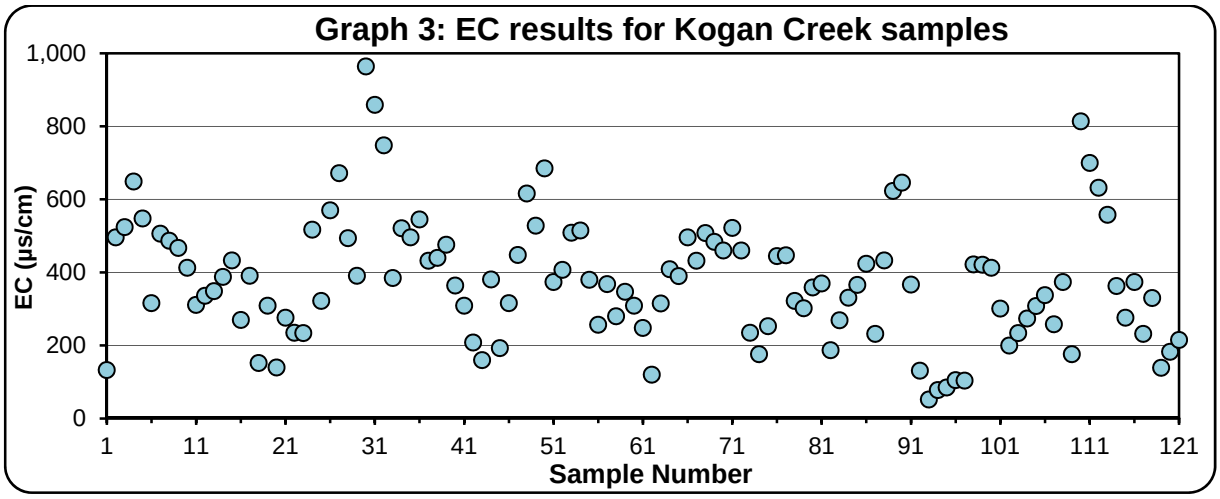
The ABA data trends discussed in this section are presented in **Graphs 1** to **6.**

- **pH**: The natural pH of the deionised water used in the pH tests is typically in the pH range 5.0 to 7.0. The $pH_{(1:5)}$ of the overburden/interburden samples ranges from pH 4.7 to 10.1 and has a slightly alkaline neutral median pH value of 8.9 (**Graph 1**). The $pH_{(1:5)}$ of the samples varied laterally, with an increasing trend in pH value with depth of sampling for each of the holes. The samples collected closest to surface generally had a lower pH value although only one sample (a surface sample) has a pH value less than 5.0 and could be considered slightly acidic (**Graph 2**), while the samples collected at depth were generally slightly alkaline. These material characteristics most likely reflect the depth of natural weathering at the site.

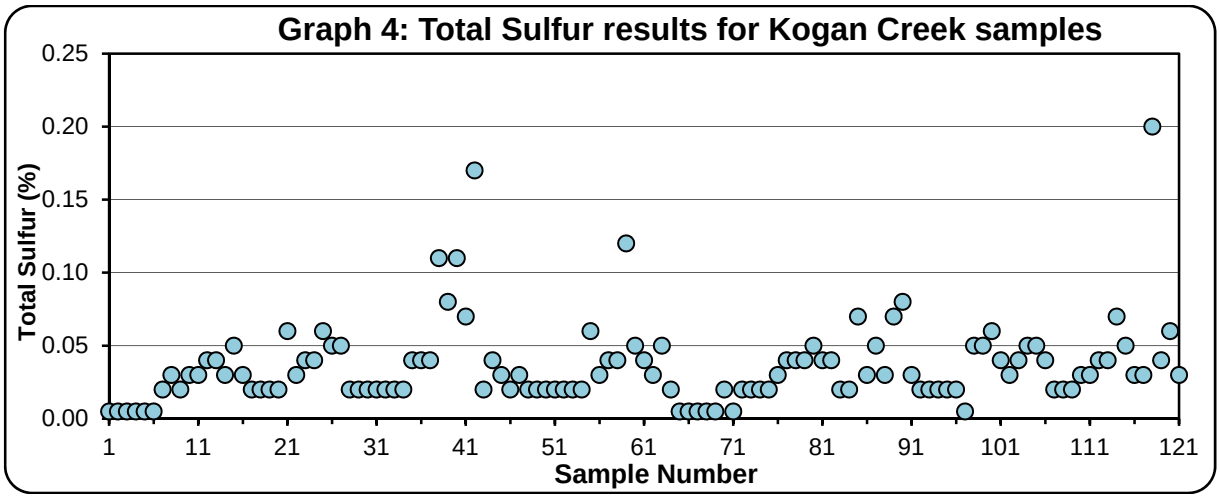




- **Electrical Conductivity (EC)**: The current $EC_{(1:5)}$ of the overburden/interburden samples ranges from 52 to 964 µS/cm and has a moderate median value of 370 µS/cm (**Graph 3**). The correlation between sample EC and sample depth is not as obvious for EC as the pH results.



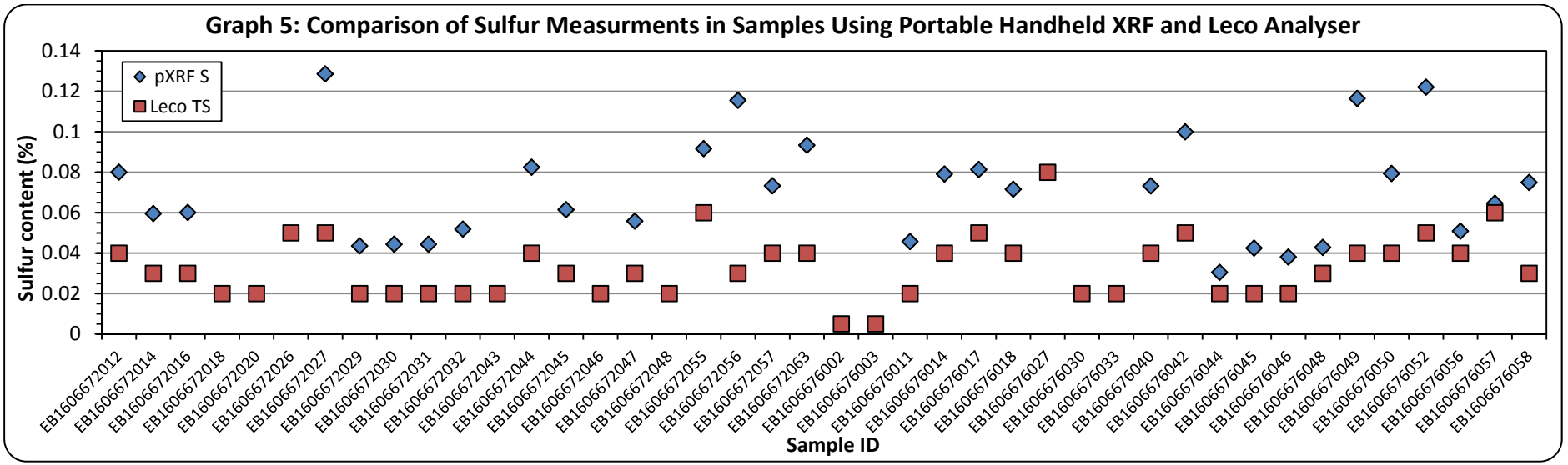
- **Total Sulfur:** The total sulfur content of the overburden/interburden samples is illustrated in **Graph 4** and ranges from 0.005 percent sulfur (%S) to 0.2 %S and is typically very low (median 0.03 %S) compared to average crustal abundance (0.1 %) for this element (INAP, 2009). Materials with a total sulfur content less than or equal to 0.1 %S are essentially barren of sulfur, generally represent background concentrations, and have negligible capacity to generate acidity[1].
- **Chromium reducible sulfur (Scr)** was measured for each five of the overburden/interburden samples (ie. for those samples which have a total S% > 0.1); the CRS value represents the sulfide sulfur content or un-oxidised portion of sulfur. The Scr results indicate that between ~42 to 65% of the total sulfur content is present as sulfide sulfur. The sulfide sulfur portion of the samples is likely associated with oxidisable pyrite or marcasite, while the non-sulfide sulfur portion of the samples is likely associated with secondary mineral sulfates such as gypsum.

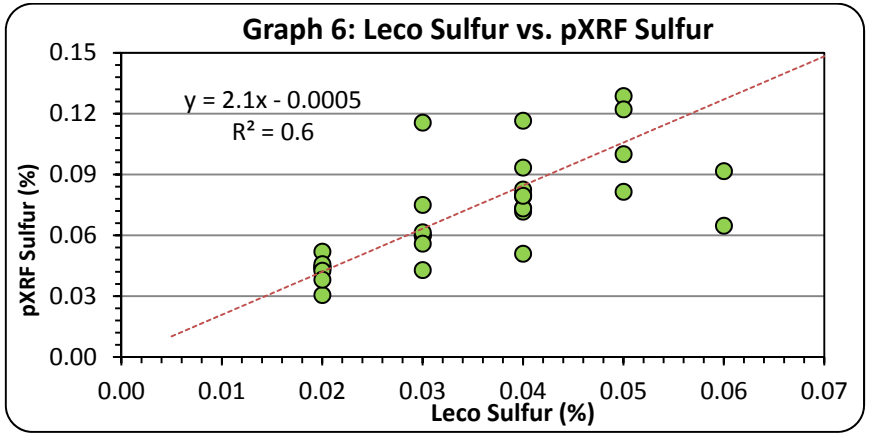


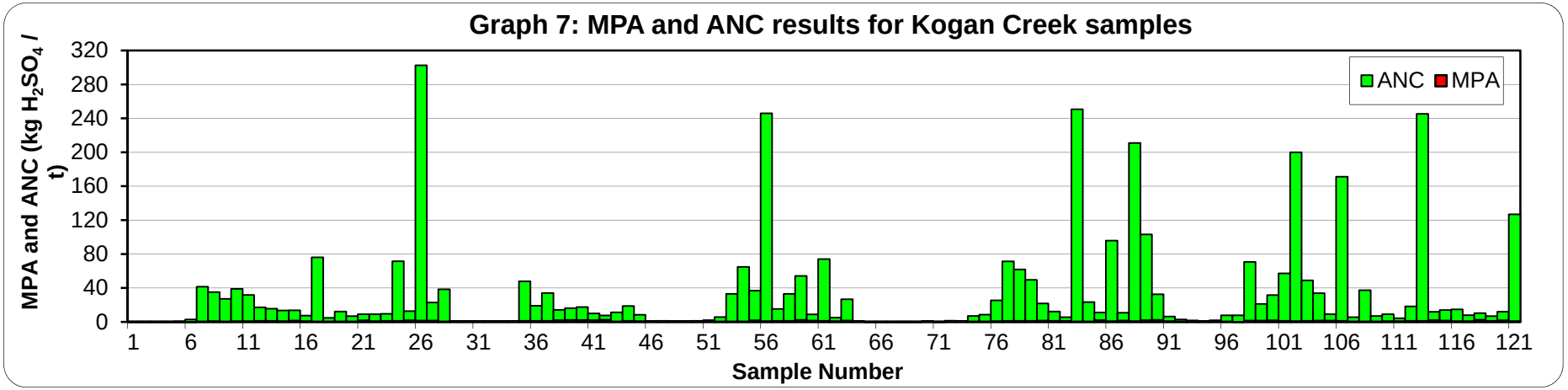
[1] The average crustal abundance of sulfur (0.07 %S) has been rounded up to 0.1 % (INAP, 2009).

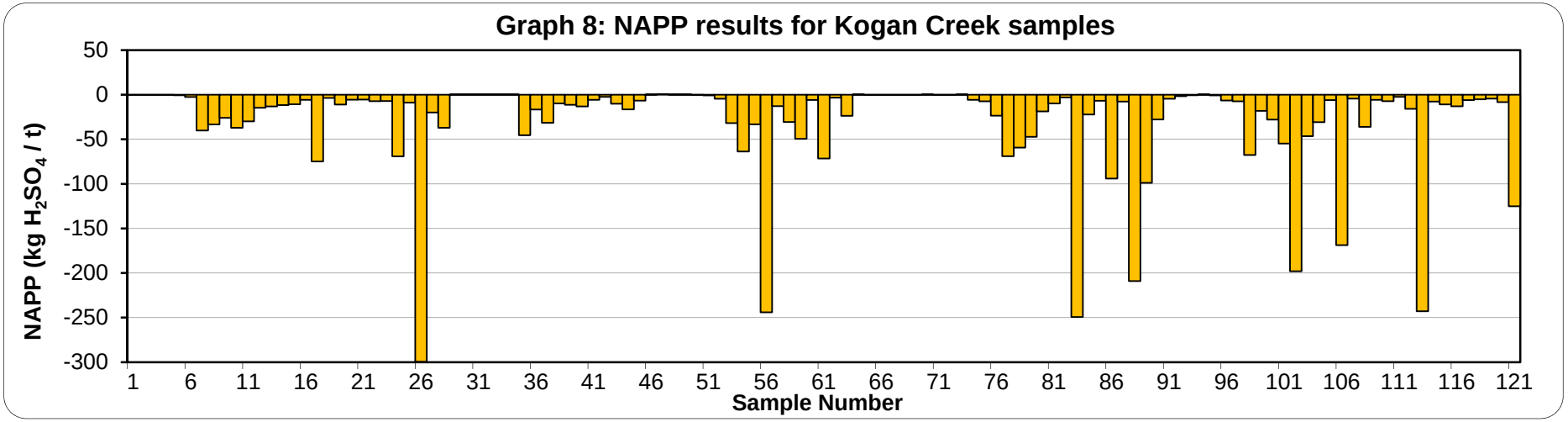
- **pXRF:** The Total Sulfur content of the overburden/interburden samples can also be rapidly ascertained using a portable handheld X-ray fluorescence spectrometer (pXRF). **Graph 5** shows a comparison of the sulfur data obtained from samples using the laboratory Leco analyser and pXRF methods. Similarly **Graphs 6** shows a comparison of sulfur data from samples using a Leco analyser and pXRF. The results show a reasonable correlation between the two methods; however, pXRF results are approximately twice that of the Leco analyser results. Once calibrated, the pXRF has the potential to be used in the field to quickly determine the sulfur content and acid generating nature of overburden/interburden materials that will report as spoil. The pXRF can also be used to simultaneously determine the concentrations of metals in materials, if required.
- **MPA**: The Maximum Potential Acidity (MPA) that could be generated through sulfide oxidation from the overburden/interburden samples is very low and ranges from 0.15 to 2.6 kg H_2SO_4/t (median 0.9 kg H_2SO_4/t) (**Graph 7**). This means that the waste materials represented by these samples have negligible risk of generating any significant acidity.
- **ANC**: The Acid Neutralising Capacity (ANC) value for the overburden/interburden samples is highly variable with a range from low to high (0.3 to 301 kg H_2SO_4/t) and has a median value of 9.8 kg H_2SO_4/t (**Graph 5**). The ANC value significantly increases with depth down a hole, with typically the top ~20 – 30m having negligible ANC.
- **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 calculated NAPP value for the 121 overburden/interburden samples ranges from -299.5 to +0.7 kg H_2SO_4/t and has a median value of -7.7 kg H_2SO_4/t. The NAPP data for the samples are presented in **Graph 6** and illustrate that the majority of the waste rock samples have NAPP values that are close to zero or negative.

Given the typically low sulfur content of the waste rock materials, represented by the 121 overburden/interburden samples, the risk of generating any significant acidity and/or neutral mine drainage (NMD) from bulk materials represented by these samples is negligible.


Graph 5: Comparison of Sulfur Measurments in Samples Using Portable Handheld XRF and Leco Analyser
pXRF S
Leco TS
Sulfur content (%)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
EB1606672012
EB1606672014
EB1606672016
EB1606672018
EB1606672020
EB1606672026
EB1606672027
EB1606672029
EB1606672030
EB1606672031
EB1606672032
EB1606672043
EB1606672044
EB1606672045
EB1606672046
EB1606672047
EB1606672048
EB1606672055
EB1606672056
EB1606672057
EB1606672063
EB1606676002
EB1606676003
EB1606676011
EB1606676014
EB1606676017
EB1606676018
EB1606676027
EB1606676030
EB1606676033
EB1606676040
EB1606676042
EB1606676044
EB1606676045
EB1606676046
EB1606676048
EB1606676049
EB1606676050
EB1606676052
EB1606676056
EB1606676057
EB1606676058
Sample ID


Graph 6: Leco Sulfur vs. pXRF Sulfur
y = 2.1x - 0.0005
R² = 0.6
pXRF Sulfur (%)
0.15
0.12
0.09
0.06
0.03
0.00
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
Leco Sulfur (%)

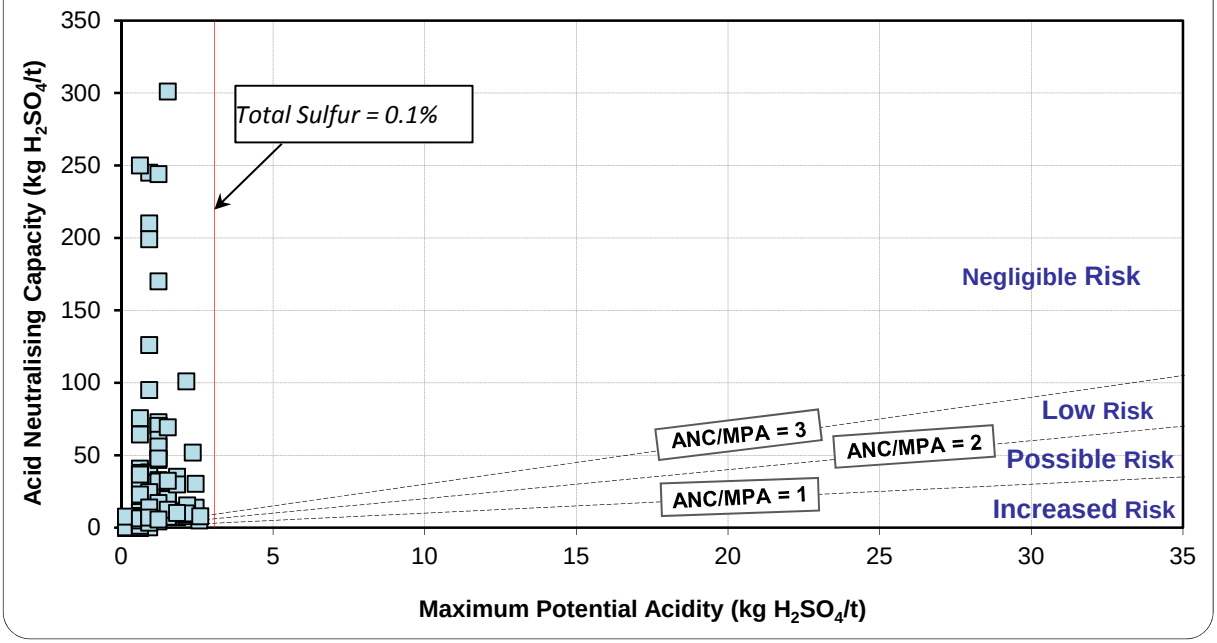

Graph 7: MPA and ANC results for Kogan Creek samples
MPA and ANC (kg H_2SO_4 / t)
320
280
240
200
160
120
80
40
0
ANC
MPA
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
76
81
86
91
96
101
106
111
116
121
Sample Number


Graph 8: NAPP results for Kogan Creek samples
NAPP (kg H_2SO_4 / t)
50
0
-50
-100
-150
-200
-250
-300
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
76
81
86
91
96
101
106
111
116
121
Sample Number

3.1.1 Material Classification

Graph 9 shows a plot of ANC versus MPA for the 121 overburden/interburden samples tested. ANC:MPA ratio lines have been plotted on the graph to illustrate the factor of safety associated with the samples (ie. Net Potential Ratio (ANC/MPA); NPR). Generally those samples with an ANC:MPA ratio of greater than 2 and/or low sulfur content (≤ 0.1 %S) are considered to have negligible risk of acid generation and a high factor of safety in terms of potential for AMD and/or NMD; conversely, samples with an ANC:MPA ratio of less than 1 and/or or elevated sulfur content (> 0.1 %S) are considered to have an elevated risk of acid generation and a reduced factor of safety in terms of potential for AMD and/or NMD (COA, 2016a; and INAP, 2009[2]). All of the overburden and interburden samples fall in the 'negligible risk' domain in the graph and therefore have a high factor of safety and very low risk of acid generation.

Graph 9: ANC vs MPA for Kogan Creek Samples



*calculated from sulphide sulfur where results are available.

The ABA test data presented in **Table C1 (Attachment C)** and discussed in this section have been used to classify the acid forming nature of the 121 samples. These classification criteria generally reflect Australian (COA, 2016a) and international (INAP, 2009) guideline criteria for classification of mine waste materials. **Table 3-1** provides a summary of the criteria used by RGS in this study to classify the acid forming nature of the samples and a breakdown of the number of samples in each classification category by material type.

The data presented in **Table 3-1** illustrate that all the overburden and interburden samples are classified as Non-Acid Forming-Barren (NAF-Barren).

[2] 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.

Table 3-1: Geochemical Classification Criteria

Geochemical Classification	Total Sulfur[1] (%)	NAPP (kg H_2SO_4/t)	ANC:MPA Ratio	Waste Samples (n = 121)
Non-Acid Forming (Barren)[2]	≤ 0.1	-	-	121
Uncertain[3]	> 0.1	-5 to ≤ +5	< 2	0
Potentially Acid Forming	> 0.1	> +5	< 2	0

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

Overall, these results confirm that the overburden and interburden materials represented by these samples have a high factor of safety with respect to potential acid generation and there is therefore a negligible risk of AMD or NMD generation from these materials at KCCM.

3.2 Multi-Element Concentration in Solids

Multi-element scans were carried out on six composite overburden samples and four composite interburden samples to identify any elements (metals/metalloids) present in these materials at concentrations that may be of environmental concern with respect to materials handling, storage, and water quality. The results were compared to potentially relevant guideline criteria to determine any concerns related to mine operation and final rehabilitation. To provide relevant context, RGS has compared the total metal(loid) concentration in samples to National Environmental Protection Council (NEPC) Health-based Investigation Levels (HIL(C)) for soils in public open spaces (NEPC, 2013).

The ten composite samples used in the multi-element test work are described in **Table C2 (Attachment C)**. The results from multi-element testing (total metals/metalloids) of the samples are presented in **Table C3 (Attachment C)**.

The results indicate materials typically have low total metal(loid) concentrations in solids, some below the laboratory limit of reporting (LoR), and all below the applied NEPC (HIL(C)) guideline for soils. In particular, the concentrations of thorium and uranium in the samples is low and therefore the concentration of any radio-nuclides associated with these elements is also likely to be low.

All sample compositions are dominated by iron (Fe) and aluminium (Al) with the concentrations generally >20,000ppm (2 wt.%) and >10,000ppm (1 wt.%), respectively. Calcium (Ca), magnesium (Mg), sodium (Na) and potassium (K) are also abundant elements in all samples with concentrations generally betwenn 10,000 to 1,000ppm (1 to 0.1 wt.%); however, it needs to be highlighted that some chemical constituents, such as silica (Si), were not measured.

3.3 Assessment of Element Enrichment

To provide additional context and in line with mining industry guidelines (COA, 2016a,b; and INAP, 2009), the multi-element results described in **Section 3.2** for the ten selected overburden and interburden samples were also compared to the average background concentration (average crustal abundance) of those elements (metal/metalloids) in soil and rock **(Table C-3, Attachment C)**. From this comparison, a geochemical abundance index (GAI) was calculated. The GAI quantifies an assay result for a particular element in terms of the average crustal abundance for that element. The index, based on a log (2) scale, is expressed in seven integer increments (0 to 6), which correspond to enrichment factors from 0 to over 96 times average crustal abundance, as shown in **Table 3-2**.

Table 3-2: Geochemical Abundance Index (GAI) values and Enrichment Factors

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

As a general rule, a GAI greater than or equal to 3 indicates enrichment to a level that may warrant further investigation. This is the case with some environmentally important 'trace' elements, such as As, Cd, Cu and Zn, rather than with major rock-forming elements, such as Ca, Mg, K and Na.

Elements identified as enriched may not necessarily be a concern for revegetation, drainage water quality or public health, but their significance should still be evaluated. The GAI only provides an indication of metal(loid)s that may be enriched relative to the global average crustal abundance, some points to consider:

- The median crustal abundance varies between different literature sources, therefore affecting the calculated GAI values.
- If a sample is shown to be enriched relative to the average crustal abundance, there is no direct correlation that that particular sample will also leach metal(loids) at elevated concentrations. The mobility of metal(loids) is dependent on mineralogy, adsorption/desorption and the environment in which it occurs.
- Although there are a number of elements elevated relative to the median crustal abundance, the nature of an ore deposit may mean the background levels are always expected to be elevated.

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

The GAI results for samples, presented in **Table C4** (**Attachment C**), indicate that all the samples tested have a GAI values below 3 for each of the metal(loid)s measured.

As previously stated in **Section 3.2**, the concentrations of all elements in the samples are all below the applied NEPC (HIL(C)) guideline for soils. In addition, most elements are expected to be relatively immobile in the spoil material and should be sparingly soluble in any water which contacts these materials. The solubility of multi-elements in water extracts from the ten selected samples is discussed in **Section 3.5**.

3.4 Exchangeable Cations and Sodicity

The exchangeable cation results for seven of the 10 selected composite samples are presented in **Table C3 (Attachment C).** The results indicate that the effective Cation Exchange Capacity (eCEC) of the samples ranges from 10.8 to 24.8 % meq/100g and is typically low to moderate (median = 10.6 meq/100g). These values indicate that the materials are typically within the 'moderate' range for eCEC (**Table 3-3**) and may require some fertiliser addition to provide a reasonable growth medium for vegetation roots if used as a rehabilitation medium.

The exchangeable sodium percentage (ESP) results for the 10 overburden and interburden samples range from 10.8 to 24.8 %, with a median ESP of 18.6 %. Generally samples with ESP values less than 6 are considered non-sodic, greater than 6 are considered sodic and greater than 14 are considered strongly sodic and may be susceptible to dispersion and erosion (Isbell, 2002; and Northcote and Skene, 1972). Hence, most materials represented by the selected samples are likely to be sodic to strongly sodic and have an increased risk of being susceptible to dispersion and erosion.

Table 3-3: Ratings for Effective Cation Exchange Capacity

eCEC Rating	CEC meq/100g
Very Low	<6
Low	6-12
Moderate	12-25
High	25-40
Very High	>40

3.5 Water Quality Static Tests

There are no specific regulatory criteria for metal(loid) concentrations in leachate from waste materials on mine sites in Queensland. As such, RGS has compared the multi-element results in water extracts from 10 samples from the Project, described in **Section 3.2** and **3.3**, with Australian guidelines for freshwater aquatic ecosystems (95 % species protection level) and livestock drinking water (ANZECC & ARMCANZ, 2000) guideline values. 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 also be recognised that direct comparison of geochemical data with guideline values can be misleading. For the purpose of this study, guideline values are only provided for broad context and should not be interpreted as arbitrary 'maximum' values or 'trigger' values. Using sample pulps (ground to passing 75 µm) provides a very high surface area to solution ratio, which encourages mineral reaction and dissolution of the solid phase. As such, the results of screening tests on water extract solutions are assumed to represent an assumed 'worst case' scenario for initial surface runoff and seepage from overburden and interburden materials reporting as spoil.

The results from multi-element testing of water extracts (1:5 sample:water) from the 10 composite samples are presented in **Table C5 (Attachment C),** respectively. The water extracts have a pH value that ranges from slightly acidic (pH 5.2) to alkaline (pH 9.80) (median pH 9.00). While 6 of the 10 pH values lie outside of the pH range (pH 6 to 9) for 95 % species protection in freshwater aquatic ecosystems (ANZECC & ARMCANZ, 2000), the average pH value for bulk materials is likely to be slightly alkaline and within the 6 to 9 pH range. The water extracts have low to moderate EC values ranging from 288 to 864 µS/cm (median 457 µS/cm) indicating low to moderate levels of salinity.

The total concentration of major ions in the water extracts is relatively low. The dominant major ions are generally bicarbonate, sodium and chloride. The concentration of soluble sulfate in the water extracts ranges from 1 to 40 mg/L and is well below the applied (ANZECC & ARMCANZ, 2000) water quality guideline criterion (1,000 mg/L) for livestock drinking water.

The water extracts have a current measured acidity in the range of 0.1 to 118 mg/L, with the majority of samples showing leached current acidity below laboratory LoR; the samples that leach acidity are associated with lower pH values (pH < 6). The current total alkalinity of the water extracts ranges from 60.4 to 9,620 mg/L and has a median value of 4,970 mg/L, which is considered high. The alkalinity value is mainly due to the presence of bicarbonate in the water extract samples. The two samples with reduced pH values represent relatively shallow claystone and sandstone overburden materials in the stratigraphic profile (most likely weathered) at the site. The concentrations of both iron and sulfate in these samples are low indicating that the reduced pH values are not associated with sulfide oxidation.

The concentration of trace metals/metalloids tested in the waste rock water extracts is typically very low, predominantly below the laboratory LoR, and typically well below the applied water quality guideline criteria where these exist. A few samples exceed the freshwater aquatic ecosystem threshold (ANZECC & ARMCANZ, 2000) for aluminium (3 samples) and arsenic (4 samples).

The risk of potential impact on the quality of surface and groundwater from the representative samples at the Project should therefore be low, although these findings should be confirmed by more detailed KLC testing and during operations by ongoing surface water and groundwater monitoring programs.

3.6 Water Quality Kinetic Tests

As described in **Section 2.1.2** and **Attachment B**, KLC tests were undertaken on four composite overburden and interburden samples (**Table 3-4**).

The KLC samples comprised three overburden samples (two sandstone and one claystone) and one roof/parting (sandstone) sample selected to represent the spoil materials at KCCM. These samples were subjected to monthly leaching using deionised water. Leachates are analysed monthly. The identity of the samples used for the KLC test program is provided in **Table C2 (Attachment C).** The KLC test results and graphical trends are also presented in **Attachment C** and interpreted in this section**.**

The KLC leachate concentrations are presented alongside ANZECC & ARMCANZ (2000) guideline values. 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 for the KCCM Project is typically 2:1 (w/v) for all the samples (ie. 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 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.

Table 3-4: KLC Samples and Leaching Progress

KLC Sample No.	Sample Description	Class	Start Date	Finish Date
KLC 1	Claystone Overburden	NAF-B	11-04-2016	10-10-2016.
KLC 2	Sandstone Overburden	NAF-B	11-04-2016	10-10-2016.
KLC 3	Sandstone Overburden	NAF-B	11-04-2016	10-10-2016.
KLC 4	Sandstone Roof and Parting	NAF-B	11-04-2016	10-10-2016.

3.7.1 Leachate from Spoil Materials

The KLC leachate pH trends show that the leachate pH from the samples is fairly consistent over the testing period with KLC2 and KLC4 samples showing similar pH trends with a decrease in pH from ~10 (alkaline) to stabilise at about 8.5 (neutral), while KLC3 increases from pH ~7.2 (neutral) to stabilise around pH 9 (slightly alkaline). KLC1 is quite different to the other samples with an initial acidic leachate pH of 4.26 which steadily increases to stabilise at ~pH 5.5 (similar pH value to the deionised water used in the KLC tests as the pH of the deionised water from ALS Laboratory used in the KLC tests is in the pH range 5.14 to 6.33). Dynamic contact with the solid sample materials typically adds some alkalinity to the deionised water used in the KLC tests. However KLC1 is again the exception with some acidity leaching from this sample during the first few leach events.

Sample KLC1 is a composite claystone sample representing most likely weathered material from a depth interval of 3m to 28m in drill hole KCE15012. This sample contains negligible sulfur (0.01%) and ANC (0.4 kg H_2SO_4/t) and both the water extracts (described in **Section 3.5**) and KLC leachate samples contain negligible dissolved iron and sulfate. The source of the acidity is therefore not related to pyrite and is more likely due to existing actual acidity in the weathered claystone material.

The EC value of KLC leachates from the samples is quite different with the three samples (KLC2, KLC3 and KLC4) that leach neutral/alkaline pH typically showing low/moderate leached EC values (~30 to 300 µS/cm) compared to the acidic leachates of KLC1 which initially has an elevated leached EC value of 2,640µS/cm which rapidly decreases over the testing period to stabilise at 166 µS/cm.

The residual sulfur contents of the samples (calculated from leached sulfate concertation) shows that after 6 months of leaching, approximately 86% (KLC1), 30% (KLC2), 44% (KLC3) and 97% (KLC 4) of the initial (negligible) amount of total sulfur remains in the samples. For all KLC samples, the sulfate concentration in KLC leachate is much lower than the applied guideline value of 1,000 mg/L (ANZECC & ARMCANZ, 2000), and has stabilised below 10 mg/L over the test period.

The residual ANC remaining in the KLC test materials (calculated from the concentrations of dissolved calcium and magnesium in leachates) indicate that approximately 60% (KLC1), 89% (KLC2), 86% (KLC3) and 100% (KLC 4) of the measured ANC remains in the samples after 6 months.

The sulfate generation rate results obtained for the KLC tests have been used to estimate the rate of sulfide oxidation in these materials (**Table 3-4**). Most sulfate salts generated from sulfide reaction involving materials with a very low sulfur concentration are highly soluble, and therefore will be collected in column leachate. The dissolved sulfate (and calcium) concentrations in the KLC leachates are typically much less than the solubility limit of gypsum ($CaSO_4$), which indicates that sulfate generation is not currently controlled by gypsum dissolution in the KLC test materials. This is confirmed with PHREEQC modelling (Parkhurst and Appelo, 1999) of the KLC leachates; the PHREEQC modelling compares measured leachate water quality data with theoretical solubility limits of a number of minerals under different geochemical conditions. The saturation states of a number of minerals (depending on the database used) are calculated from the saturation index (SI). The SI value of a particular mineral is indicative of a mineral's potential to precipitate or dissolve out of solution. If the SI value is negative, then the mineral is undersaturated in solution. However, if the SI of a mineral is positive, then the mineral is supersaturated and may precipitate out of solution. If the SI value is equal to zero, then the mineral(s) and solution are at equilibrium. The SI values for all leachates indicated that gypsum was undersaturated and unlikely to precipitate under current conditions. Therefore, the sulfate concentrations and oxidation rate calculations provide reasonable estimates of these parameters and the results align well with existing static and dynamic geochemical data derived from a wide range of mine waste materials (The International Kinetic Database (IKD$^{©,TM}$); Morin et al., 1996) (**Graph 10**). The sulfate generation rate and associated sulfide oxidation rate for the four KLC tests are shown in **Table 3-5.**

Table 3-5: Sulfate Generation and Sulfide Oxidation Rates for KLC Tests

KLC Sample No.	Sample Description	Sulfate Generation Rate (mg/kg/week)	Oxidation Rate (kg $O_2/m^3/s$)
KLC 1	Claystone Overburden	0.68	2.75×10^{-10}
KLC 2	Sandstone Overburden	3.32	1.30×10^{-9}
KLC 3	Sandstone Overburden	2.75	1.11×10^{-9}
KLC 4	Sandstone Roof and Parting	1.24	5.1×10^{-10}

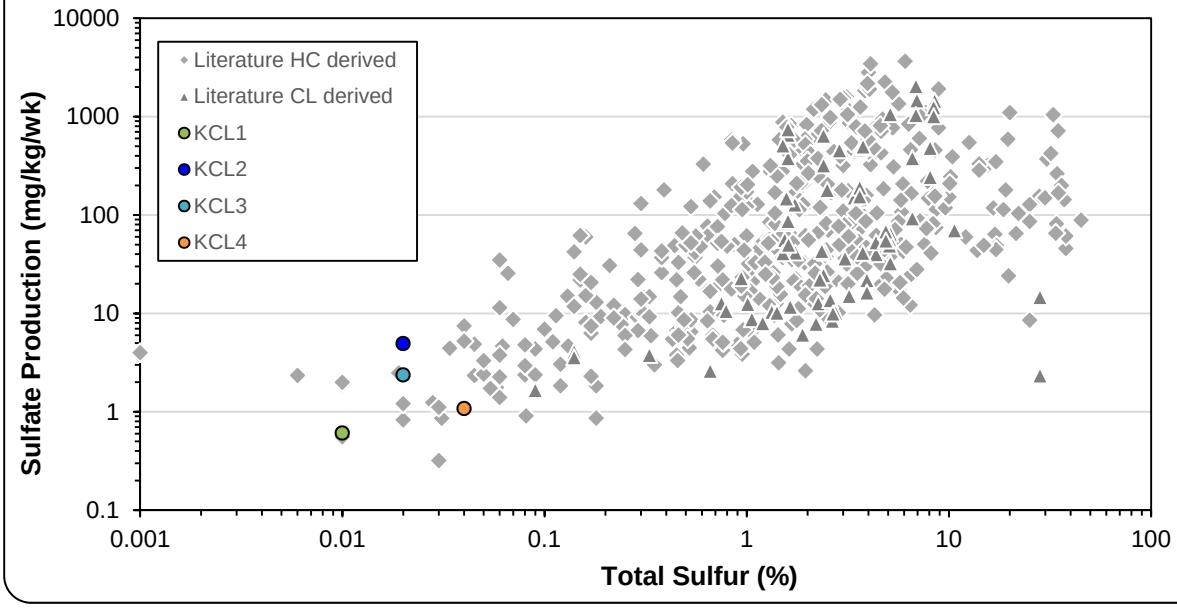
The average sulfate generation rate for the KLC samples ranges from 0.68 to 3.32 mg/kg/week indicating that the rate of sulfide oxidation is very low (equivalent to an oxidation rate of 2.75×10^{-10} to 1.30×10^{-9} kg $O_2/m^3/s$). Mine waste materials with an oxidation rate in this range and with some neutralising capacity 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; Bennett *et al*., 2000). Hence, samples KLC2, KLC3 and KLC4 fall into this category and the KLC results reflect the NAF-Barren material

characteristics predicted from static geochemical test results presented in **Section 3.1**. Sample KLC1 has some existing actual acidity in the sample matrix that is initially flushed out in the KLC tests, before the sample generates a pH value similar to that of the deionised water used in the KLC test.

The concentration of dissolved trace metals/metalloids in leachate for all the samples is very low with all the measured parameters well below the applied water quality guidelines for livestock drinking water and fresh/marine water quality (ANZECC & ARMCANZ, 2000) and the majority of measurements below the LoR. The only exception is the selenium concentration in one leachate for KLC2. These results reflect the results observed for the water quality static tests (**Section 3.5**). The initial "first-flush" leachate concentrations, particularly for KLC1, are generally orders of magnitude higher than the following leachates, which reflect the leaching of weathering products, which are formed during sampling and transportation.

Overall, these results indicate that dissolved metal/metalloid concentrations in ongoing surface runoff and seepage from the bulk overburden and interburden materials at the project are not likely to impact upon the quality of surface and groundwater resources (salinity and metal(loids)).

Graph 10: Total Sulfur vs Sulphate Production



Note: HC = Humidity Cell kinetic tests; CL = Column Leach kinetic tests. Literature values were obtained from different mines around the world (The International Kinetic Database; Morin et al., 1996).

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

RGS has completed a geochemical characterisation program for representative samples of overburden and interburden materials from KCCM Eastern Area. The results from geochemical testing of the sampled materials indicate that:

- Most materials have negligible sulfur, low to high ANC, and are classified as NAF-Barren. There is therefore a high factor of safety and low risk of acid generation from most of these materials;
- Some of the weathered claystone overburden material may initially release some existing acidity into contact water;
- All materials have low concentrations of metal(loid)s that do not present a significant risk to the environment with respect to total metal(loid) concentrations in solids;
- Most materials generate pH neutral to slightly alkaline contact water with low salinity and low concentrations of dissolved metals/metalloids and therefore poses negligible risk of potential impact on the quality of surface and groundwater resources;
- Some of the weathered claystone overburden material may initially generate slightly acidic pH contact water; however, leachate salinity and dissolved metal(loid)s concentrations are likely to be low;
- Some materials may require some fertiliser addition to provide a reasonable growth medium for vegetation roots if used as a rehabilitation medium; and
- Most materials are likely to be sodic and may have an increased risk of being susceptible to dispersion and erosion.

4.2 Recommendations

This geochemical assessment was undertaken to assess the AMD and NMD characteristics of the overburden and interburden spoil from KCCM Eastern Area. As a result of the geochemical assessment work completed on the material, it is recommended that CS Energy considers:

- Decommission the KLC tests;
- Post KLC testing of selected sample materials after decommissioning of the KLC tests. The testing should comprise Acid Base Accounting (pH, EC, total sulfur, ANC and acidity/alkalinity), whole-rock metal analysis, and X-ray diffraction (XRD) mineralogical analysis;
- Additional geochemical testing of representative samples of weathered claystone material comprising Acid Base Accounting (pH, EC, total sulfur, ANC and acidity/alkalinity), whole-rock metal analysis, and XRD mineralogical analysis; and
- Field trials during the operational phase of mining to determine the best rehabilitation option for mine waste materials (including sodic/dispersive materials) at the project site both progressively and at mine closure.

Surface water and seepage from the proposed mining areas should be monitored to ensure that key water quality parameters remain within appropriate criteria. It is therefore suggested that CS Energy:

- Monitors surface run-off and seepage from the proposed areas for pH, EC, total suspended solids (TSS) on a quarterly basis and the suite of water quality analyses described in **Table C5** (**Attachment C**) of this report opportunistically and at least on an annual basis.

5.0 REFERENCES

AMIRA (1995). Mine Waste Management: *Project P387 Prediction and Identification of Acid Forming Mine Waste*. Australian Minerals Industry Research Association, Report prepared by EGi Pty Ltd, August 1995.

AMIRA (2002). ARD Test Handbook: Project 387A Prediction and Kinetic Control of Acid Mine Drainage. Australian Minerals Industry Research Association, Ian Wark Research Institute and Environmental Geochemistry International Pty Ltd, May 2002.

ANZECC and ARMCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, ACT (2000).

Bennett J.W, Comarmond J.M. and Jeffrey J.J. (2000). Comparison of Oxidation Rates of Sulfidic Mine Wastes in the Laboratory and Field. Paper prepared by the Australian Nuclear Science and Technology Organisation and Environmental Geochemistry International Pty Ltd, Australian Centre for Mining Environmental Research. February.

Bowen, H.J.M. (1979). Environmental Chemistry of the Elements. Academic Press, New York, USA.

COA (2016a). Commonwealth of Australia. Leading Practice Sustainable Development Program for the Mining Industry. Preventing Acid and Metalliferous Drainage. September, Canberra ACT.

COA (2016b). Department of Industry, Tourism and Resources. Leading Practice Sustainable Development Program for the Mining Industry. Mine Closure. September, Commonwealth of Australia, Canberra ACT.

DEHP (2013). Application Requirements for Activities with Impacts to Land Guideline. Queensland Department of Environment and Heritage Protection.

DME (1995). Draft Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland, Technical Guideline – Assessment and Management of Acid Drainage and Saline/Sodic Wastes. Queensland Department of Minerals and Energy (DME).

INAP (2009). Global Acid Rock Drainage Guide (GARD Guide). Document prepared by Golder Associates on behalf of the International Network on Acid Prevention (INAP). June 2009 (http://www.inap.com.au/).

Isbell, R.F. (2002). The Australian Soil Classification (revised edition). CSIRO Publishing. Victoria.

Morin, K.A., N.M. Hutt, and K.D. Ferguson (1996). The International Kinetic Database: Rates of acid generation, neutralization, and metal leaching from mines around the world. IN: Proceedings of the 3rd International and 21st Annual Minerals Council of Australia Environmental Workshop, October 14-18, Newcastle, New South Wales, Australia, Volume 1, p.132-148.

NEPC (2013). National Environment Protection Council (NEPC). National Environmental Protection (Assessment of Site Contamination) Measure (NEPM). Guideline on investigation levels for soil and groundwater. Health Based Investigation Levels for public open spaces (HIL(C)).

Northcote, K.H., and Skene, J.K.M. (1972). Australian Soils with Saline and Sodic properties. CSIRO Australia, Soil Publication No. 27, Canberra.

NSW Trade and Investment. (2013). Online geological information source assessed at: http://www.trade.nsw.gov.au/

Parkhurst, D.L. and Appelo, C.A.J., (1999). User's guide to PHREEQC (version 2) - a computer program for speciation, reaction-path, 1D-transport, and inverse geochemical calculations. US Geol. Surv. Water Resour. Inv. Rep. 99-4259, 312p.

RGS (2015). Geochemical Assessment of Mine and Power Station Waste Materials. Kogan Creek Coal Mine. Report prepared by RGS Environmental Pty Ltd for CS Energy Ltd. April.

Xenith. (2014) 2014 Resource Estimate. Kogan Creek Coal Project. Prepared by Xenith Consulting Pty Ltd for CS Energy Ltd.

6.0 LIMITATIONS

This report has been prepared by RGS for the use of CS Energy. It is based on accepted consulting practices and standards and no other warranty is made as to the professional advice included in this report.

This report was prepared from March 2016 to January 2017 and is based on the information provided by CS Energy at the time of preparation. RGS disclaims responsibility for any changes that may have occurred after this time.

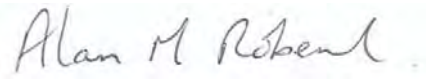
The sources of information and methodology used by RGS are outlined in this report and no independent verification of this information has been made. RGS assumes no responsibility for any inaccuracies or omissions, although no indication was found that any information contained in this report as provided to RGS was incorrect.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not provide legal advice, which can only be given by qualified legal practitioners.

If you have any questions regarding the information presented in this report, please contact the undersigned on (+617) 3344 1222 or (+61) 431 620 623.

Yours sincerely,

RGS Environmental Pty Ltd



Dr. Alan M. Robertson
Principal Geochemist/Director

ATTACHMENT A

Figures

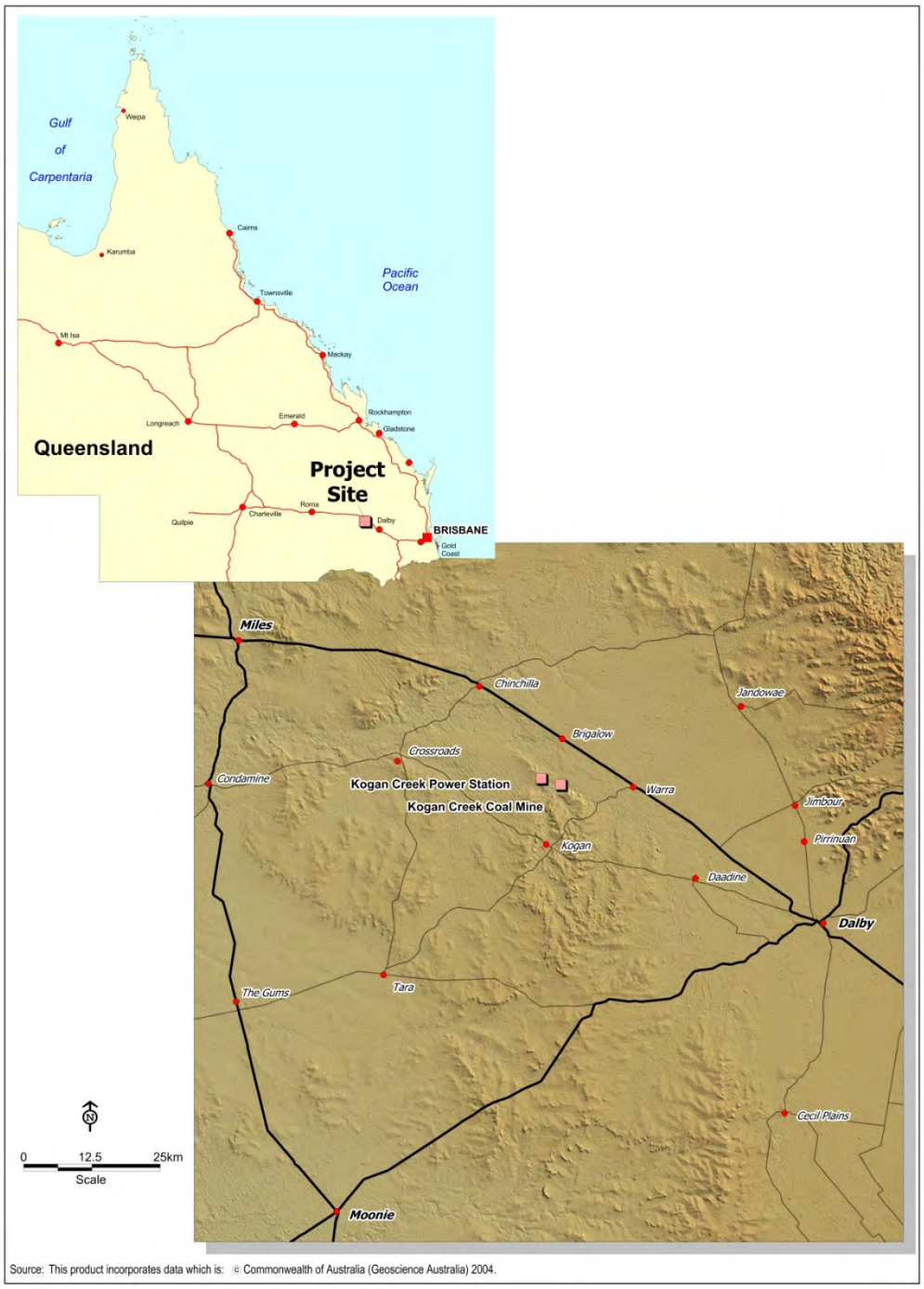


Figure 1-1: Location Map

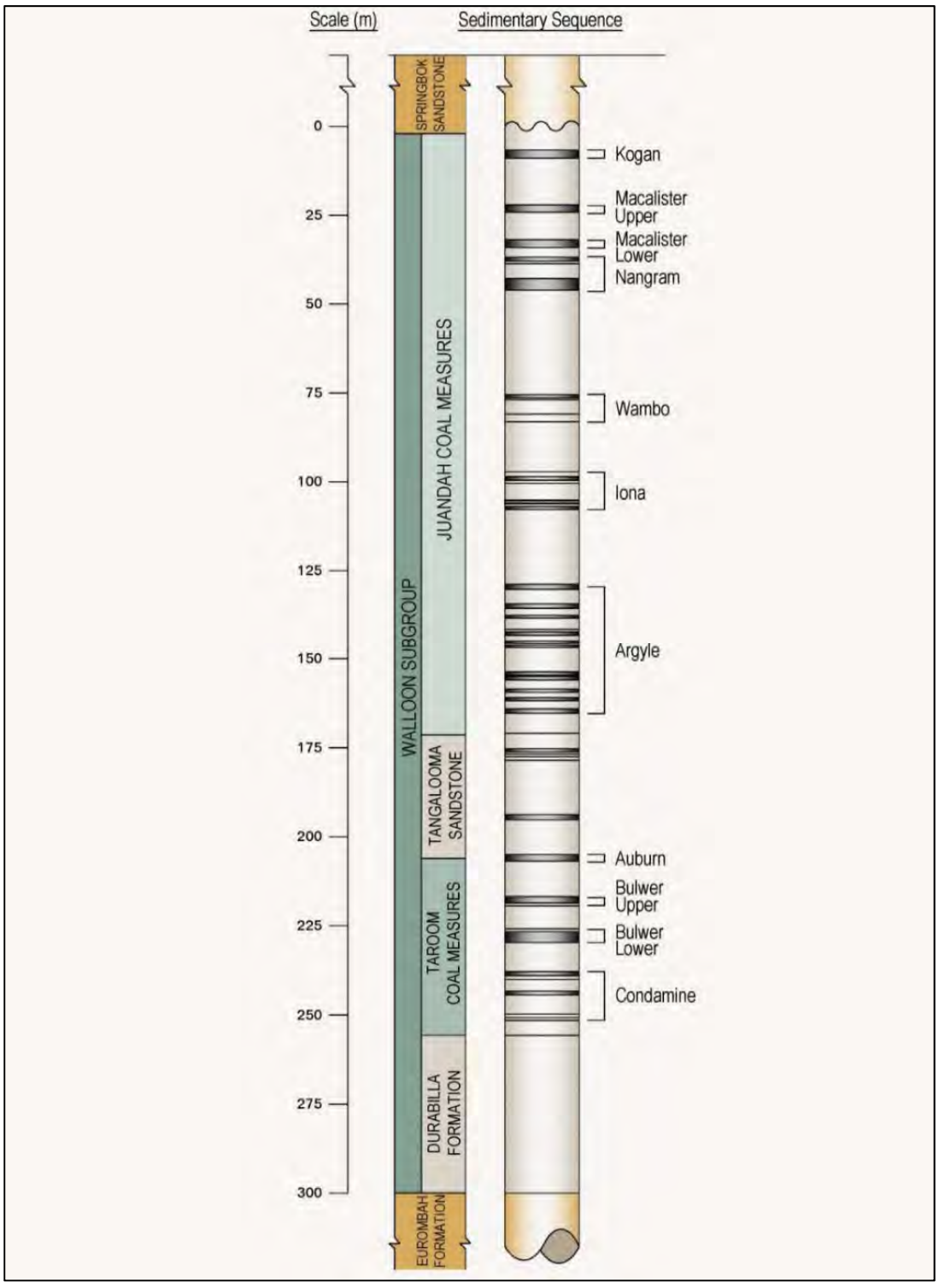


Figure 1-2: Regional Stratigraphy of the Surat Basin

Source Xenith Consulting

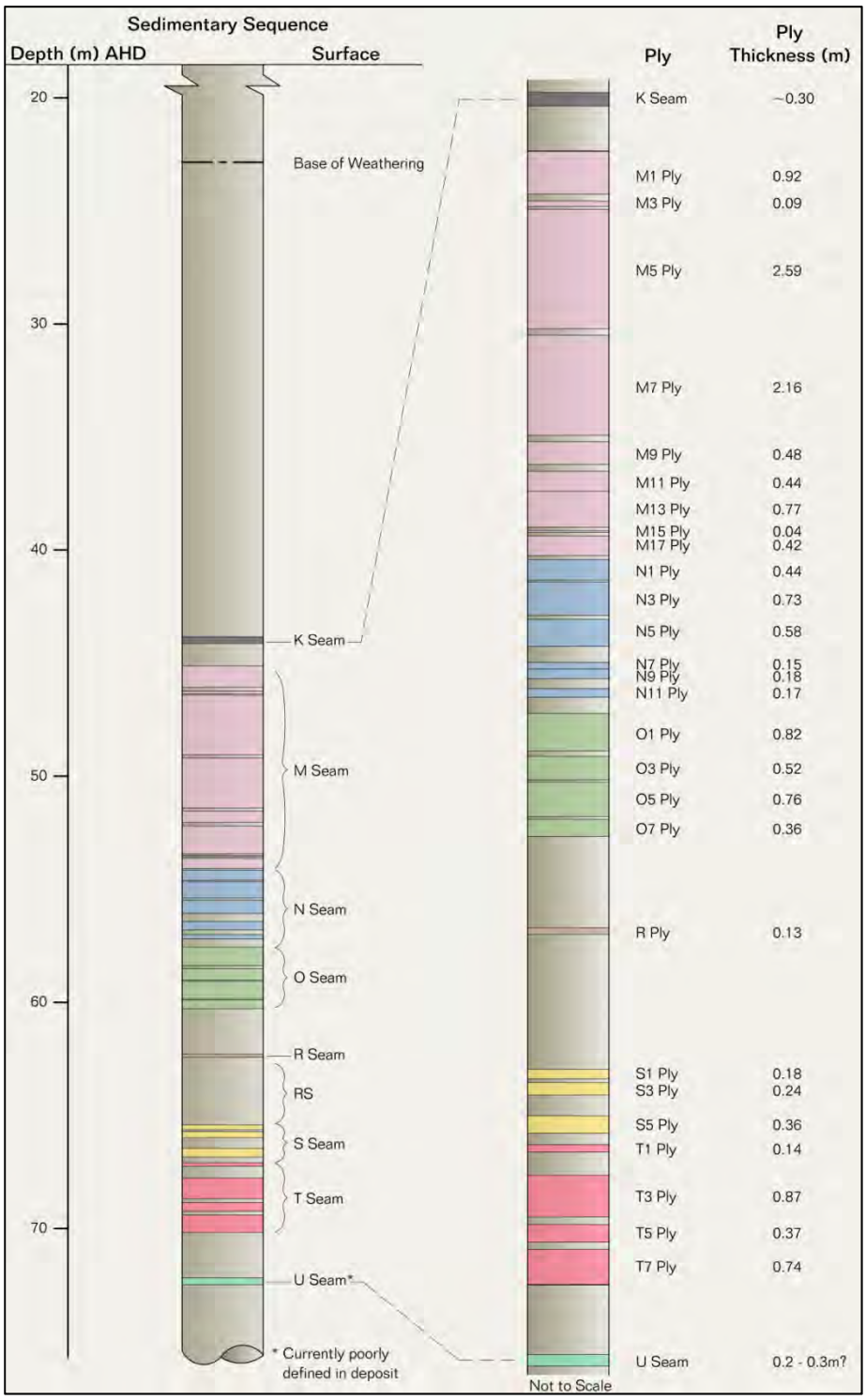


Figure 1-3: Local Stratigraphy of the Kogan Creek Coal Mine

Source Xenith Consulting

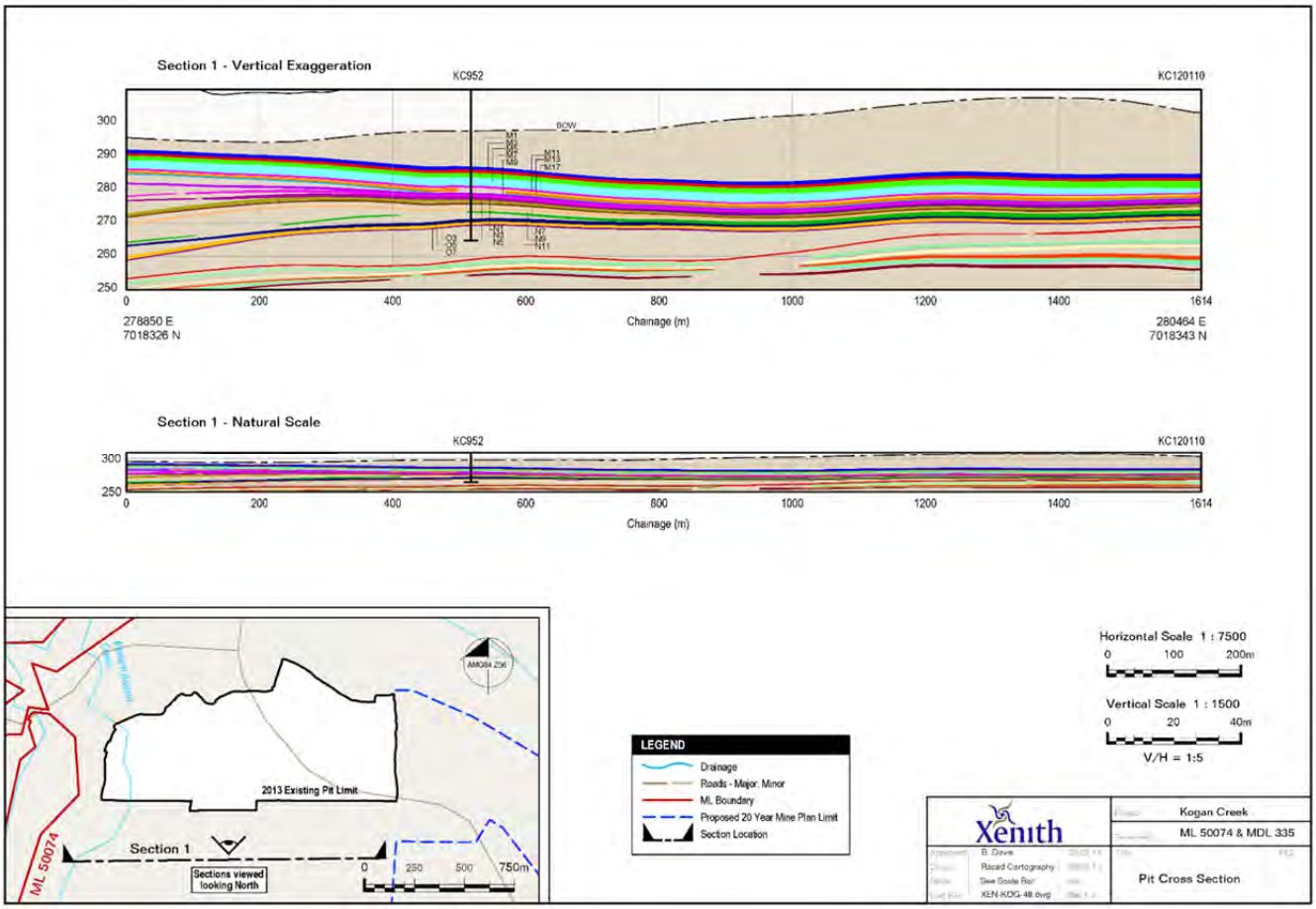


Figure 1-4: Typical Pit Cross Section at Kogan Creek Coal Mine

Source: Xenith Consulting

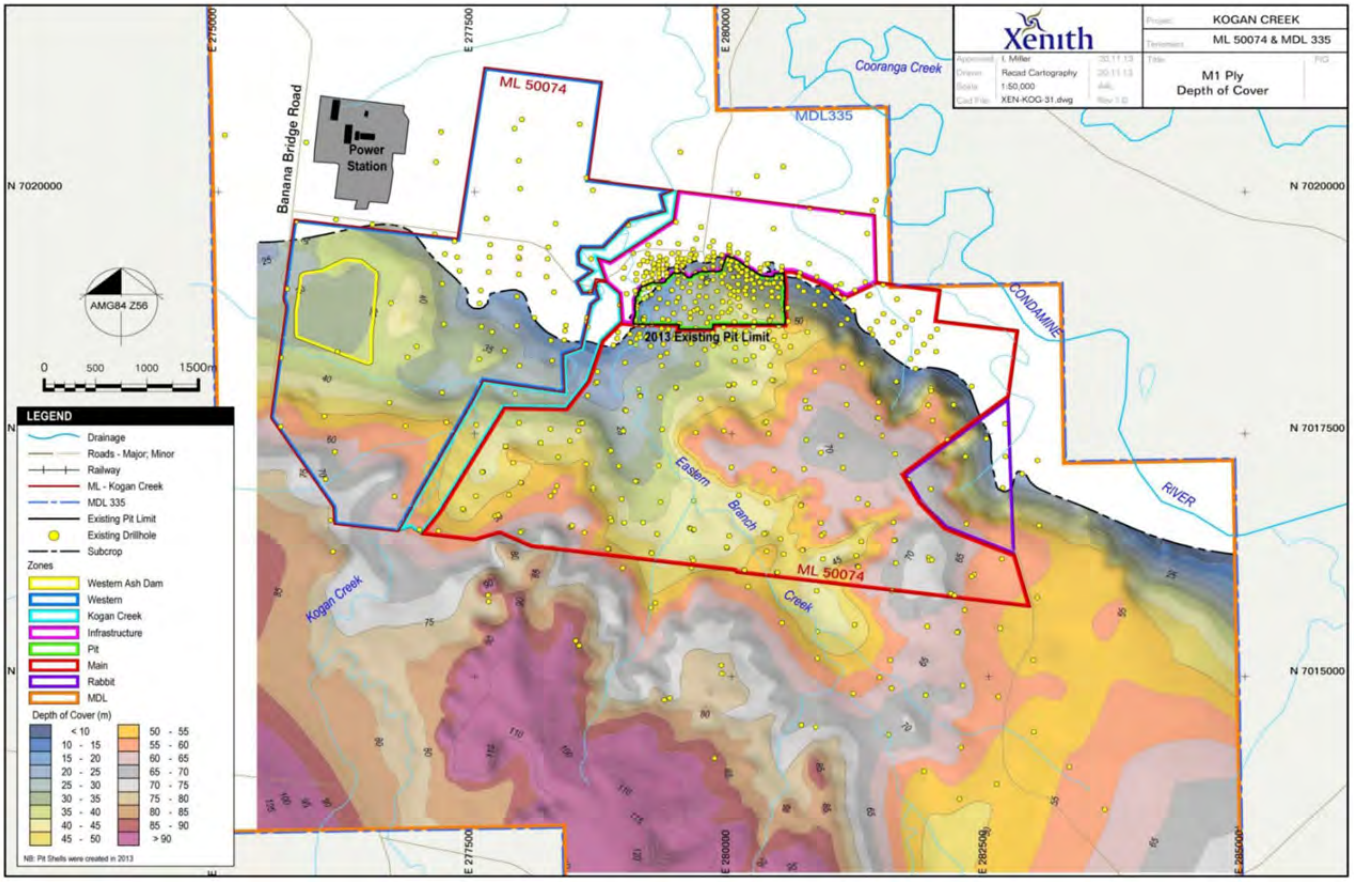


Figure 1-5: Depth of Cover at Kogan Creek Coal Mine

Source: Xenith Consulting

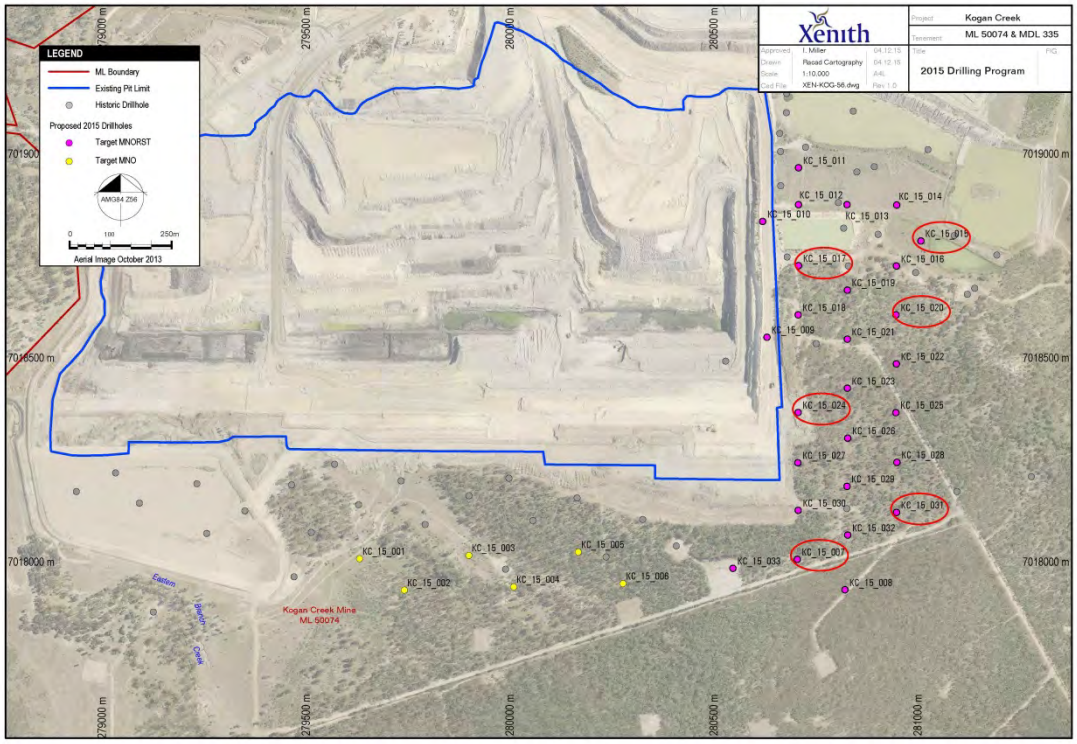


Figure 2-1: Location of Drill Holes used for Sampling at Kogan Creek Coal Mine

ATTACHMENT B

Geochemical Assessment of Mine Materials

ATTACHMENT B

GEOCHEMICAL ASSESSMENT OF MINE MATERIALS

ACID GENERATION AND PREDICTION

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

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

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

Determination of pH and Electrical Conductivity

pH and Electrical Conductivity (EC) measured on 1:5 w/w water extract. This gives an indication of the inherent acidity and salinity of the mine material when initially exposed in an emplacement area.

Total Sulfur Content and Maximum Potential Acidity (MPA)

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

Acid Neutralising Capacity (ANC)

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

Net Acid Producing Potential (NAPP)

Calculated from the MPA and ANC results. The NAPP represents the balance between a sample's inherent capacities to generate and neutralise acid. If the MPA is greater than the ANC then the NAPP is positive. If the MPA is less than the ANC then the sample then the NAPP is negative.

Net Acid Producing Potential

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

acid (ANC) exceeds their capacity to generate acid (MPA), then the NAPP of the material is negative. Conversely, if the MPA exceeds the ANC, the NAPP of the material is positive.

Net Acid Generation (NAG)

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

ASSESSMENT OF ELEMENT ENRICHMENT AND SOLUBILITY

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

Major elements	Al, Ca, Fe, K, Mg, Na and S.
Minor elements	As, B, Cd, Co, Cr, Cu, F, Hg, Mn, Mo, Ni, Pb, Sb, Se and Zn.

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

Multi-Element Composition of Solids

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

Multi-Element Composition of Water Extracts (1:5 w/v)

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

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

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 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 characteristics and indicate the rate of acid generation, over what period it will occur, and what management controls may be required.

In KLC tests, water is added to a sample and the mixture allowed to leach products and by-products of acid producing and consuming reactions. Samples of leachate are then collected and analysed. Intermittent water application is applied to simulate rainfall and heat lamps are used to simulate sunshine. These tests provide real-time information and may have to continue for months or years. Monitoring includes trends in pH, sulfate, acidity or alkalinity, and metals, for example. The pH of the collected leachate simulates the acid drainage 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 concentration data provides an assessment of metal solubility and leaching behaviour.

Figure B1 shows the kinetic leach column set up used by RGS adapted from *AMIRA, 2002*. The columns are placed under heat lamps to allow the sample to dry between water additions to ensure adequate oxygen ingress into the sample material.

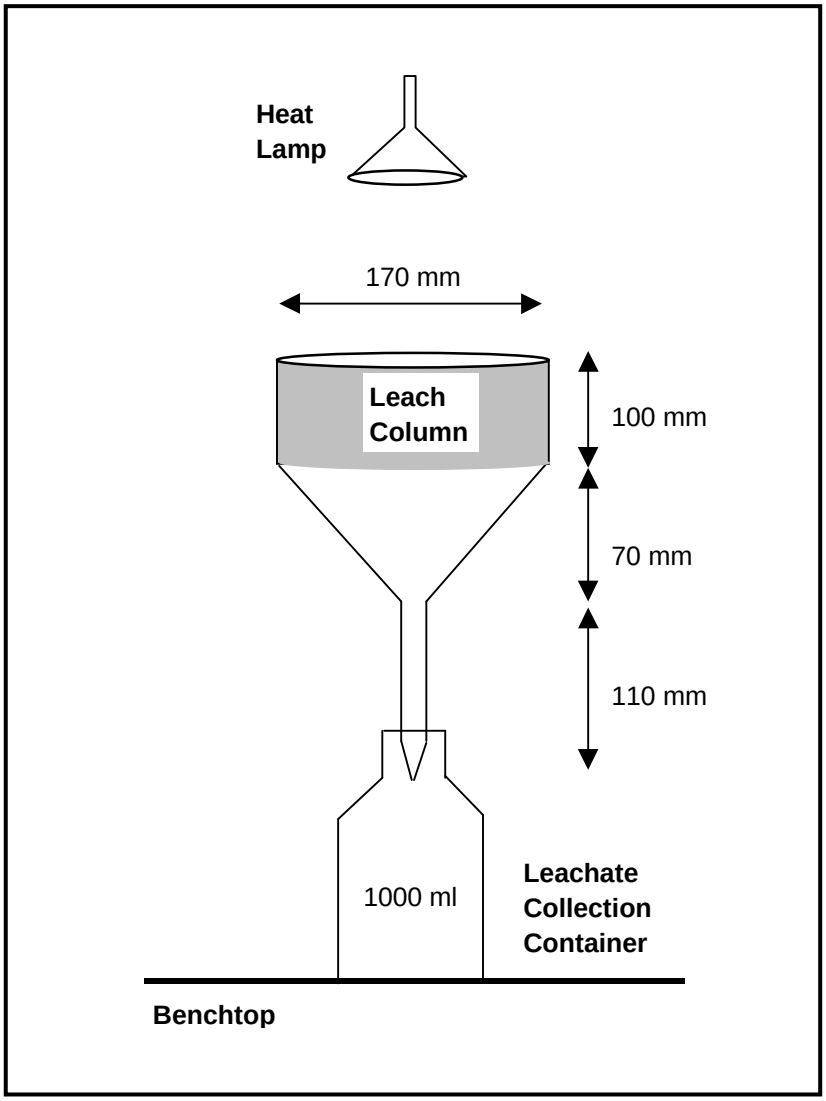
Approximately 2 kg of sample is accurately weighed and used in the leach columns depending on the physical nature of the material and particle size. Some materials can be used on an as-received basis (*i.e.* no crushing as with process residues and tailings materials), whereas others are crushed to nominal 5-10 mm particle size (as with overburden).

The sample in the column is initially leached with deionised water at a rate of about 400 ml/kg of sample and the initial leachate from the columns collected and analysed. Subsequent column leaching is carried out at a rate of about 400 ml/kg per month or quarterly, and again collected and analysed. The leaching rate can be varied to better simulate expected site conditions or satisfy test program data requirements.

The column must be exposed to drying conditions in between watering events. The residual water content and air void content in the column can be determined by comparing the wet and dry column weights. A heat lamp is generally used above the sample during daylight hours to maintain the leach column surface temperature at about 30^{o}C.

Figure B1

Kinetic Leach Column Setup



AMIRA (2002). *ARD Test Handbook: Project 387A Prediction and Kinetic Control of Acid Mine Drainage*. Australian Minerals Industry Research Association, Ian Wark Research Institute and Environmental Geochemistry International Pty Ltd, May 2002.

ATTACHMENT C

Summary Tables of Results

Static Test Results

Table C-1: Acid-Base Account Test Results for all Samples

Table C-2: Selected Samples for Additional Static Geochemical Testing

Table C-3: Multi-Element Test Results for Selected Samples

Table C-4: Geochemical Abundance Index Results for Selected Samples

Table C-5 Multi-Element Results for Water Extracts from Selected Samples

KLC Test Results and Trends

Table KLC1 KLC 1 Test Results

Table KLC2 KLC 2 Test Results

Table KLC3 KLC 3 Test Results

Table KLC4 KLC 4 Test Results

Table C1: Acid Base Account Results for Kogan Creek Samples

RGS Sample No.	ALS Laboratory Number	Drill Hole ID	Client Sample ID	Depth Interval (m)			Sample Type	Sample Lithology	pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	Sample Classification[3]
				From	To	Range				(µS/cm)	(%)		(kg H_2SO_4/t)				
1	EB1606672001	KCE15012	121645	0.00	2.00	2.00	Overburden	Clay	6.2	133	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
2	EB1606672002	KCE15012	121646	3.00	9.00	6.00	Overburden	Claystone	5.6	496	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
3	EB1606672003	KCE15012	121647	10.00	14.00	4.00	Overburden	Claystone	5.6	524	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
4	EB1606672004	KCE15012	121648	14.00	21.00	7.00	Overburden	Claystone	5.6	649	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
5	EB1606672005	KCE15012	121649	21.00	28.00	7.00	Overburden	Claystone	6.1	548	0.01	-	0.2	0.7	-0.5	4.6	Non-Acid Forming-Barren
6	EB1606672006	KCE15012	121650	28.00	30.00	2.00	Overburden	Sandstone	6.8	316	0.01	-	0.2	2.7	-2.5	17.7	Non-Acid Forming-Barren
7	EB1606672007	KCE15012	121651	30.00	36.00	6.00	Overburden	Sandstone	8.7	506	0.02	-	0.6	40.8	-40.2	66.7	Non-Acid Forming-Barren
8	EB1606672008	KCE15012	121652	36.00	42.00	6.00	Overburden	Sandstone	9.0	487	0.03	-	0.9	34.2	-33.3	37.3	Non-Acid Forming-Barren
9	EB1606672009	KCE15012	121653	43.00	48.00	5.00	Overburden	Sandstone	9.1	467	0.02	-	0.6	26.6	-26.0	43.5	Non-Acid Forming-Barren
10	EB1606672010	KCE15012	121654	48.00	53.02	5.02	Overburden	Sandstone	9.2	413	0.03	-	0.9	38.1	-37.2	41.5	Non-Acid Forming-Barren
11	EB1606672011	KCE15012	121655	54.50	54.80	0.30	Overburden	Sandstone	9.4	311	0.03	-	0.9	30.8	-29.9	33.6	Non-Acid Forming-Barren
12	EB1606672012	KCE15012	121656	56.50	56.80	0.30	Roof K Seam	Siltstone	9.1	336	0.04	-	1.2	15.9	-14.7	13.0	Non-Acid Forming-Barren
13	EB1606672013	KCE15012	121657	57.67	57.90	0.23	Floor K Seam	Mudstone	9.1	349	0.04	-	1.2	14.4	-13.2	11.8	Non-Acid Forming-Barren
14	EB1606672014	KCE15012	121658	68.08	68.36	0.28	Parting N Seam	Siltstone	9.6	388	0.03	-	0.9	12.6	-11.7	13.7	Non-Acid Forming-Barren
15	EB1606672015	KCE15012	121659	68.36	68.60	0.24	Parting N Seam	Sandstone	9.6	433	0.05	-	1.5	12.2	-10.7	8.0	Non-Acid Forming-Barren
16	EB1606672016	KCE15012	121660	69.12	69.40	0.28	Parting N Seam	Siltstone	9.5	270	0.03	-	0.9	6.6	-5.7	7.2	Non-Acid Forming-Barren
17	EB1606672017	KCE15012	121661	70.00	70.31	0.31	Parting N Seam	Sandstone	9.7	391	0.02	-	0.6	75.5	-74.9	123.4	Non-Acid Forming-Barren
18	EB1606672018	KCE15012	121662	74.38	74.68	0.30	Parting O Seam	Siltstone	9.5	152	0.02	-	0.6	4.2	-3.6	6.9	Non-Acid Forming-Barren
19	EB1606672019	KCE15012	121663	76.85	77.27	0.42	Floor R Seam	Sandstone	9.6	309	0.02	-	0.6	11.7	-11.1	19.1	Non-Acid Forming-Barren
20	EB1606672020	KCE15012	121664	77.27	77.64	0.37	Parting RS Seams	Siltstone	9.4	140	0.02	-	0.6	6.2	-5.6	10.1	Non-Acid Forming-Barren
21	EB1606672021	KCE15012	121665	80.67	81.04	0.37	Parting S Seam	Sandstone	9.4	276	0.06	-	1.8	7.2	-5.4	3.9	Non-Acid Forming-Barren
22	EB1606672022	KCE15012	121666	81.42	81.75	0.33	Parting S Seam	Sandstone	9.6	235	0.03	-	0.9	8.1	-7.2	8.8	Non-Acid Forming-Barren
23	EB1606672023	KCE15012	121667	82.98	83.33	0.35	Parting S Seam	Siltstone	9.6	234	0.04	-	1.2	8.3	-7.1	6.8	Non-Acid Forming-Barren
24	EB1606672024	KCE15012	121668	85.17	85.65	0.48	Parting S Seam	Sandstone	9.9	517	0.04	-	1.2	70.3	-69.1	57.5	Non-Acid Forming-Barren
25	EB1606672025	KCE15012	121669	86.17	86.44	0.27	Parting S Seam	Sandstone	9.7	322	0.06	-	1.8	10.8	-9.0	5.9	Non-Acid Forming-Barren
26	EB1606672026	KCE15012	121670	89.99	90.37	0.38	Parting T Seam	Sandstone	10.1	570	0.05	-	1.5	301.0	-299.5	196.8	Non-Acid Forming-Barren
27	EB1606672027	KCE15012	121671	92.75	93.13	0.38	Floor T Seam	Sandstone	10.0	672	0.05	-	1.5	21.4	-19.9	14.0	Non-Acid Forming-Barren
28	EB1606672028	KCE15016	329256	0.00	1.00	1.00	Overburden	Soil	7.5	494	0.02	-	0.6	37.8	-37.2	61.8	Non-Acid Forming-Barren
29	EB1606672029	KCE15016	329257	4.00	5.00	1.00	Overburden	Sandstone	6.5	391	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
30	EB1606672030	KCE15016	329258	9.00	10.00	1.00	Overburden	Claystone	5.7	964	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
31	EB1606672031	KCE15016	329259	14.00	15.00	1.00	Overburden	Claystone	5.5	859	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
32	EB1606672032	KCE15016	329260	19.00	20.00	1.00	Overburden	Claystone	5.7	748	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
33	EB1606672033	KCE15016	329261	24.00	25.00	1.00	Overburden	Sandstone	6.7	385	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
34	EB1606672034	KCE15016	329262	29.00	30.00	1.00	Overburden	Sandstone	8.2	521	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
35	EB1606672035	KCE15016	329263	36.84	37.14	0.30	Overburden	Siltstone	9.1	496	0.04	-	1.2	46.7	-45.5	38.2	Non-Acid Forming-Barren

Table C1: Acid Base Account Results for Kogan Creek Samples

RGS Sample No.	ALS Laboratory Number	Drill Hole ID	Client Sample ID	Depth Interval (m)			Sample Type	Sample Lithology	pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	Sample Classification[3]
				From	To	Range				(µS/cm)	(%)		(kg H_2SO_4/t)				
36	EB1606672036	KCE15016	329264	37.36	37.66	0.30	Overburden	Sandstone	8.9	545	0.04	-	1.2	17.8	-16.6	14.5	Non-Acid Forming-Barren
37	EB1606672037	KCE15016	329265	40.15	40.47	0.32	Overburden	Sandstone	9.0	432	0.04	-	1.2	32.8	-31.6	26.8	Non-Acid Forming-Barren
38	EB1606672038	KCE15016	329266	42.32	42.59	0.27	Roof K Seam	Mudstone	8.9	440	0.11	0.07	2.1	12.0	-9.9	5.6	Non-Acid Forming-Barren
39	EB1606672039	KCE15016	329273	43.89	44.14	0.25	Parting KM Seams	Mudstone	8.9	476	0.08	-	2.4	13.8	-11.4	5.6	Non-Acid Forming-Barren
40	EB1606672040	KCE15016	329305	51.99	52.23	0.24	Parting M Seam	Mudstone	8.6	364	0.11	0.07	2.2	15.3	-13.1	7.0	Non-Acid Forming-Barren
41	EB1606672041	KCE15016	329319	55.32	55.60	0.28	Parting N Seam	Mudstone	8.4	309	0.07	-	2.1	7.8	-5.7	3.6	Non-Acid Forming-Barren
42	EB1606672042	KCE15016	329342	60.42	60.74	0.32	Parting O Seam	Siltstone	8.3	208	0.17	0.08	2.6	5.0	-2.4	1.9	Non-Acid Forming-Barren
43	EB1606672043	KCE15016	329245	65.01	65.31	0.30	Parting RS Seams	Siltstone	9.2	160	0.02	-	0.6	10.7	-10.1	17.5	Non-Acid Forming-Barren
44	EB1606672044	KCE15016	329352	67.00	67.30	0.30	Parting S Seam	Mudstone	9.5	381	0.04	-	1.2	17.6	-16.4	14.4	Non-Acid Forming-Barren
45	EB1606672045	KCE15016	329360	69.66	69.96	0.30	Parting S Seam	Siltstone	9.6	193	0.03	-	0.9	7.5	-6.6	8.2	Non-Acid Forming-Barren
46	EB1606672046	KCE15019	329583	0.00	2.00	2.00	Overburden	Sandstone	5.6	316	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
47	EB1606672047	KCE15019	329584	4.00	5.00	1.00	Overburden	Claystone	5.6	448	0.03	-	0.9	0.3	0.7	0.3	Non-Acid Forming-Barren
48	EB1606672048	KCE15019	329585	9.00	10.00	1.00	Overburden	Claystone	5.2	616	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
49	EB1606672049	KCE15019	329586	14.00	17.00	3.00	Overburden	Sandstone	5.4	528	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
50	EB1606672050	KCE15019	329587	19.00	20.00	1.00	Overburden	Sandstone	5.6	685	0.02	-	0.6	0.7	-0.1	1.1	Non-Acid Forming-Barren
51	EB1606672051	KCE15019	329588	24.00	25.00	1.00	Overburden	Sandstone	6.5	374	0.02	-	0.6	1.4	-0.8	2.3	Non-Acid Forming-Barren
52	EB1606672052	KCE15019	329589	29.00	30.00	1.00	Overburden	Sandstone	7.0	407	0.02	-	0.6	5.1	-4.5	8.3	Non-Acid Forming-Barren
53	EB1606672053	KCE15019	329590	34.00	35.00	1.00	Overburden	Sandstone	8.6	509	0.02	-	0.6	32.4	-31.8	53.0	Non-Acid Forming-Barren
54	EB1606672054	KCE15019	329591	39.00	40.03	1.03	Overburden	Sandstone	8.6	515	0.02	-	0.6	64.3	-63.7	105.1	Non-Acid Forming-Barren
55	EB1606672055	KCE15019	329592	46.76	47.03	0.27	Overburden	Siltstone	8.8	380	0.06	-	1.8	35.1	-33.3	19.1	Non-Acid Forming-Barren
56	EB1606672056	KCE15019	329593	49.39	49.72	0.33	Roof K Seam	Sandstone	9.0	257	0.03	-	0.9	245.0	-244.1	267.0	Non-Acid Forming-Barren
57	EB1606672057	KCE15019	329597	50.43	50.71	0.28	Parting KM Seams	Mudstone	8.9	368	0.04	-	1.2	14.1	-12.9	11.5	Non-Acid Forming-Barren
58	EB1606672063	KCE15019	329633	58.60	58.93	0.33	Parting M Seam	Mudstone	9.2	280	0.04	-	1.2	31.8	-30.6	26.0	Non-Acid Forming-Barren
59	EB1606672058	KCE15019	329651	61.89	62.14	0.25	Parting N seam	Siltstone	9.1	347	0.12	0.08	2.4	51.8	-49.4	22.0	Non-Acid Forming-Barren
60	EB1606672059	KCE15019	329657	62.95	63.15	0.20	Parting N Seam	Siltstone	9.1	309	0.05	-	1.5	7.4	-5.9	4.8	Non-Acid Forming-Barren
61	EB1606672060	KCE15019	329673	66.70	67.00	0.30	Parting O Seam	Siltstone	9.2	248	0.04	-	1.2	72.8	-71.6	59.5	Non-Acid Forming-Barren
62	EB1606672061	KCE15019	329675	68.35	68.66	0.31	Parting RS Seams	Siltstone	9.1	120	0.03	-	0.9	4.2	-3.3	4.6	Non-Acid Forming-Barren
63	EB1606672062	KCE15019	329682	69.85	70.19	0.34	Parting S Seam	Siltstone	9.2	315	0.05	-	1.5	25.2	-23.7	16.5	Non-Acid Forming-Barren
64	EB1606676001	KCE15020	329710	0.00	6.00	6.00	Overburden	Sandstone	4.7	409	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
65	EB1606676002	KCE15020	329711	6.00	7.00	1.00	Overburden	Calcrete	5.0	390	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
66	EB1606676003	KCE15020	329712	7.00	8.00	1.00	Overburden	Laterite	5.0	496	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
67	EB1606676004	KCE15020	329713	8.00	10.00	2.00	Overburden	Sandstone	5.2	432	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
68	EB1606676005	KCE15020	329714	10.00	12.00	2.00	Overburden	Sandstone	5.0	508	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
69	EB1606676006	KCE15020	329715	12.00	14.00	2.00	Overburden	Sandstone	5.2	484	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
70	EB1606676007	KCE15020	329716	14.00	21.00	7.00	Overburden	Sandstone	5.6	460	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
71	EB1606676008	KCE15020	329717	21.00	23.00	2.00	Overburden	Sandstone	5.9	522	0.01	-	0.2	0.3	-0.1	1.6	Non-Acid Forming-Barren
72	EB1606676009	KCE15020	329718	23.00	25.00	2.00	Overburden	Sandstone	6.1	460	0.02	-	0.6	0.8	-0.2	1.3	Non-Acid Forming-Barren

Table C1: Acid Base Account Results for Kogan Creek Samples

RGS Sample No.	ALS Laboratory Number	Drill Hole ID	Client Sample ID	Depth Interval (m)			Sample Type	Sample Lithology	pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	Sample Classification[3]
				From	To	Range				(µS/cm)	(%)		(kg H_2SO_4/t)				
73	EB1606676010	KCE15020	329719	25.00	33.00	8.00	Overburden	Sandstone	7.1	235	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
74	EB1606676011	KCE15020	329720	33.00	34.00	1.00	Overburden	Sandstone	7.8	176	0.02	-	0.6	6.4	-5.8	10.5	Non-Acid Forming-Barren
75	EB1606676012	KCE15020	329721	34.00	36.00	2.00	Overburden	Sandstone	8.5	253	0.02	-	0.6	8.0	-7.4	13.1	Non-Acid Forming-Barren
76	EB1606676013	KCE15020	329722	36.00	39.00	3.00	Overburden	Sandstone	8.7	445	0.03	-	0.9	24.5	-23.6	26.7	Non-Acid Forming-Barren
77	EB1606676014	KCE15020	329723	39.00	45.02	6.02	Overburden	Siltstone	8.7	447	0.04	-	1.2	70.2	-69.0	57.4	Non-Acid Forming-Barren
78	EB1606676015	KCE15020	329724	46.57	46.87	0.30	Overburden	Sandstone	9.0	322	0.04	-	1.2	60.6	-59.4	49.5	Non-Acid Forming-Barren
79	EB1606676016	KCE15020	329725	48.04	48.34	0.30	Overburden	Sandstone	9.1	302	0.04	-	1.2	48.4	-47.2	39.6	Non-Acid Forming-Barren
80	EB1606676017	KCE15020	329726	50.63	50.95	0.32	Overburden	Mudstone	9.0	359	0.05	-	1.5	20.3	-18.8	13.3	Non-Acid Forming-Barren
81	EB1606676018	KCE15020	329730	51.87	52.14	0.27	Parting KM Seams	Carb. Mudstone	8.8	370	0.04	-	1.2	11.0	-9.8	9.0	Non-Acid Forming-Barren
82	EB1606676019	KCE15020	329785	66.87	67.16	0.29	Parting O Seam	Sandstone	8.9	187	0.04	-	1.2	4.3	-3.1	3.5	Non-Acid Forming-Barren
83	EB1606676020	KCE15020	329789	69.17	69.47	0.30	Parting RS Seams	Sandstone	9.4	269	0.02	-	0.6	250.0	-249.4	408.6	Non-Acid Forming-Barren
84	EB1606676021	KCE15020	329790	71.45	71.75	0.30	Roof S Seam	Sandstone	9.3	331	0.02	-	0.6	22.8	-22.2	37.3	Non-Acid Forming-Barren
85	EB1606676022	KCE15020	329801	73.88	74.10	0.22	Parting S Seam	Sandstone	9.4	366	0.07	-	2.1	9.0	-6.9	4.2	Non-Acid Forming-Barren
86	EB1606676023	KCE15020	329805	74.84	75.14	0.30	Parting S Seam	Sandstone	9.7	424	0.03	-	0.9	95.0	-94.1	103.5	Non-Acid Forming-Barren
87	EB1606676024	KCE15020	329806	76.58	76.92	0.34	Parting S Seam	Sandstone	9.3	232	0.05	-	1.5	9.2	-7.7	6.0	Non-Acid Forming-Barren
88	EB1606676025	KCE15020	329807	77.67	77.97	0.30	Parting ST Seams	Sandstone	9.5	433	0.03	-	0.9	210.0	-209.1	228.8	Non-Acid Forming-Barren
89	EB1606676026	KCE15020	329822	81.94	82.24	0.30	Parting T Seam	Sandstone	9.8	623	0.07	-	2.1	101.0	-98.9	47.2	Non-Acid Forming-Barren
90	EB1606676027	KCE15020	329823	83.94	84.24	0.30	Floor T Seam	Sandstone	9.9	646	0.08	-	2.4	30.2	-27.8	12.3	Non-Acid Forming-Barren
91	EB1606676028	KCE15029	330274	0.00	1.00	1.00	Overburden	Sand, Claystone	8.1	367	0.03	-	0.9	5.4	-4.5	5.9	Non-Acid Forming-Barren
92	EB1606676029	KCE15029	330275	4.00	5.00	1.00	Overburden	Claystone	7.1	131	0.02	-	0.6	2.2	-1.6	3.6	Non-Acid Forming-Barren
93	EB1606676030	KCE15029	330276	9.00	10.00	1.00	Overburden	Claystone	6.4	52	0.02	-	0.6	1.2	-0.6	2.0	Non-Acid Forming-Barren
94	EB1606676031	KCE15029	330277	14.00	15.00	1.00	Overburden	Claystone	5.8	78	0.02	-	0.6	0.3	0.4	0.4	Non-Acid Forming-Barren
95	EB1606676032	KCE15029	330278	19.00	20.00	1.00	Overburden	Sandstone	5.9	85	0.02	-	0.6	1.3	-0.7	2.1	Non-Acid Forming-Barren
96	EB1606676033	KCE15029	330279	24.00	25.00	1.00	Overburden	Sandstone	7.2	105	0.02	-	0.6	7.1	-6.5	11.6	Non-Acid Forming-Barren
97	EB1606676034	KCE15029	330280	29.00	30.00	1.00	Overburden	Sandstone	7.8	104	0.01	-	0.2	7.6	-7.4	49.7	Non-Acid Forming-Barren
98	EB1606676035	KCE15029	330281	34.00	35.00	1.00	Overburden	Sandstone	8.4	422	0.05	-	1.5	69.2	-67.7	45.2	Non-Acid Forming-Barren
99	EB1606676036	KCE15029	330282	39.00	40.00	1.00	Overburden	Siltstone	8.4	421	0.05	-	1.5	19.6	-18.1	12.8	Non-Acid Forming-Barren
100	EB1606676037	KCE15029	330283	44.00	45.00	1.00	Overburden	Siltstone	8.5	413	0.06	-	1.8	29.8	-28.0	16.2	Non-Acid Forming-Barren
101	EB1606676038	KCE15029	330284	49.00	50.01	1.01	Overburden	Siltstone	8.5	301	0.04	-	1.2	56.0	-54.8	45.8	Non-Acid Forming-Barren
102	EB1606676039	KCE15029	330285	51.07	51.40	0.33	Overburden	Sandstone	9.0	200	0.03	-	0.9	199.0	-198.1	216.8	Non-Acid Forming-Barren
103	EB1606676040	KCE15029	330286	51.40	51.69	0.29	Overburden	Sandstone	9.1	234	0.04	-	1.2	47.7	-46.5	39.0	Non-Acid Forming-Barren
104	EB1606676041	KCE15029	330287	52.90	53.23	0.33	Roof K Seam	Mudstone	8.9	274	0.05	-	1.5	32.3	-30.8	21.1	Non-Acid Forming-Barren
105	EB1606676042	KCE15029	330290	54.26	54.47	0.21	Floor K Seam	Mudstone	8.9	308	0.05	-	1.5	7.5	-6.0	4.9	Non-Acid Forming-Barren
106	EB1606676043	KCE15029	330327	64.60	64.88	0.28	Parting N Seam	Sandstone	9.3	338	0.04	-	1.2	170.0	-168.8	138.9	Non-Acid Forming-Barren
107	EB1606676044	KCE15029	330346	69.08	69.37	0.29	Parting O Seam	Sandstone	9.4	258	0.02	-	0.6	5.0	-4.4	8.2	Non-Acid Forming-Barren
108	EB1606676045	KCE15029	330347	72.15	72.48	0.33	Parting RS Seams	Siltstone	9.7	374	0.02	-	0.6	36.7	-36.1	60.0	Non-Acid Forming-Barren
109	EB1606676046	KCE15029	330348	74.37	74.67	0.30	Parting RS Seams	Siltstone	9.4	176	0.02	-	0.6	6.4	-5.8	10.5	Non-Acid Forming-Barren

Table C1: Acid Base Account Results for Kogan Creek Samples

RGS Sample No.	ALS Laboratory Number	Drill Hole ID	Client Sample ID	Depth Interval (m)			Sample Type	Sample Lithology	pH[1]	EC[1]	Total S	Scr[2]	MPA[2]	ANC[2]	NAPP[2]	ANC: MPA Ratio	Sample Classification[3]
				From	To	Range				(µS/cm)	(%)		(kg H_2SO_4/t)				
110	EB1606676047	KCE15032	330485	0.00	1.00	1.00	Overburden	Soil	7.6	814	0.03	-	0.9	8.1	-7.2	8.8	Non-Acid Forming-Barren
111	EB1606676048	KCE15032	330486	4.00	5.00	1.00	Overburden	Clay	6.6	700	0.03	-	0.9	3.4	-2.5	3.7	Non-Acid Forming-Barren
112	EB1606676049	KCE15032	330487	9.00	9.99	0.99	Overburden	Siltstone	8.6	632	0.04	-	1.2	17.0	-15.8	13.9	Non-Acid Forming-Barren
113	EB1606676050	KCE15032	330488	10.55	10.79	0.24	Overburden	Sandstone	9.0	558	0.04	-	1.2	244.0	-242.8	199.4	Non-Acid Forming-Barren
114	EB1606676051	KCE15032	330489	13.38	13.69	0.31	Overburden	Mudstone	8.3	363	0.07	-	2.1	9.8	-7.7	4.6	Non-Acid Forming-Barren
115	EB1606676052	KCE15032	330490	14.64	14.87	0.23	Roof K Seam	Sandstone	8.2	276	0.05	-	1.5	12.4	-10.9	8.1	Non-Acid Forming-Barren
116	EB1606676053	KCE15032	330494	15.84	16.21	0.37	Parting KM Seams	Mudstone	9.0	374	0.03	-	0.9	13.9	-13.0	15.1	Non-Acid Forming-Barren
117	EB1606676054	KCE15032	330527	24.49	24.79	0.30	Parting M Seam	Mudstone	8.8	232	0.03	-	0.9	7.0	-6.1	7.6	Non-Acid Forming-Barren
118	EB1606676055	KCE15032	330548	30.09	30.30	0.21	Parting N Seam	Mudstone	8.6	330	0.20	0.09	2.6	7.8	-5.2	3.0	Non-Acid Forming-Barren
119	EB1606676056	KCE15032	330564	34.27	34.50	0.23	Parting O Seam	Siltstone	9.1	139	0.04	-	1.2	5.6	-4.4	4.6	Non-Acid Forming-Barren
120	EB1606676057	KCE15032	330568	35.56	35.85	0.29	Parting RS Seams	Siltstone	9.2	183	0.06	-	1.8	10.2	-8.4	5.6	Non-Acid Forming-Barren
121	EB1606676058	KCE15032	330577	38.56	38.77	0.21	Parting S Seam	Siderite	9.2	215	0.03	-	0.9	126.0	-125.1	137.3	Non-Acid Forming-Barren

Notes:

1. Current pH, EC, Alkalinity and Acidity provided for 1:5 sample:water extracts
2. Scr = Chromium Reducible Sulfur; MPA = Maximum Potential Acidity; ANC = Acid Neutralising Capacity; and NAPP = Net Acid Producing Potential.
3. Concentrations of Total S and NAPP less than the laboratory Limit of Reporting (LoR) have been marked as half the LoR value.
4. Sample classification detail provided in report text.

Table C2: Samples Selected for Additional Static and Kinetic Geochemical Tests

RGS Sample No.	ALS Laboratory Number	Drill Hole ID	Client Sample ID	Depth Interval (m)			Sample Type	Sample Lithology	Sample Classification[1]	ALS Assays required			RGS	
				From	To	Range				Scr	ME	CEC + ESP	KLC	pXRF
1	EB1606672001	KCE15012	121645	0.00	2.00	2.00	Overburden	Clay	Non-Acid Forming-Barren					
2	EB1606672002	KCE15012	121646	3.00	9.00	6.00	Overburden	Claystone	Non-Acid Forming-Barren					
3	EB1606672003	KCE15012	121647	10.00	14.00	4.00	Overburden	Claystone	Non-Acid Forming-Barren					
4	EB1606672004	KCE15012	121648	14.00	21.00	7.00	Overburden	Claystone	Non-Acid Forming-Barren		1	1	1	
5	EB1606672005	KCE15012	121649	21.00	28.00	7.00	Overburden	Claystone	Non-Acid Forming-Barren					
6	EB1606672006	KCE15012	121650	28.00	30.00	2.00	Overburden	Sandstone	Non-Acid Forming-Barren					
7	EB1606672007	KCE15012	121651	30.00	36.00	6.00	Overburden	Sandstone	Non-Acid Forming-Barren					
8	EB1606672008	KCE15012	121652	36.00	42.00	6.00	Overburden	Sandstone	Non-Acid Forming-Barren					
9	EB1606672009	KCE15012	121653	43.00	48.00	5.00	Overburden	Sandstone	Non-Acid Forming-Barren		2	2	2	
10	EB1606672010	KCE15012	121654	48.00	53.02	5.02	Overburden	Sandstone	Non-Acid Forming-Barren					
11	EB1606672011	KCE15012	121655	54.50	54.80	0.30	Overburden	Sandstone	Non-Acid Forming-Barren					
12	EB1606672012	KCE15012	121656	56.50	56.80	0.30	Roof K Seam	Siltstone	Non-Acid Forming-Barren					Yes
13	EB1606672013	KCE15012	121657	57.67	57.90	0.23	Floor K Seam	Mudstone	Non-Acid Forming-Barren					
14	EB1606672014	KCE15012	121658	68.08	68.36	0.28	Parting N Seam	Siltstone	Non-Acid Forming-Barren					Yes
15	EB1606672015	KCE15012	121659	68.36	68.60	0.24	Parting N Seam	Sandstone	Non-Acid Forming-Barren					
16	EB1606672016	KCE15012	121660	69.12	69.40	0.28	Parting N Seam	Siltstone	Non-Acid Forming-Barren					Yes
17	EB1606672017	KCE15012	121661	70.00	70.31	0.31	Parting N Seam	Sandstone	Non-Acid Forming-Barren					
18	EB1606672018	KCE15012	121662	74.38	74.68	0.30	Parting O Seam	Siltstone	Non-Acid Forming-Barren					Yes
19	EB1606672019	KCE15012	121663	76.85	77.27	0.42	Floor R Seam	Sandstone	Non-Acid Forming-Barren					
20	EB1606672020	KCE15012	121664	77.27	77.64	0.37	Parting RS Seams	Siltstone	Non-Acid Forming-Barren					Yes
21	EB1606672021	KCE15012	121665	80.67	81.04	0.37	Parting S Seam	Sandstone	Non-Acid Forming-Barren					
22	EB1606672022	KCE15012	121666	81.42	81.75	0.33	Parting S Seam	Sandstone	Non-Acid Forming-Barren					
23	EB1606672023	KCE15012	121667	82.98	83.33	0.35	Parting S Seam	Siltstone	Non-Acid Forming-Barren		3			
24	EB1606672024	KCE15012	121668	85.17	85.65	0.48	Parting S Seam	Sandstone	Non-Acid Forming-Barren					
25	EB1606672025	KCE15012	121669	86.17	86.44	0.27	Parting S Seam	Sandstone	Non-Acid Forming-Barren					
26	EB1606672026	KCE15012	121670	89.99	90.37	0.38	Parting T Seam	Sandstone	Non-Acid Forming-Barren					Yes
27	EB1606672027	KCE15012	121671	92.75	93.13	0.38	Floor T Seam	Sandstone	Non-Acid Forming-Barren					Yes
28	EB1606672028	KCE15016	329256	0.00	1.00	1.00	Overburden	Soil	Non-Acid Forming-Barren					
29	EB1606672029	KCE15016	329257	4.00	5.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					Yes
30	EB1606672030	KCE15016	329258	9.00	10.00	1.00	Overburden	Claystone	Non-Acid Forming-Barren					Yes
31	EB1606672031	KCE15016	329259	14.00	15.00	1.00	Overburden	Claystone	Non-Acid Forming-Barren					Yes
32	EB1606672032	KCE15016	329260	19.00	20.00	1.00	Overburden	Claystone	Non-Acid Forming-Barren					Yes

Table C2: Samples Selected for Additional Static and Kinetic Geochemical Tests

RGS Sample No.	ALS Laboratory Number	Drill Hole ID	Client Sample ID	Depth Interval (m)			Sample Type	Sample Lithology	Sample Classification[1]	ALS Assays required			RGS	
				From	To	Range				Scr	ME	CEC + ESP	KLC	pXRF
33	EB1606672033	KCE15016	329261	24.00	25.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren		4	3		
34	EB1606672034	KCE15016	329262	29.00	30.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					
35	EB1606672035	KCE15016	329263	36.84	37.14	0.30	Overburden	Siltstone	Non-Acid Forming-Barren					
36	EB1606672036	KCE15016	329264	37.36	37.66	0.30	Overburden	Sandstone	Non-Acid Forming-Barren					
37	EB1606672037	KCE15016	329265	40.15	40.47	0.32	Overburden	Sandstone	Non-Acid Forming-Barren					
38	EB1606672038	KCE15016	329266	42.32	42.59	0.27	Roof K Seam	Mudstone	Non-Acid Forming-Barren	Yes				
39	EB1606672039	KCE15016	329273	43.89	44.14	0.25	Parting KM Seams	Mudstone	Non-Acid Forming-Barren					
40	EB1606672040	KCE15016	329305	51.99	52.23	0.24	Parting M Seam	Mudstone	Non-Acid Forming-Barren	Yes				
41	EB1606672041	KCE15016	329319	55.32	55.60	0.28	Parting N Seam	Mudstone	Non-Acid Forming-Barren					
42	EB1606672042	KCE15016	329342	60.42	60.74	0.32	Parting O Seam	Siltstone	Non-Acid Forming-Barren	Yes				
43	EB1606672043	KCE15016	329245	65.01	65.31	0.30	Parting RS Seams	Siltstone	Non-Acid Forming-Barren					Yes
44	EB1606672044	KCE15016	329352	67.00	67.30	0.30	Parting S Seam	Mudstone	Non-Acid Forming-Barren					Yes
45	EB1606672045	KCE15016	329360	69.66	69.96	0.30	Parting S Seam	Siltstone	Non-Acid Forming-Barren					Yes
46	EB1606672046	KCE15019	329583	0.00	2.00	2.00	Overburden	Sandstone	Non-Acid Forming-Barren					Yes
47	EB1606672047	KCE15019	329584	4.00	5.00	1.00	Overburden	Claystone	Non-Acid Forming-Barren					Yes
48	EB1606672048	KCE15019	329585	9.00	10.00	1.00	Overburden	Claystone	Non-Acid Forming-Barren					Yes
49	EB1606672049	KCE15019	329586	14.00	17.00	3.00	Overburden	Sandstone	Non-Acid Forming-Barren		5	4	3	
50	EB1606672050	KCE15019	329587	19.00	20.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					
51	EB1606672051	KCE15019	329588	24.00	25.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					
52	EB1606672052	KCE15019	329589	29.00	30.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					
53	EB1606672053	KCE15019	329590	34.00	35.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					
54	EB1606672054	KCE15019	329591	39.00	40.03	1.03	Overburden	Sandstone	Non-Acid Forming-Barren					
55	EB1606672055	KCE15019	329592	46.76	47.03	0.27	Overburden	Siltstone	Non-Acid Forming-Barren					Yes
56	EB1606672056	KCE15019	329593	49.39	49.72	0.33	Roof K Seam	Sandstone	Non-Acid Forming-Barren					Yes
57	EB1606672057	KCE15019	329597	50.43	50.71	0.28	Parting KM Seams	Mudstone	Non-Acid Forming-Barren					Yes
58	EB1606672063	KCE15019	329633	58.60	58.93	0.33	Parting M Seam	Mudstone	Non-Acid Forming-Barren					Yes
59	EB1606672058	KCE15019	329651	61.89	62.14	0.25	Parting N seam	Siltstone	Non-Acid Forming-Barren	Yes	6			
60	EB1606672059	KCE15019	329657	62.95	63.15	0.20	Parting N Seam	Siltstone	Non-Acid Forming-Barren					
61	EB1606672060	KCE15019	329673	66.70	67.00	0.30	Parting O Seam	Siltstone	Non-Acid Forming-Barren					
62	EB1606672061	KCE15019	329675	68.35	68.66	0.31	Parting RS Seams	Siltstone	Non-Acid Forming-Barren					
63	EB1606672062	KCE15019	329682	69.85	70.19	0.34	Parting S Seam	Siltstone	Non-Acid Forming-Barren					
64	EB1606676001	KCE15020	329710	0.00	6.00	6.00	Overburden	Sandstone	Non-Acid Forming-Barren					
65	EB1606676002	KCE15020	329711	6.00	7.00	1.00	Overburden	Calcrete	Non-Acid Forming-Barren					Yes

Table C2: Samples Selected for Additional Static and Kinetic Geochemical Tests

RGS Sample No.	ALS Laboratory Number	Drill Hole ID	Client Sample ID	Depth Interval (m)			Sample Type	Sample Lithology	Sample Classification[1]	ALS Assays required			RGS	
				From	To	Range				Scr	ME	CEC + ESP	KLC	pXRF
66	EB1606676003	KCE15020	329712	7.00	8.00	1.00	Overburden	Laterite	Non-Acid Forming-Barren					Yes
67	EB1606676004	KCE15020	329713	8.00	10.00	2.00	Overburden	Sandstone	Non-Acid Forming-Barren					
68	EB1606676005	KCE15020	329714	10.00	12.00	2.00	Overburden	Sandstone	Non-Acid Forming-Barren					
69	EB1606676006	KCE15020	329715	12.00	14.00	2.00	Overburden	Sandstone	Non-Acid Forming-Barren					
70	EB1606676007	KCE15020	329716	14.00	21.00	7.00	Overburden	Sandstone	Non-Acid Forming-Barren		7	5		
71	EB1606676008	KCE15020	329717	21.00	23.00	2.00	Overburden	Sandstone	Non-Acid Forming-Barren					
72	EB1606676009	KCE15020	329718	23.00	25.00	2.00	Overburden	Sandstone	Non-Acid Forming-Barren					
73	EB1606676010	KCE15020	329719	25.00	33.00	8.00	Overburden	Sandstone	Non-Acid Forming-Barren					
74	EB1606676011	KCE15020	329720	33.00	34.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					Yes
75	EB1606676012	KCE15020	329721	34.00	36.00	2.00	Overburden	Sandstone	Non-Acid Forming-Barren					
76	EB1606676013	KCE15020	329722	36.00	39.00	3.00	Overburden	Sandstone	Non-Acid Forming-Barren					
77	EB1606676014	KCE15020	329723	39.00	45.02	6.02	Overburden	Siltstone	Non-Acid Forming-Barren					Yes
78	EB1606676015	KCE15020	329724	46.57	46.87	0.30	Overburden	Sandstone	Non-Acid Forming-Barren					
79	EB1606676016	KCE15020	329725	48.04	48.34	0.30	Overburden	Sandstone	Non-Acid Forming-Barren					
80	EB1606676017	KCE15020	329726	50.63	50.95	0.32	Overburden	Mudstone	Non-Acid Forming-Barren					Yes
81	EB1606676018	KCE15020	329730	51.87	52.14	0.27	Parting KM Seams	Carb. Mudstone	Non-Acid Forming-Barren					Yes
82	EB1606676019	KCE15020	329785	66.87	67.16	0.29	Parting O Seam	Sandstone	Non-Acid Forming-Barren					
83	EB1606676020	KCE15020	329789	69.17	69.47	0.30	Parting RS Seams	Sandstone	Non-Acid Forming-Barren					
84	EB1606676021	KCE15020	329790	71.45	71.75	0.30	Roof S Seam	Sandstone	Non-Acid Forming-Barren					
85	EB1606676022	KCE15020	329801	73.88	74.10	0.22	Parting S Seam	Sandstone	Non-Acid Forming-Barren					
86	EB1606676023	KCE15020	329805	74.84	75.14	0.30	Parting S Seam	Sandstone	Non-Acid Forming-Barren		8		4	
87	EB1606676024	KCE15020	329806	76.58	76.92	0.34	Parting S Seam	Sandstone	Non-Acid Forming-Barren					
88	EB1606676025	KCE15020	329807	77.67	77.97	0.30	Parting ST Seams	Sandstone	Non-Acid Forming-Barren					
89	EB1606676026	KCE15020	329822	81.94	82.24	0.30	Parting T Seam	Sandstone	Non-Acid Forming-Barren					
90	EB1606676027	KCE15020	329823	83.94	84.24	0.30	Floor T Seam	Sandstone	Non-Acid Forming-Barren					Yes
91	EB1606676028	KCE15029	330274	0.00	1.00	1.00	Overburden	Sand, Claystone	Non-Acid Forming-Barren					
92	EB1606676029	KCE15029	330275	4.00	5.00	1.00	Overburden	Claystone	Non-Acid Forming-Barren					
93	EB1606676030	KCE15029	330276	9.00	10.00	1.00	Overburden	Claystone	Non-Acid Forming-Barren					Yes
94	EB1606676031	KCE15029	330277	14.00	15.00	1.00	Overburden	Claystone	Non-Acid Forming-Barren					
95	EB1606676032	KCE15029	330278	19.00	20.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					
96	EB1606676033	KCE15029	330279	24.00	25.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					Yes
97	EB1606676034	KCE15029	330280	29.00	30.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					
98	EB1606676035	KCE15029	330281	34.00	35.00	1.00	Overburden	Sandstone	Non-Acid Forming-Barren					

Table C2: Samples Selected for Additional Static and Kinetic Geochemical Tests

RGS Sample No.	ALS Laboratory Number	Drill Hole ID	Client Sample ID	Depth Interval (m)			Sample Type	Sample Lithology	Sample Classification[1]	ALS Assays required			RGS	
				From	To	Range				Scr	ME	CEC + ESP	KLC	pXRF
99	EB1606676036	KCE15029	330282	39.00	40.00	1.00	Overburden	Siltstone	Non-Acid Forming-Barren		9	6		
100	EB1606676037	KCE15029	330283	44.00	45.00	1.00	Overburden	Siltstone	Non-Acid Forming-Barren					
101	EB1606676038	KCE15029	330284	49.00	50.01	1.01	Overburden	Siltstone	Non-Acid Forming-Barren					
102	EB1606676039	KCE15029	330285	51.07	51.40	0.33	Overburden	Sandstone	Non-Acid Forming-Barren					
103	EB1606676040	KCE15029	330286	51.40	51.69	0.29	Overburden	Sandstone	Non-Acid Forming-Barren					Yes
104	EB1606676041	KCE15029	330287	52.90	53.23	0.33	Roof K Seam	Mudstone	Non-Acid Forming-Barren					
105	EB1606676042	KCE15029	330290	54.26	54.47	0.21	Floor K Seam	Mudstone	Non-Acid Forming-Barren					Yes
106	EB1606676043	KCE15029	330327	64.60	64.88	0.28	Parting N Seam	Sandstone	Non-Acid Forming-Barren					
107	EB1606676044	KCE15029	330346	69.08	69.37	0.29	Parting O Seam	Sandstone	Non-Acid Forming-Barren					Yes
108	EB1606676045	KCE15029	330347	72.15	72.48	0.33	Parting RS Seams	Siltstone	Non-Acid Forming-Barren					Yes
109	EB1606676046	KCE15029	330348	74.37	74.67	0.30	Parting RS Seams	Siltstone	Non-Acid Forming-Barren					Yes
110	EB1606676047	KCE15032	330485	0.00	1.00	1.00	Overburden	Soil	Non-Acid Forming-Barren					
111	EB1606676048	KCE15032	330486	4.00	5.00	1.00	Overburden	Clay	Non-Acid Forming-Barren					Yes
112	EB1606676049	KCE15032	330487	9.00	9.99	0.99	Overburden	Siltstone	Non-Acid Forming-Barren					Yes
113	EB1606676050	KCE15032	330488	10.55	10.79	0.24	Overburden	Sandstone	Non-Acid Forming-Barren					Yes
114	EB1606676051	KCE15032	330489	13.38	13.69	0.31	Overburden	Mudstone	Non-Acid Forming-Barren					
115	EB1606676052	KCE15032	330490	14.64	14.87	0.23	Roof K Seam	Sandstone	Non-Acid Forming-Barren					Yes
116	EB1606676053	KCE15032	330494	15.84	16.21	0.37	Parting KM Seams	Mudstone	Non-Acid Forming-Barren		10	7		
117	EB1606676054	KCE15032	330527	24.49	24.79	0.30	Parting M Seam	Mudstone	Non-Acid Forming-Barren					
118	EB1606676055	KCE15032	330548	30.09	30.30	0.21	Parting N Seam	Mudstone	Non-Acid Forming-Barren	Yes				
119	EB1606676056	KCE15032	330564	34.27	34.50	0.23	Parting O Seam	Siltstone	Non-Acid Forming-Barren					Yes
120	EB1606676057	KCE15032	330568	35.56	35.85	0.29	Parting RS Seams	Siltstone	Non-Acid Forming-Barren					Yes
121	EB1606676058	KCE15032	330577	38.56	38.77	0.21	Parting S Seam	Siderite	Non-Acid Forming-Barren					Yes

Table C3: Multi-Element Test Results for Selected Samples

	Material Type →		Overburden	Overburden	Parting S Seam	Overburden	Overburden	Parting N Seam + Parting O Seam + Parting RS Seams + Parting S Seam	Overburden	Roof S Seam + Parting S Seam + Parting ST Seam	Overburden	Parting KM Seam + Parting M Seam + Parting N Seam
	RGS Sample Number →		1	2	3	4	5	6	7	8	9	10
	ALS Laboratory ID →		EB1608733051	EB1608733052	EB1608733053	EB1608733054	EB1608733055	EB1608733056	EB1608733057	EB1608733058	EB1608733059	EB1608733060
	Drill hole ID →		KCE15012	KCE15012	KCE15012	KCE15012	KCE15012 + KCE15016	KCE15016	KCE15016	KCE15016	KCE15016 + KCE15019	KCE15019
	Client Sample ID (1st) →		Composite 1	Composite 2	Composite 3	Composite 4	Composite 5	Composite 6	Composite 7	Composite 8	Composite 9	Composite 10
Parameters	Limit of Reporting	NEPC[1] Health-Based Investigation Level (HILs)-C	Claystone	Sandstone	Sandstone + Siltstone	Sandstone + Siltstone	Sandstone	Siltstone	Sandstone	Sandstone	Siltstone	Mudstone
Major Elements	**All units mg/kg**											
Calcium (Ca)	50	-	2,100	13,300	6,380	7,610	6,680	11,300	1,750	24,600	17,400	3,190
Magnesium (Mg)	50	-	2,640	4,160	4,600	4,230	3,380	4,520	3,820	6,360	3,880	3,090
Potassium (K)	50	-	400	960	1,530	1,160	710	1,590	530	1,450	1,470	1,590
Sodium (Na)	50	-	2,300	1,730	2,700	1,890	1,780	980	2,150	1,840	1,030	870
Minor Elements	**All units mg/kg**											
Aluminium (Al)	50	-	15,500	12,100	11,900	12,700	13,700	8,650	19,400	10,900	10,700	8,320
Antimony (Sb)	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic (As)	5	300	<5	<5	<5	<5	<5	<5	5	<5	<5	6
Boron (B)	50	20,000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium (Cd)	1	90	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chromium (Cr) - VI	2	300 **	49	34	17	43	42	16	16	21	14	13
Cobalt (Co)	2	300	12	20	11	28	16	6	17	8	24	9
Copper (Cu)	5	17,000	6	15	52	20	10	31	9	37	28	36
Iron (Fe)	50	-	13,600	29,500	14,200	21,700	23,100	9,370	30,900	16,200	28,000	8,850
Lead (Pb)	5	600	12	10	18	11	8	20	10	14	13	21
Manganese (Mn)	5	19,000	510	940	142	906	594	152	147	146	824	124
Molybdenum (Mo)	2	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Nickel (Ni)	2	1,200	8	13	13	25	13	8	14	11	23	9
Selenium (Se)	5	700	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Thorium (Th)	0.1	-	2.8	2.9	4.6	3.2	2.3	5.3	2.8	4.1	4.1	5
Uranium (U)	0.1	-	0.2	0.4	0.5	0.5	0.4	0.6	0.3	0.5	0.6	0.6
Vanadium (V)	5	-	40.0	42	31.0	45	52	22	61	30.0	50	22
Zinc (Zn)	5	30,000	47	82	97	90	67	65	60	98	86	115
Exchangable Cations	**All units meq/100g (except Exchangable Sodium Percentage (%))**											
Exch. Calcium	0.2	-	4.9	5.1	----	5.9	4.6	----	3.7	----	5.8	2.8
Exch. Magnesium	0.2	-	6.0	3.6	----	5.3	3.7	----	8.8	----	2.9	2.3
Exch. Potassium	0.2	-	<0.2	<0.2	----	0.4	<0.2	----	<0.2	----	0.5	0.3
Exch. Sodium	0.2	-	3.6	2.0	----	2.6	1.5	----	3.4	----	1.4	0.7
Cation Exchange Capacity	0.2	-	14.5	10.6	----	14.2	9.8	----	15.9	----	10.6	6.1
Calcium:Magnesium Ratio	-	-	0.8	1.4	----	1.1	1.2	----	0.4	----	2.0	1.2
Exchangable Sodium Percentage	0.2	-	24.8	18.7	----	18.6	15.7	----	21.2	----	13.6	10.8

Notes: < indicates less than the laboratory limit of reporting.

Table C4: Geochemical Abundance Index (GAI) Results for Selected Samples

Parameters		Material Type →	Overburden	Overburden	Parting S Seam	Overburden	Overburden	Parting N Seam + Parting O Seam + Parting RS Seams + Parting S Seam	Overburden	Roof S Seam + Parting S Seam + Parting ST Seam	Overburden	Parting KM Seam + Parting M Seam + Parting N Seam
		RGS Sample Number →	1	2	3	4	5	6	7	8	9	10
		ALS Laboratory ID →	EB1608733051	EB1608733052	EB1608733053	EB1608733054	EB1608733055	EB1608733056	EB1608733057	EB1608733058	EB1608733059	EB1608733060
		Drill Hole ID →	KCE15012	KCE15012	KCE15012	KCE15012	KCE15012 + KCE15016	KCE15016	KCE15016	KCE15016	KCE15016 + KCE15019	KCE15019
		Client Sample ID (1st)→	Composite 1	Composite 2	Composite 3	Composite 4	Composite 5	Composite 6	Composite 7	Composite 8	Composite 9	Composite 10
		Material Description/Seam →	Claystone	Sandstone	Sandstone + Siltstone	Sandstone + Siltstone	Sandstone	Siltstone	Sandstone	Sandstone	Siltstone	Mudstone
		Date →	24/02/2016	24/02/2016	24/02/2016	24/02/2016	24/02/2016	24/02/2016	24/02/2016	24/02/2016	24/02/2016	24/02/2016
	Limit of Reporting	Average Crustal Abundance[1]	Kogan Creek	Kogan Creek	Kogan Creek	Kogan Creek	Kogan Creek	Kogan Creek	Kogan Creek	Kogan Creek	Kogan Creek	Kogan Creek
Major Elements	mg/kg		Geochemical Abundance Index									
Aluminium (Al)	50.0	71,000	0	0	0	0	0	0	0	0	0	0
Calcium (Ca)	50.0	15,000	0	0	0	0	0	0	0	0	0	0
Iron (Fe)	50.0	40,000	0	0	0	0	0	0	0	0	0	0
Magnesium (Mg)	50.0	5,000	0	0	0	0	0	0	0	0	0	0
Potassium (K)	50.0	14,000	0	0	0	0	0	0	0	0	0	0
Sodium (Na)	50.0	5,000	0	0	0	0	0	0	0	0	0	0
Minor Elements	mg/kg		Geochemical Abundance Index									
Antimony (Sb)	5.0	5	0	0	0	0	0	0	0	0	0	0
Arsenic (As)	5.0	6	0	0	0	0	0	0	0	0	0	0
Boron (B)	50.0	100	0	0	0	0	0	0	0	0	0	0
Cadmium (Cd)	1.0	0.35	0	0	0	0	0	0	0	0	0	0
Chromium (Cr)	2.0	70	0	0	0	0	0	0	0	0	0	0
Cobalt (Co)	2.0	8	0	1	0	1	0	0	1	0	1	0
Copper (Cu)	5.0	30	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	5.0	35	0	0	0	0	0	0	0	0	0	0
Manganese (Mn)	5.0	1000	0	0	0	0	0	0	0	0	0	0
Molybdenum (Mo)	2.0	2	0	0	0	0	0	0	0	0	0	0
Nickel (Ni)	2.0	50	0	0	0	0	0	0	0	0	0	0
Selenium (Se)	5.0	0.4	2	2	2	2	2	2	2	2	2	2
Zinc (Zn)	5.0	90	0	0	0	0	0	0	0	0	0	0

Notes:

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

1. Average Crustal Abundance values sourced from the "GARD Guide", Chapter 5 (INAP, 2009).
2. Se = all samples below LOR = entered zero (ICP-AES detection limits)
3. Concentrations less than LoR have been halfed
4. When no GARD Guide value is available for particular element, then values are taken from Bowen H.J.M.(1979) Environmental Chemistry of the Elements, Academic Press, New York, p42-43.

Table C5: Multi-Element Test Results for Water Extracts from Selected Samples

		RGS Sample Number →	1	2	3	4	5	6	7	8	9	10
		ALS Laboratory ID →	EB1608733051	EB1608733052	EB1608733053	EB1608733054	EB1608733055	EB1608733056	EB1608733057	EB1608733058	EB1608733059	EB1608733060
		Client Sample ID (1st) →	Composite 1	Composite 2	Composite 3	Composite 4	Composite 5	Composite 6	Composite 7	Composite 8	Composite 9	Composite 10
		Water Quality Guidelines:										
Parameters	Limit of Reporting	Aquatic Ecosystems (freshwater)[1]	Livestock Drinking Water[2]	Claystone	Sandstone	Sandstone + Siltstone	Sandstone + Siltstone	Sandstone	Siltstone	Sandstone	Sandstone	Siltstone	Mudstone
pH	0.01 pH unit	6 to 9	-	5.20	9.10	9.80	8.90	7.60	9.30	5.30	9.80	8.80	9.00
Electrical Conductivity	1 µS/cm	<1,000#	-	551	452	474	561	864	288	463	442	376	338
Carbonate Alkalinity ($mgCaCO_3/L$)	1 mg/L	-	-	<1	26.4	212	26.4	<1	39.8	<1	292	39.8	26.4
Bicarbonate Alkalinity ($mgCaCO_3/L$)	1 mg/L	-	-	60	2140	954	796	728	1232	114	9320	2340	372
Total Alkalinity ($mgCaCO_3/L$)	1 mg/L	-	-	60	2180	1166	822	728	1272	114	9620	2380	398
Acidity ($mgCaCO_3/L$)	1 mg/L	-	-	118	<1	<1	<1	9.8	<1	111	<1	<1	<1
Net Alkalinity ($mgCaCO_3/L$)	1 mg/L	-	-	-58	2180	1166	822	718	1272	3	9620	2380	398
Major Ions	All units mg/L			All units mg/L									
Calcium (Ca)	2	-	1,000	<2	<2	<2	2	18	<2	<2	<2	4	<2
Magnesium (Mg)	2	-	-	<2	<2	<2	<2	8.0	<2	<2	<2	<2	<2
Potassium (K)	2	-	-	<2	2	2	4	4	4	<2	2	6	6
Sodium (Na)	2	-	-	106	94	88	118	178	54	84	90	76	64
Chloride (Cl)	2	-	-	168	40	6	68	116	12	138	6	14	22
Fluoride (F)	0.2	-	2	<2	<2	<2	0	0	0	<2	<2	<2	0
Phosphate (PO_4)	0.02	-	-	<2	0	0	0	<2	0	<2	0	0	0
Sulfate (SO_4)	2	-	1,000	<2	18	8	34	24	16	<2	8	38	40
Trace Metals/Metalloids	All units mg/L			All units mg/L									
Aluminium (Al)	0.02	0.055	5	<0.02	0.02	0.16	<0.02	<0.02	0.06	<0.02	0.16	<0.02	0.02
Antimony (Sb)	0.002			<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic (As) - pentavalent	0.002	0.013 **	0.5	<0.002	0.018	0.198	0.010	<0.002	0.038	<0.002	0.088	0.004	0.006
Barium (Ba)	0.002	-	-	0.014	0.006	0.004	0.008	0.022	0.004	0.010	0.004	<0.002	<0.002
Beryllium (Be)	0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron (B)	0.2	0.37	5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium (Cd)	0.002	0.0002	0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (Cr) - total	0.002	0.001 (hex)*	1 (total)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt (Co)	0.002	-	1	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Copper (Cu)	0.002	0.0014	1	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron (Fe)	0.2	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Lead (Pb)	0.002	0.0034	0.1	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese (Mn)	0.002	1.90	-	0.018	<0.002	<0.002	0.002	0.082	<0.002	<0.002	<0.002	<0.002	<0.002
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
Molybdenum (Mo)	0.002	-	0.15	<0.002	0.008	0.042	0.030	0.004	0.028	<0.002	0.020	0.004	<0.002
Nickel (Ni)	0.002	0.011	1	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Selenium (Se)	0.02	0.011	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Thorium (Th)	0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium (U)	0.002	-	0.2	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium (V)	0.02	-	-	<0.02	<0.02	0.12	<0.02	<0.02	0.06	<0.02	0.06	<0.02	<0.02
Zinc (Zn)	0.01	0.008	20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

* Cr (VI) = hexavalent. ** 0.024 mg/Lfor trivalent Arsenic (III).

Notes: < indicates concentration less than limit of reporting. Shaded cells exceed applied guideline values.

1. ANZECC & ARMCANZ (2000). Trigger values for aquatic ecosystems (95% species protection level). 2. ANZECC & ARMCANZ (2000). Recommended guideline limits for Livestock Drinking Water.

1 + 2. both taken from the "Australian and New Zealand Guidelines for Fresh and Marine Water Quality", National Water Quality Management Strategy, 2000, (ANZECC and ARMCANZ, 2000).

KLC1 - Claystone (Overburden)

Weight (kg)	1.51	**Total S (%)**	0.01	**ANC**	0.4
pH (1:5)	5.73	**Scr (%)**	0.01	**NAPP**	-0.2
EC (µS/cm)	554	**MPA**	0.15	**ANC:MPA**	2.4

Date		**11-Apr-16**	**09-May-16**	**13-Jun-16**	**11-Jul-16**	**08-Aug-16**	**12-Sep-16**	**10-Oct-16**
Week		**0**	**4**	**9**	**13**	**17**	**22**	**26**
Leach Number		**1**	**2**	**3**	**4**	**5**	**6**	**7**
ALS Laboratory Number		EB1609695	EB1612199	EB1616245	EB1617820	EB1619904	EB1622349	EB1624335
Volume On (L)		1.3	1.2	1.3	1.0	1.0	1.0	1.0
Volume Off (L)		0.556	0.734	0.563	0.928	0.891	0.860	0.893
Cum. Volume (L)		0.56	1.29	1.85	2.78	3.67	4.53	5.43
Pore Volumes		0.4	1.0	1.4	2.1	2.7	3.4	4.0
pH (RGS Measurement)		4.26	4.67	4.84	5.45	5.48	5.57	5.45
pH (ALS Measurement)		4.28	4.63	4.78	5.98	6.12	6.03	5.83
pH (deionised water)		6.33	5.43	5.64	5.60	5.41	5.15	5.14
EC (µS/cm) (RGS Measurement)		2,640	847	1,081	126	99	58	118
EC (µS/cm) (ALS Measurement)		2,640	890	1,170	144	108	66	130
Acidity (mg/L)*		29	4	590	4	6	5	11
Alkalinity (mg/L)*		<1	<1	13	4	5	5	4
Net Alkalinity (mg/L)*		-29	-4	-577	0	-1	0	-7
Total Anions (meq/L)		----	8	11	----	----	----	1
Total Cations (meq/L)		----	7	9	----	----	----	1
Ionic Balance (%)		----	4	6	----	----	----	----
Major Ions (mg/L)	**Guideline Limits #**							
Calcium (Ca)	1,000	44	6	2	<1	<1	<1	<1
Potassium (K)	-	2	1	1	<1	<1	<1	<1
Magnesium (Mg)	-	48	6	2	<1	<1	<1	<1
Sodium (Na)	-	396	151	207	24	17	13	24
Chloride (Cl)	-	864	282	353	32	24	16	31
Fluoride (F)	2	0.1	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1
Sulfate (SO_4)	1,000	5	5	12	3	8	6	3
Trace metals/ metalloids (mg/L)	**Guideline Limits #**							
Aluminium (Al)	5	0.85	0.05	<0.05	0.45	0.15	0.7	0.6
Arsenic (As)	0.5	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001
Boron (B)	5	<0.05	0.05	0.07	<0.05	<0.05	<0.05	<0.05
Barium (Ba)	-	0.123	0.022	0.005	<0.001	0.001	<0.001	<0.001
Beryllium (Be)	-	0.002	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd)	0.01	0.0002	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)	1	0.022	0.003	<0.005	<0.001	<0.001	<0.001	<0.001
Chromium (Cr)	1	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001
Copper (Cu)	1	0.006	0.002	<0.005	<0.001	<0.001	<0.001	<0.001
Iron (Fe)	1#	<0.05	<0.05	<0.05	0.21	0.06	0.42	0.31
Mercury (Hg)	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese (Mn)	2#	0.101	0.018	0.007	0.002	0.002	0.001	0.001
Molybdenum (Mo)	0.15	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001
Nickel (Ni)	1	0.014	0.002	<0.005	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1	0.002	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	-	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001
Selenium (Se)	0.02	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01
Vanadium (V)	-	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01
Zinc (Zn)	20	0.076	0.007	<0.025	<0.005	<0.005	<0.005	<0.005
Calculations**								
SO_4 Release Rate		2	2	4	2	5	3	2
Cumulative SO_4 Release		2	4	9	11	15	19	21
Ca Release Rate		16.3	2.9	0.7	0.3	0.3	0.3	0.3
Cumulative Ca Release		16.3	19.2	19.9	20.2	20.5	20.8	21.1
Mg Release Rate		17.7	2.9	0.7	0.3	0.3	0.3	0.3
Cumulative Mg Release		17.7	20.7	21.4	21.7	22.0	22.3	22.6
Residual ANC (%)		69.3	64.1	62.7	62.2	61.6	61.1	60.6
Residual Sulfur (%)		98.8	97.1	94.1	92.9	89.7	87.5	86.3
SO_4/(Ca+Mg) molar ratio		0.02	0.1	0.9	0.9	2.5	1.9	0.9

< indicates less than the analytical detection limit. * Acidity and alkalinity data calculated in mg $CaCO_3$/L.
** SO_4, Ca and Mg release rates calculated in mg/kg/flush.
Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity.
MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.
# ANZECC & ARCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy, 2000, ANZECC (Australian and New Zealand Environment Conservation Council) and ARMCANZ (Agriculture and Resource Management Council of Australia and New Zealand). Livestock Drinking Water Levels (Irrigation Levels used for Fe and Mn).

KLC 2 - Sandstone (Overburden)

Weight (kg)	Weight (kg)	1.53	Total S (%)	0.02	ANC	29
pH (1:5)	pH (1:5)	8.70	Scr (%)	0.02	NAPP	-28.2
EC (µS/cm)	EC (µS/cm)	417	MPA	0.69	ANC:MPA	41.9

Date		**11-Apr-16**	**09-May-16**	**13-Jun-16**	**11-Jul-16**	**08-Aug-16**	**12-Sep-16**	**10-Oct-16**
Week		**0**	**4**	**9**	**13**	**17**	**22**	**26**
Leach Number		**1**	**2**	**3**	**4**	**5**	**6**	**7**
ALS Laboratory Number		EB1609695	EB1612199	EB1616245	EB1617820	EB1619904	EB1622349	EB1624335
Volume On (L)		1.3	1.2	1.3	1.0	1.0	1.0	1.0
Volume Off (L)		0.734	0.799	0.562	0.865	0.828	0.819	0.812
Cum. Volume (L)		0.73	1.53	2.10	2.96	3.79	4.61	5.42
Pore Volumes		0.5	1.1	1.6	2.2	2.8	3.4	4.0
pH (RGS Measurement)		9.43	9.15	8.51	9.27	7.67	8.39	8.85
pH (ALS Measurement)		8.94	8.38	8.31	7.06	7.36	6.73	9.00
pH (deionised water)		6.33	5.43	5.64	5.60	5.41	5.15	5.14
EC (µS/cm) (RGS Measurement)		302	192	1,070	36	39	29	60
EC (µS/cm) (ALS Measurement)		242	212	1,140	50	48	35	74
Acidity (mg/L)*		<1	<1	<1	2	2	1	<1
Alkalinity (mg/L)*		67	26	149	9	11	9	25
Net Alkalinity (mg/L)*		67	26	149	7	9	8	25
Total Anions (meq/L)		----	2	11	----	----	0	1
Total Cations (meq/L)		----	2	11	----	----	0	1
Ionic Balance (%)		----	----	1	----	----	----	----
Major Ions (mg/L)	**Guideline Limits #**							
Calcium (Ca)	1,000	2	2	13	<1	<1	<1	<1
Potassium (K)	-	2	2	6	<1	<1	<1	<1
Magnesium (Mg)	-	<1	1	8	<1	<1	<1	<1
Sodium (Na)	-	53	41	208	6	8	4	14
Chloride (Cl)	-	29	18	167	2	3	<1	3
Fluoride (F)	2	0.3	<0.1	0.3	<0.1	<0.1	<0.1	<0.1
Sulfate (SO_4)	1,000	18	43	144	10	11	6	10
Trace metals/ metalloids (mg/L)	**Guideline Limits #**							
Aluminium (Al)	5	0.09	0.32	<0.01	0.3	0.04	0.38	0.93
Arsenic (As)	0.5	0.008	0.001	0.003	<0.001	<0.001	<0.001	<0.001
Boron (B)	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Barium (Ba)	-	0.002	0.002	0.012	0.001	0.002	0.002	<0.001
Beryllium (Be)	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd)	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Cr)	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (Cu)	1	0.006	0.002	0.001	<0.001	0.001	<0.001	<0.001
Iron (Fe)	1#	<0.05	0.09	<0.05	0.08	<0.05	0.13	0.23
Mercury (Hg)	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese (Mn)	2#	0.004	0.005	<0.001	0.001	0.002	0.003	0.001
Molybdenum (Mo)	0.15	0.032	0.009	0.024	<0.001	<0.001	<0.001	<0.001
Nickel (Ni)	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium (Se)	0.02	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01
Vanadium (V)	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc (Zn)	20	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calculations**								
SO_4 Release Rate		9	22	53	6	6	3	5
Cumulative SO_4 Release		9	31	84	90	96	99	104
Ca Release Rate		1.0	1.0	4.8	0.3	0.3	0.3	0.3
Cumulative Ca Release		1.0	2.0	6.8	7.1	7.3	7.6	7.9
Mg Release Rate		0.2	0.5	2.9	0.3	0.3	0.3	0.3
Cumulative Mg Release		0.2	0.8	3.7	4.0	4.3	4.5	4.8
Residual ANC (%)		99.1	97.8	91.3	90.8	90.3	89.8	89.4
Residual Sulfur (%)		94.2	79.2	43.9	40.2	36.2	34.0	30.5
SO_4/(Ca+Mg) molar ratio		2.7	4.9	2.3	3.2	3.5	1.9	3.2

< indicates less than the analytical detection limit. * Acidity and alkalinity data calculated in mg $CaCO_3$/L.
** SO_4, Ca and Mg release rates calculated in mg/kg/flush.
Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity.
MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.
# ANZECC & ARCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy, 2000, ANZECC (Australian and New Zealand Environment Conservation Council) and ARMCANZ (Agriculture and Resource Management Council of Australia and New Zealand). Livestock Drinking Water Levels (Irrigation Levels used for Fe and Mn).

KLC 3 - Sandstone (Overburden)

Weight (kg)	**Weight (kg)**	1.51	**Total S (%)**	0.02	**ANC**	17	
pH (1:5)	**pH (1:5)**	6.95	**Scr (%)**	0.02	**NAPP**	-16.7	
EC (µS/cm)	**EC (µS/cm)**	503	**MPA**	0.61	**ANC:MPA**	28.3	

Date		**11-Apr-16**	**09-May-16**	**13-Jun-16**	**11-Jul-16**	**08-Aug-16**	**12-Sep-16**	**10-Oct-16**
Week		**0**	**4**	**9**	**13**	**17**	**22**	**26**
Leach Number		**1**	**2**	**3**	**4**	**5**	**6**	**7**
ALS Laboratory Number		EB1609695	EB1612199	EB1616245	EB1617820	EB1619904	EB1622349	EB1624335
Volume On (L)		1.3	1.2	1.0	1.0	1.3	1.0	1.0
Volume Off (L)		0.632	0.966	0.624	0.736	0.717	0.855	0.819
Cum. Volume (L)		0.63	1.60	2.22	2.96	3.68	4.53	5.35
Pore Volumes		0.5	1.2	1.6	2.2	2.7	3.4	4.0
pH (RGS Measurement)		7.21	7.13	7.20	9.32	8.59	8.55	9.30
pH (ALS Measurement)		7.45	6.93	6.99	7.05	8.62	7.04	9.27
pH (deionised water)		6.33	5.43	5.73	5.60	5.41	5.15	5.14
EC (µS/cm) (RGS Measurement)		126	130	244	150	268	359	166
EC (µS/cm) (ALS Measurement)		128	143	281	170	872	381	199
Acidity (mg/L)*		2.00	2.00	3.00	2.00	<1	2.00	<1
Alkalinity (mg/L)*		74	7	11	11	112	14	31
Net Alkalinity (mg/L)*		72	5	8	9	112	14.00	31.00
Total Anions (meq/L)		----	1	2.22	----	----	3.28	1.78
Total Cations (meq/L)		----	1	2.33	----	----	3.53	1.87
Ionic Balance (%)		----	----	----	----	----	3.63	----
Major Ions (mg/L)	**Guideline Limits** #							
Calcium (Ca)	1,000	1	5	6	1	3	6	<1
Potassium (K)	-	<1	<1	<1	<1	1	1	<1
Magnesium (Mg)	-	<1	2	3	<1	2	3	<1
Sodium (Na)	-	25	21	41	28	46	68	43
Chloride (Cl)	-	17	18	40	27	208	85	31
Fluoride (F)	2	0.3	<0.1	0.2	0.1	0.4	0.2	0.3
Sulfate (SO_4)	1,000	3	25	42	14	39	29	14
Trace metals/ metalloids (mg/L)	**Guideline Limits** #							
Aluminium (Al)	5	0.1	0.15	0.53	0.54	0.1	0.39	0.66
Arsenic (As)	0.5	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Boron (B)	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Barium (Ba)	-	0.001	0.002	0.003	0.001	0.002	0.002	0.002
Beryllium (Be)	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd)	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Cr)	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (Cu)	1	0.002	0.001	0.001	<0.001	0.002	<0.001	<0.001
Iron (Fe)	1#	<0.05	0.07	0.22	0.2	<0.05	0.15	0.24
Mercury (Hg)	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese (Mn)	2#	0.01	0.012	0.012	0.007	0.009	0.005	0.008
Molybdenum (Mo)	0.15	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001
Nickel (Ni)	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium (Se)	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium (V)	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc (Zn)	20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calculations**								
SO_4 Release Rate		1	16	17	7	18	16	8
Cumulative SO_4 Release		1	17	35	41	60	76	84
Ca Release Rate		0.4	3.2	2.5	0.5	1.4	3.4	0.3
Cumulative Ca Release		0.4	3.6	6.1	6.6	8.0	11.4	11.7
Mg Release Rate		0.2	1.3	1.2	0.2	0.9	1.7	0.3
Cumulative Mg Release		0.2	1.5	2.7	3.0	3.9	5.6	5.9
Residual ANC (%)		99.5	95.9	92.9	92.3	90.2	86.1	85.6
Residual Sulfur (%)		99.2	88.5	76.9	72.4	60.0	49.1	44.0
SO_4/(Ca+Mg) molar ratio		0.7	1.3	1.6	3.2	2.6	1.1	4.4

< indicates less than the analytical detection limit. * Acidity and alkalinity data calculated in mg $CaCO_3$/L.
** SO_4, Ca and Mg release rates calculated in mg/kg/flush.
Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity.
MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.
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KLC 4 - Sandstone (Roof + Parting)

Weight (kg)	**Weight (kg)**	1.63	**Total S (%)**	0.04	**ANC**	69
pH (1:5)	**pH (1:5)**	9.44	**Scr (%)**	0.02	**NAPP**	-68.0
EC (µS/cm)	**EC (µS/cm)**	357	**MPA**	1.23	**ANC:MPA**	56.5

Date		**11-Apr-16**	**09-May-16**	**13-Jun-16**	**11-Jul-16**	**08-Aug-16**	**12-Sep-16**	**10-Oct-16**
Week		**0**	**4**	**9**	**13**	**17**	**22**	**26**
Leach Number		**1**	**2**	**3**	**4**	**5**	**6**	**7**
ALS Laboratory Number		EB1609695	EB1612199	EB1616245	EB1617820	EB1619904	EB1622349	EB1624335
Volume On (L)		1.3	1.2	1.0	1.0	1.0	1.0	1.0
Volume Off (L)		0.658	1.002	0.802	0.816	0.832	0.843	0.824
Cum. Volume (L)		0.66	1.66	2.46	3.28	4.11	4.95	5.78
Pore Volumes		0.5	1.2	1.8	2.4	3.0	3.7	4.3
pH (RGS Measurement)		10.11	9.05	8.84	8.29	7.53	7.80	8.54
pH (ALS Measurement)		9.83	7.86	6.95	6.79	7.06	6.67	7.69
pH (deionised water)		6.33	5.43	5.73	5.60	5.41	5.15	5.14
EC (µS/cm) (RGS Measurement)		171	57	36	29	27	36	57
EC (µS/cm) (ALS Measurement)		181	64	45	34	30	40	67
Acidity (mg/L)*		<1	2	3	2	2	2	<1
Alkalinity (mg/L)*		96	13	10	7	7	6	14
Net Alkalinity (mg/L)*		96	11	7	5	5	4	14
Total Anions (meq/L)		----	1	0	----	----	0	1
Total Cations (meq/L)		----	1	0	----	----	0	1
Ionic Balance (%)		----	----	----	----	----	----	----
Major Ions (mg/L)	**Guideline Limits #**							
Calcium (Ca)	1,000	<1	2	2	2	2	5	<1
Potassium (K)	-	1	<1	<1	<1	<1	<1	<1
Magnesium (Mg)	-	<1	<1	<1	<1	<1	<1	<1
Sodium (Na)	-	39	14	6	4	3	5	12
Chloride (Cl)	-	6	2	1	1	1	1	2
Fluoride (F)	2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate (SO_4)	1,000	5	12	11	7	10	10	16
Trace metals/ metalloids (mg/L)	**Guideline Limits #**							
Aluminium (Al)	5	0.38	0.54	0.12	0.52	0.04	0.22	1.06
Arsenic (As)	0.5	0.024	0.004	0.002	0.002	0.001	0.002	0.004
Boron (B)	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Barium (Ba)	-	0.02	0.023	0.024	0.031	0.037	0.039	0.011
Beryllium (Be)	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd)	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Cr)	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (Cu)	1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (Fe)	1#	0.09	0.09	<0.05	0.08	<0.05	<0.05	0.17
Mercury (Hg)	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese (Mn)	2#	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum (Mo)	0.15	0.03	0.028	0.014	0.009	0.009	0.013	0.026
Nickel (Ni)	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium (Se)	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium (V)	-	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc (Zn)	20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calculations**								
SO_4 Release Rate		2.0	7.4	5.4	3.5	5	5	8
Cumulative SO_4 Release		2.0	9.4	14.8	18.3	23	29	37
Ca Release Rate		0.2	1.2	1.0	1.0	1.0	2.6	0.3
Cumulative Ca Release		0.2	1.4	2.4	3.4	4.4	7.0	7.3
Mg Release Rate		0.2	0.3	0.2	0.3	0.3	0.3	0.3
Cumulative Mg Release		0.2	0.5	0.8	1.0	1.3	1.5	1.8
Residual ANC (%)		100.0	100.0	100.0	100.0	100.0	100.0	100.0
Residual Sulfur (%)		99.8	99.2	98.8	98.5	98.0	97.6	96.9
SO_4/(Ca+Mg) molar ratio		1.6	1.8	1.6	1.0	1.5	0.7	5.0

< indicates less than the analytical detection limit. * Acidity and alkalinity data calculated in mg $CaCO_3$/L.
** SO_4, Ca and Mg release rates calculated in mg/kg/flush.
Total S = Total Sulfur; Scr = Chromium Reducible Sulfur; and ANC = Acid Neutralising Capacity.
MPA = Maximum Potential Acidity, and NAPP = Net Acid Producing Potential.
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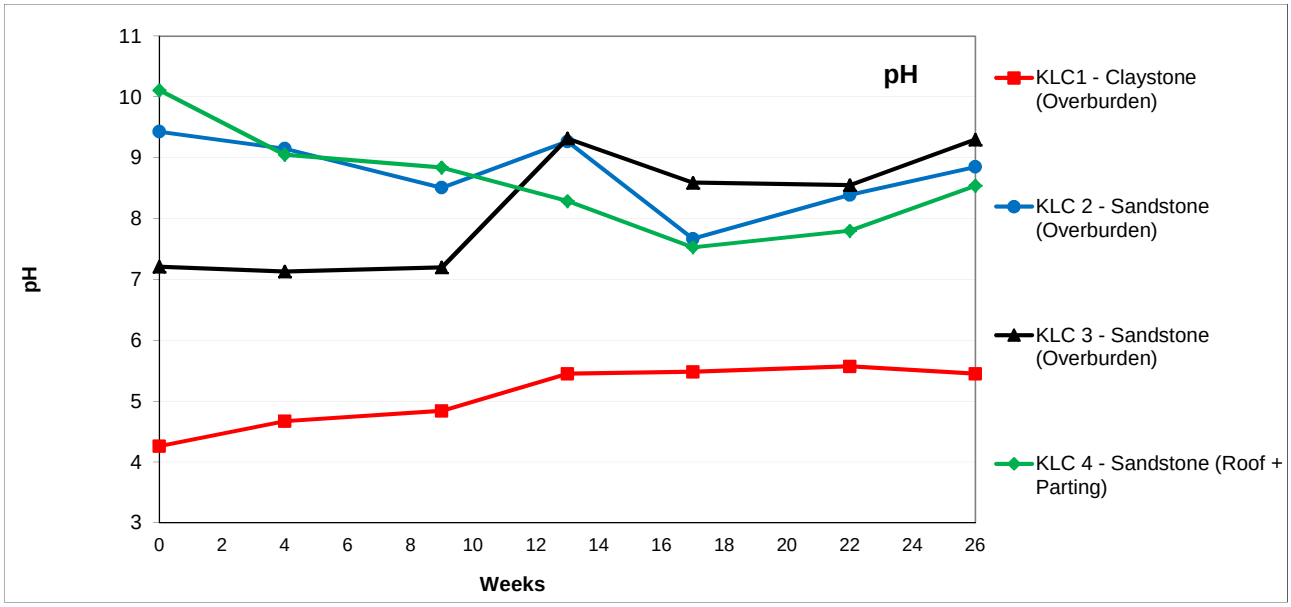
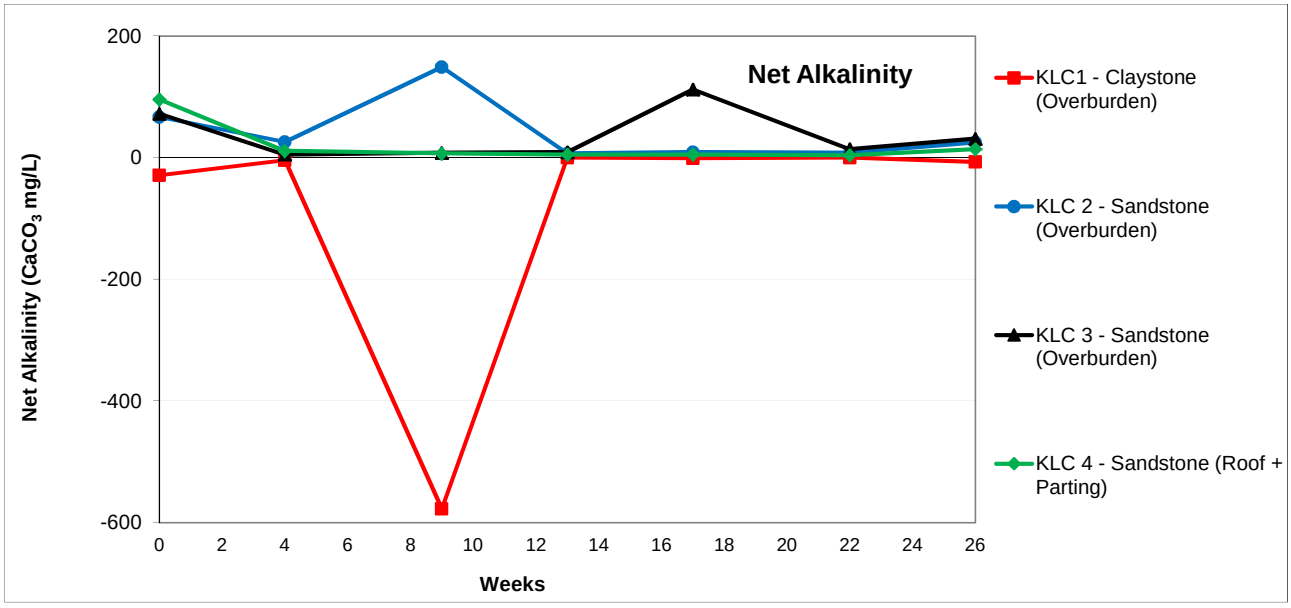
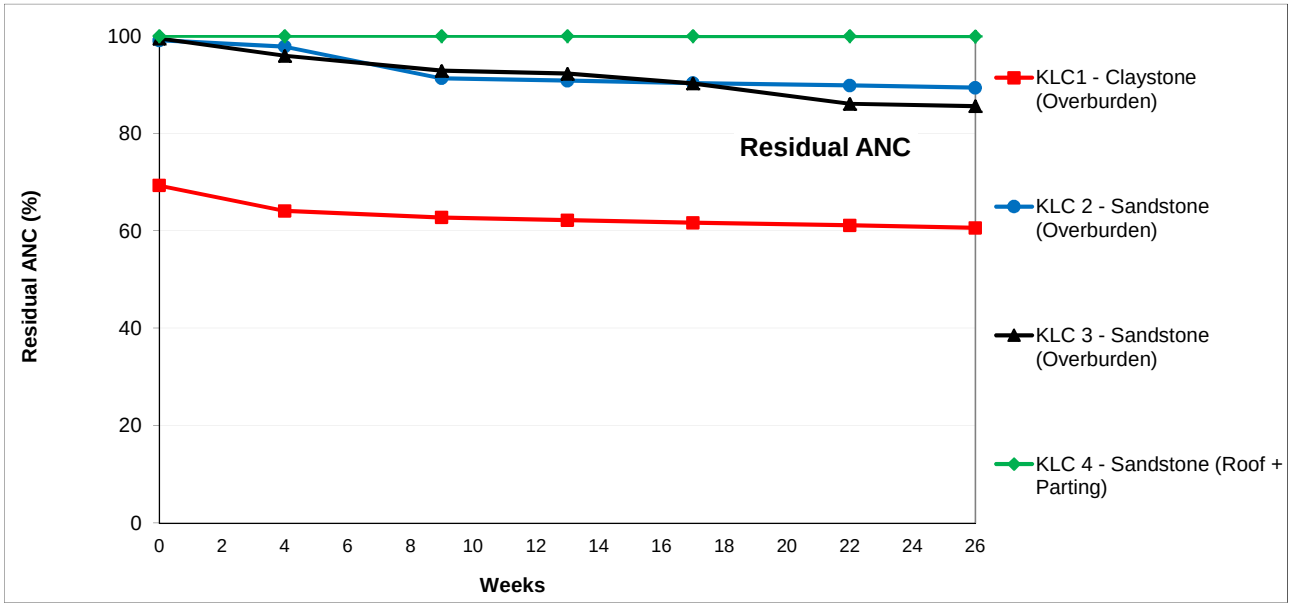
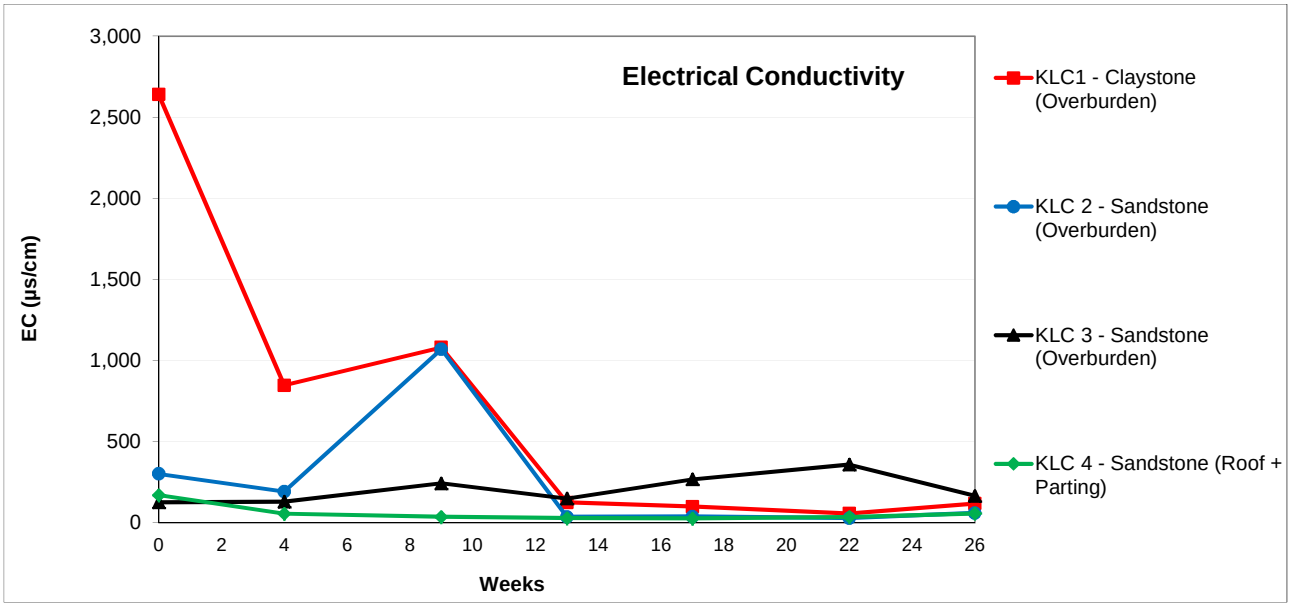
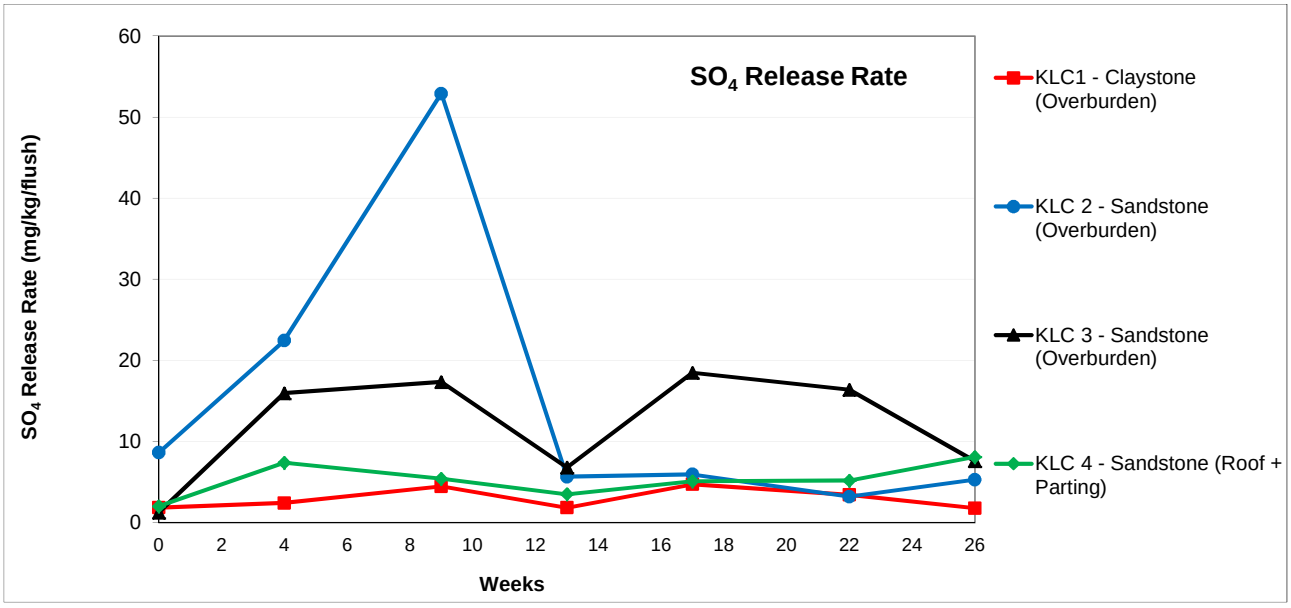
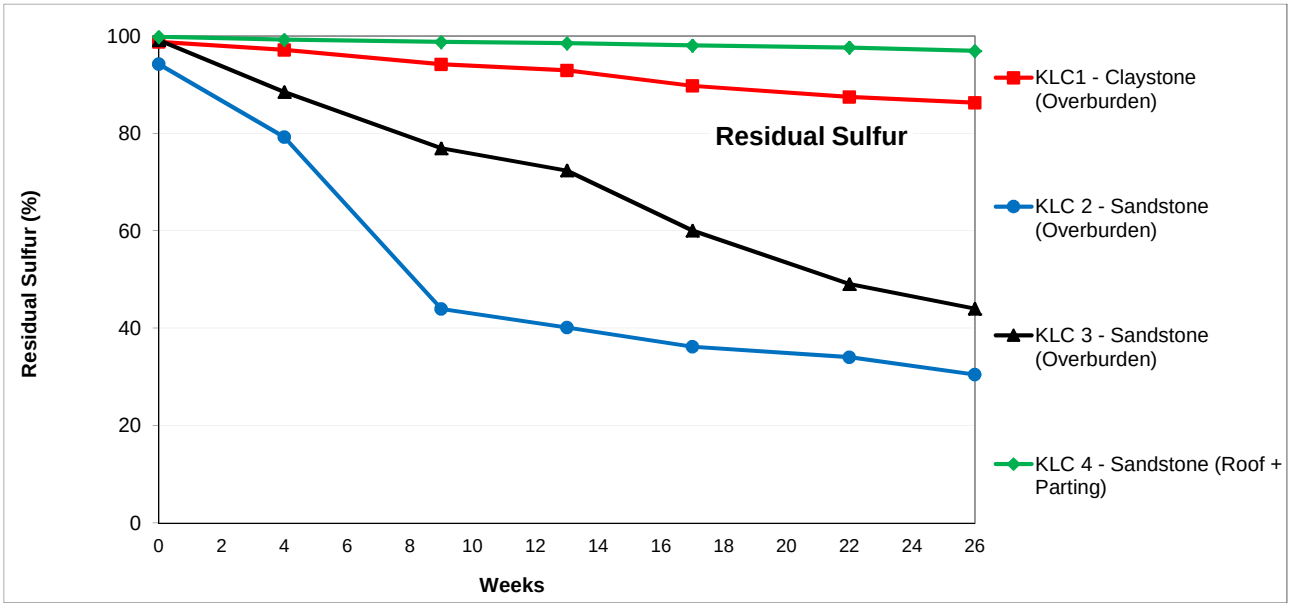

pH
pH
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

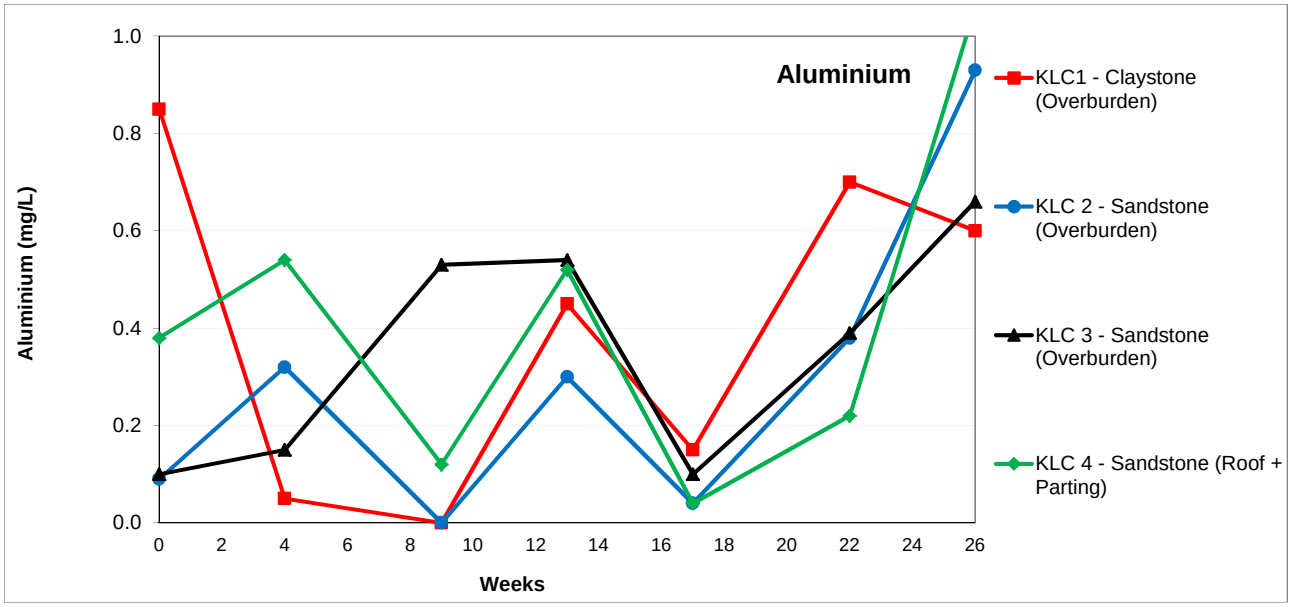

Net Alkalinity
Net Alkalinity (CaCO3 mg/L)
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

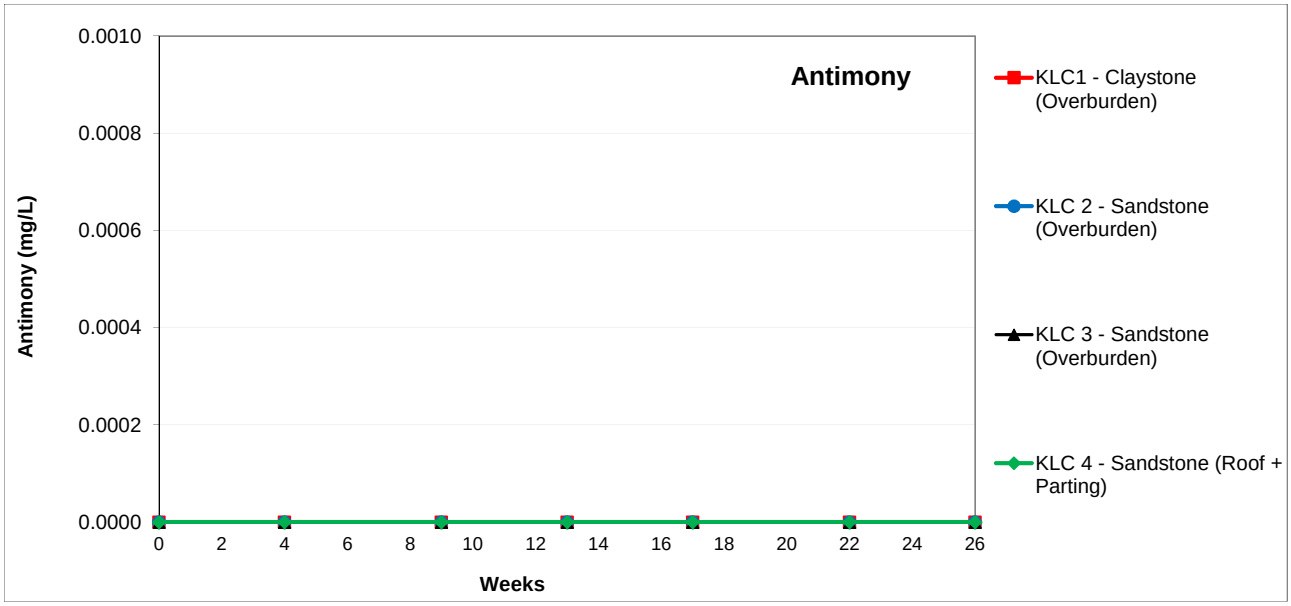

Residual ANC
Residual ANC (%)
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

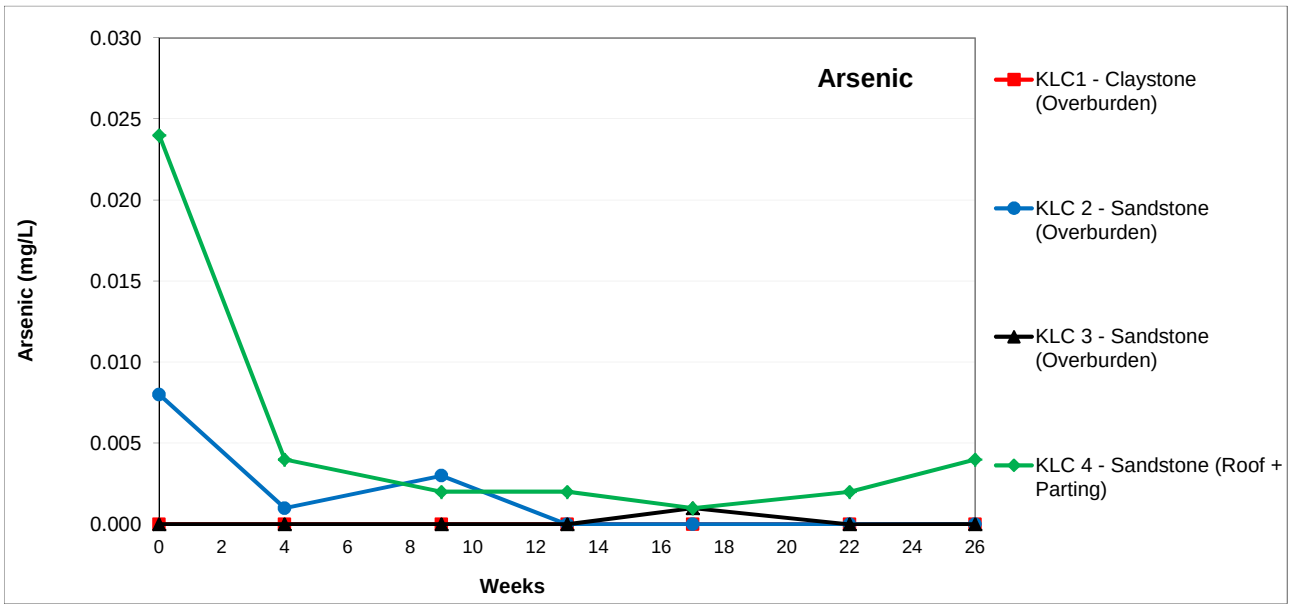

Electrical Conductivity
EC (µs/cm)
3,000
2,500
2,000
1,500
1,000
500
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

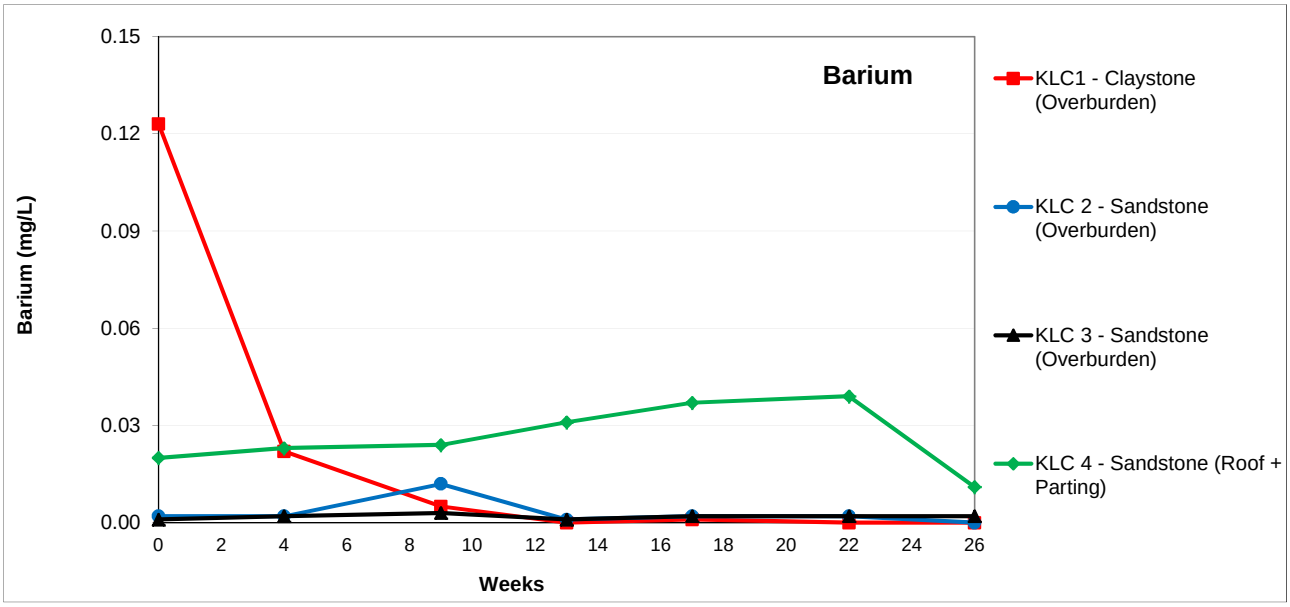

SO4 Release Rate
SO4 Release Rate (mg/kg/flush)
60
50
40
30
20
10
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

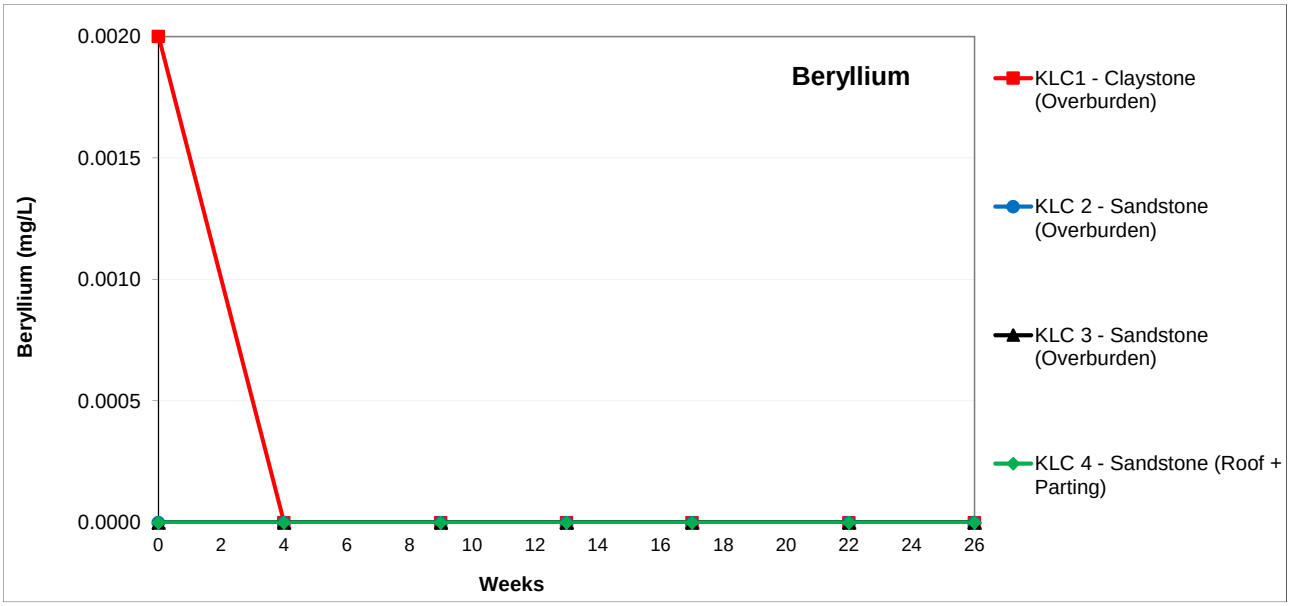

Residual Sulfur
Residual Sulfur (%)
100
80
60
40
20
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

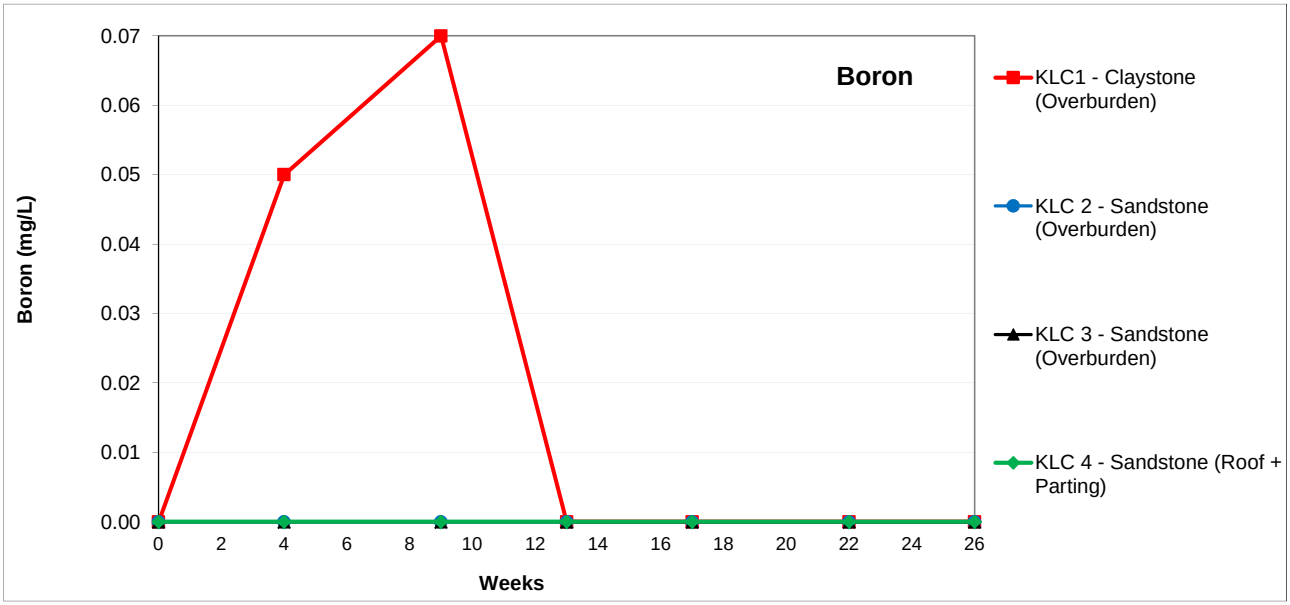

Aluminium
Aluminium (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

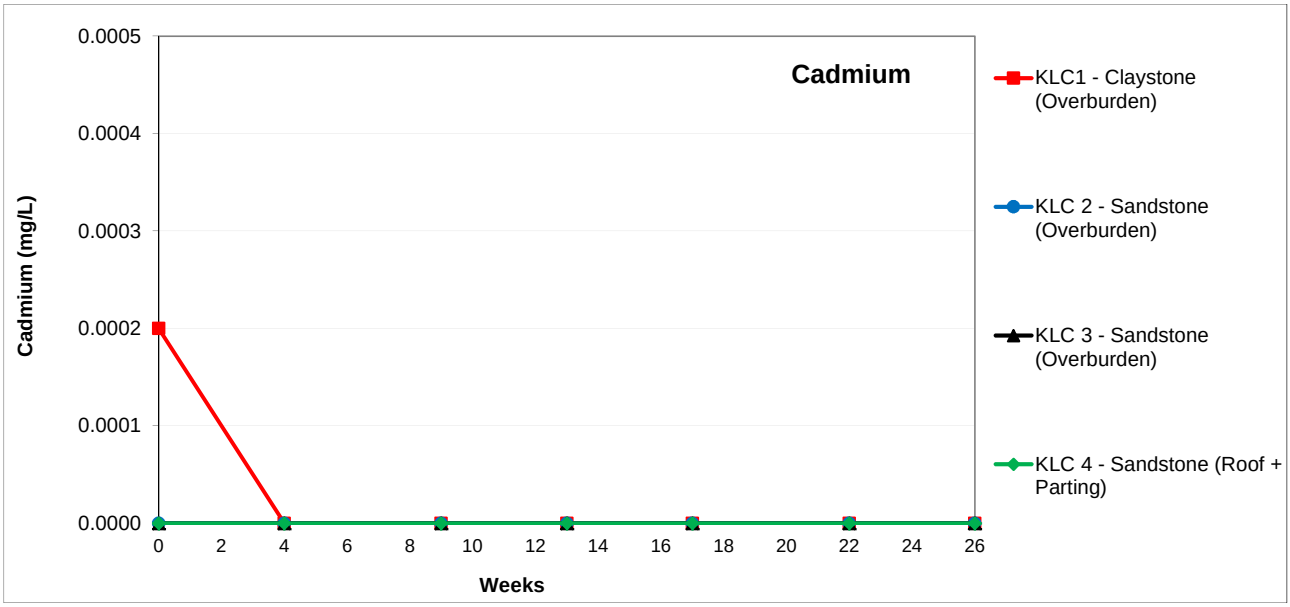

Antimony
Antimony (mg/L)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

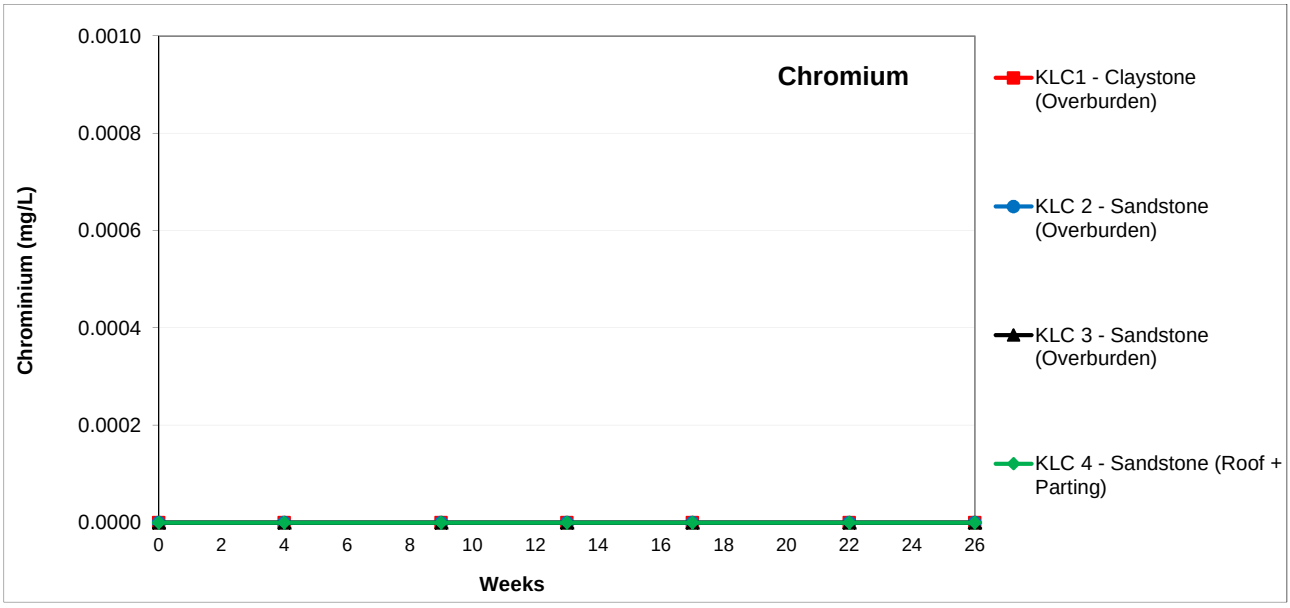

Arsenic
Arsenic (mg/L)
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

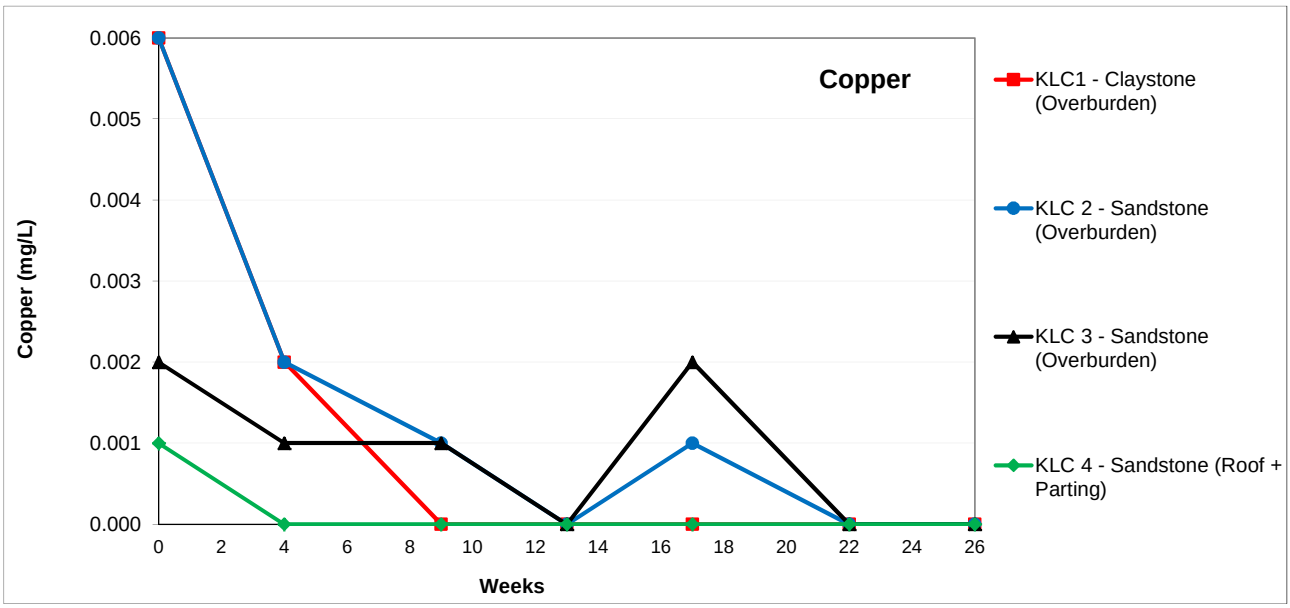

Barium
Barium (mg/L)
0.15
0.12
0.09
0.06
0.03
0.00
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

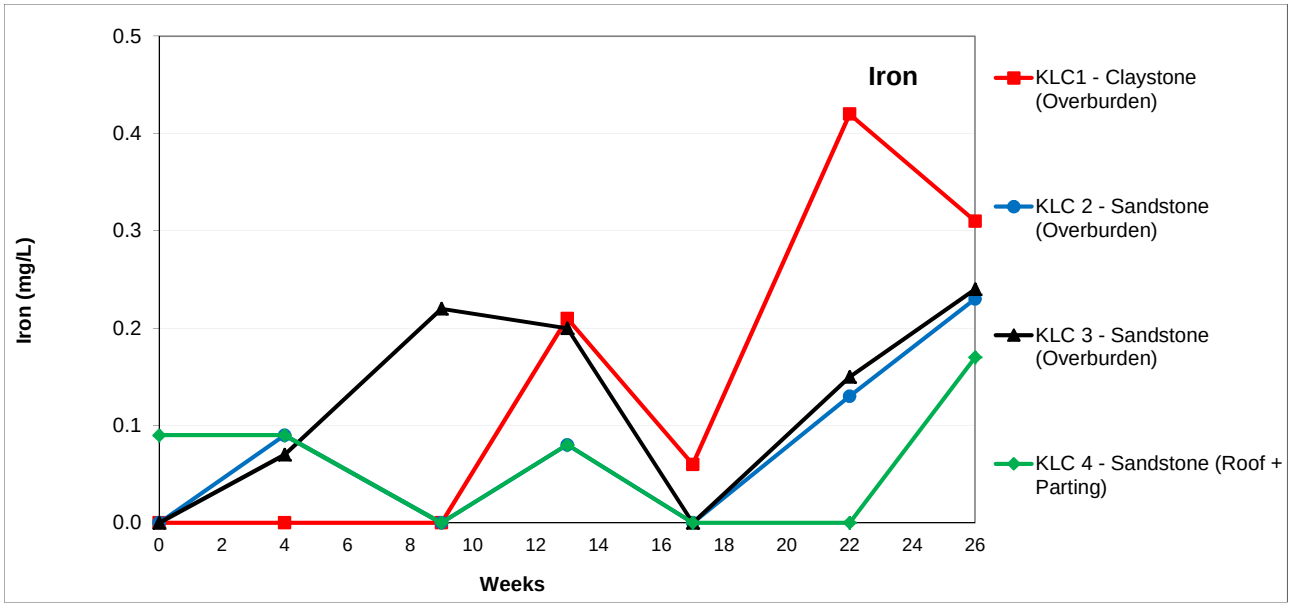

Beryllium
Beryllium (mg/L)
0.0020
0.0015
0.0010
0.0005
0.0000
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

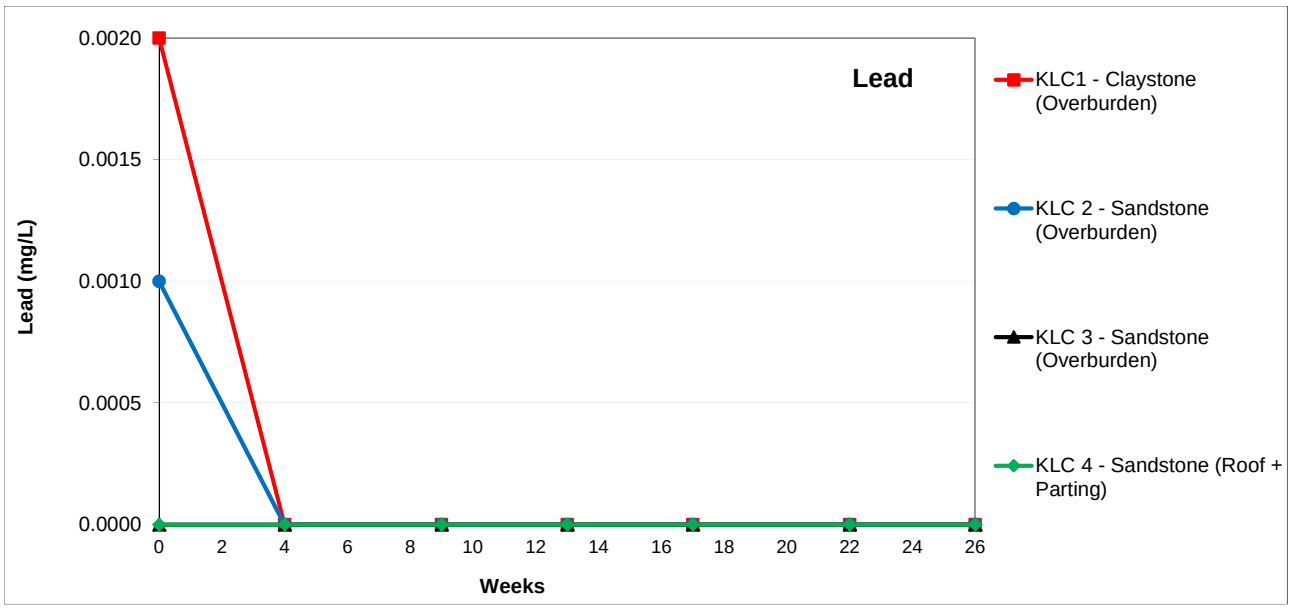

Boron
Boron (mg/L)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

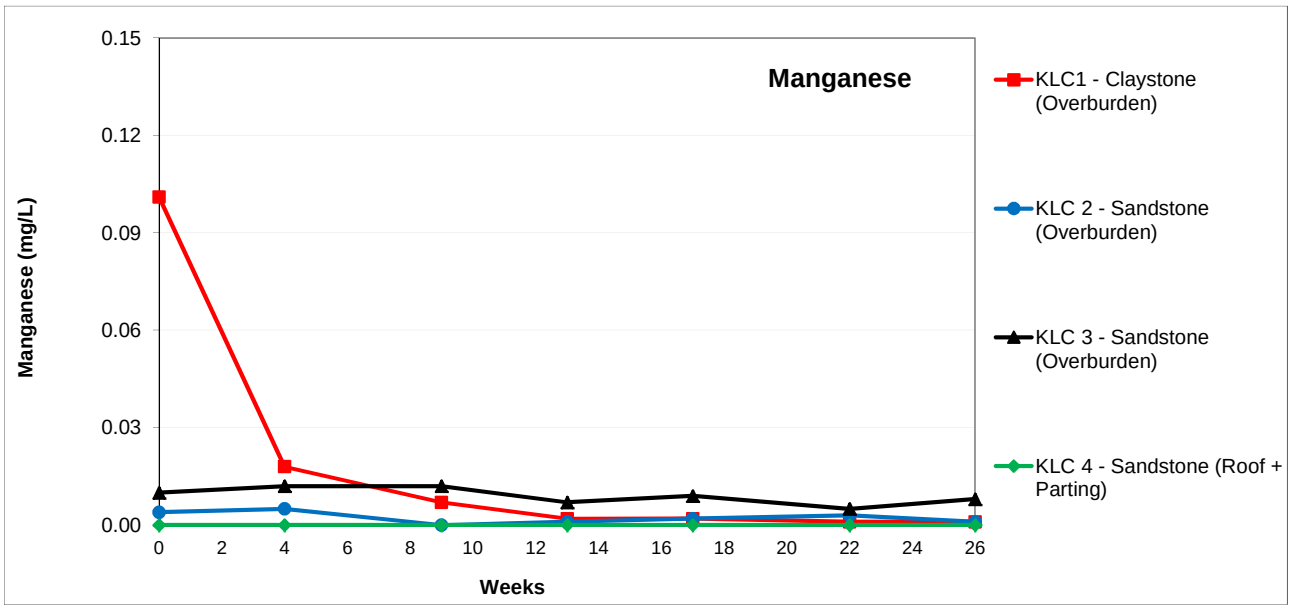

Cadmium
Cadmium (mg/L)
0.0005
0.0004
0.0003
0.0002
0.0001
0.0000
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

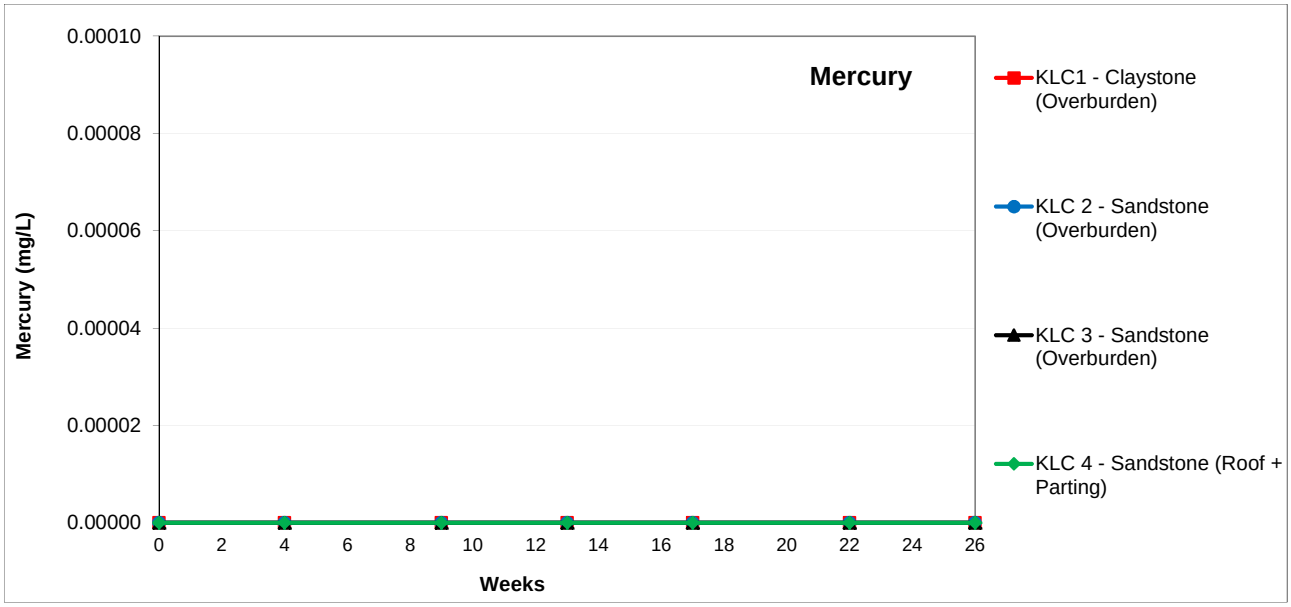

Chromium
Chrominium (mg/L)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

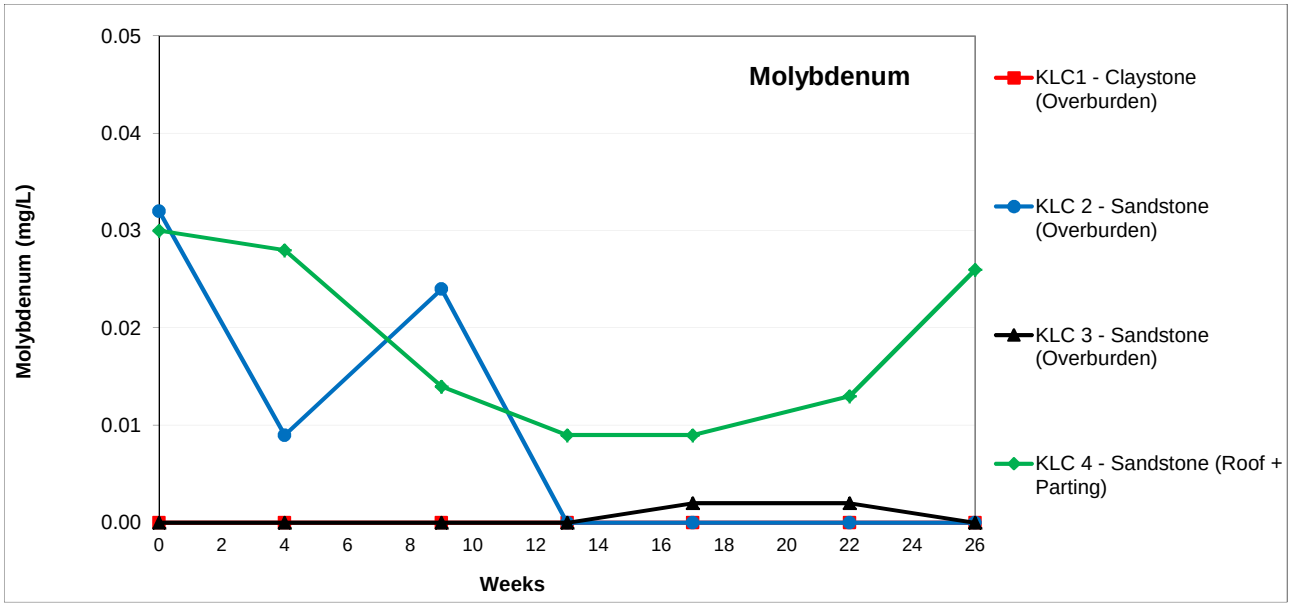

Copper
Copper (mg/L)
0.006
0.005
0.004
0.003
0.002
0.001
0.000
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

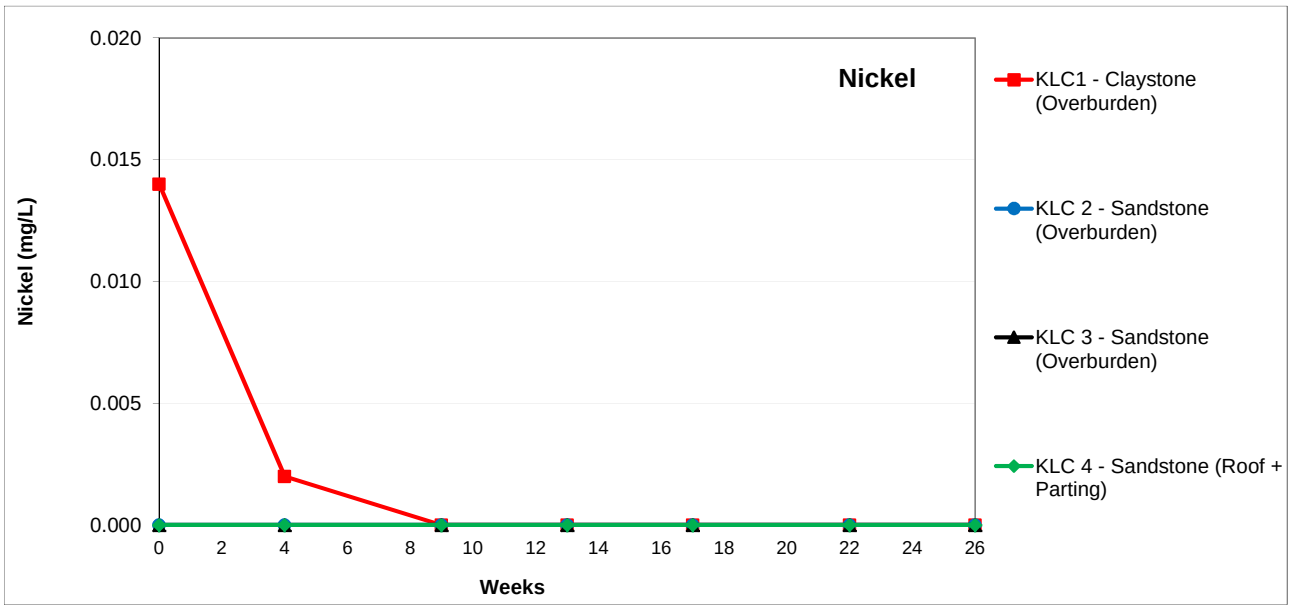

Iron
Iron (mg/L)
0.5
0.4
0.3
0.2
0.1
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

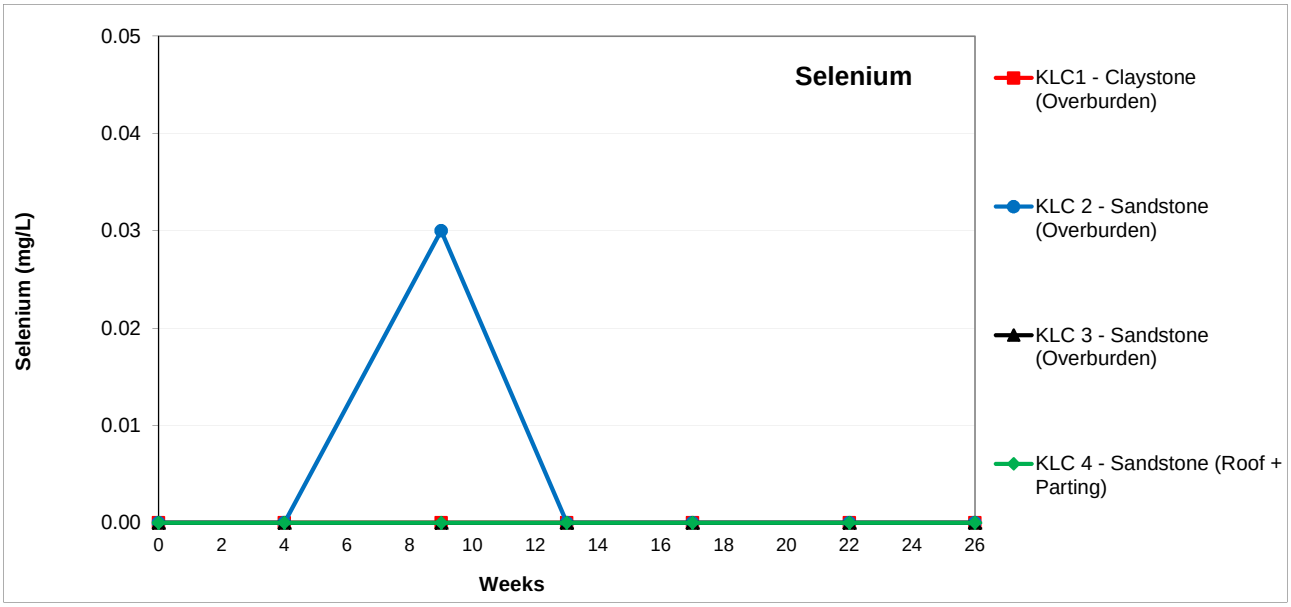

Lead
Lead (mg/L)
0.0020
0.0015
0.0010
0.0005
0.0000
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

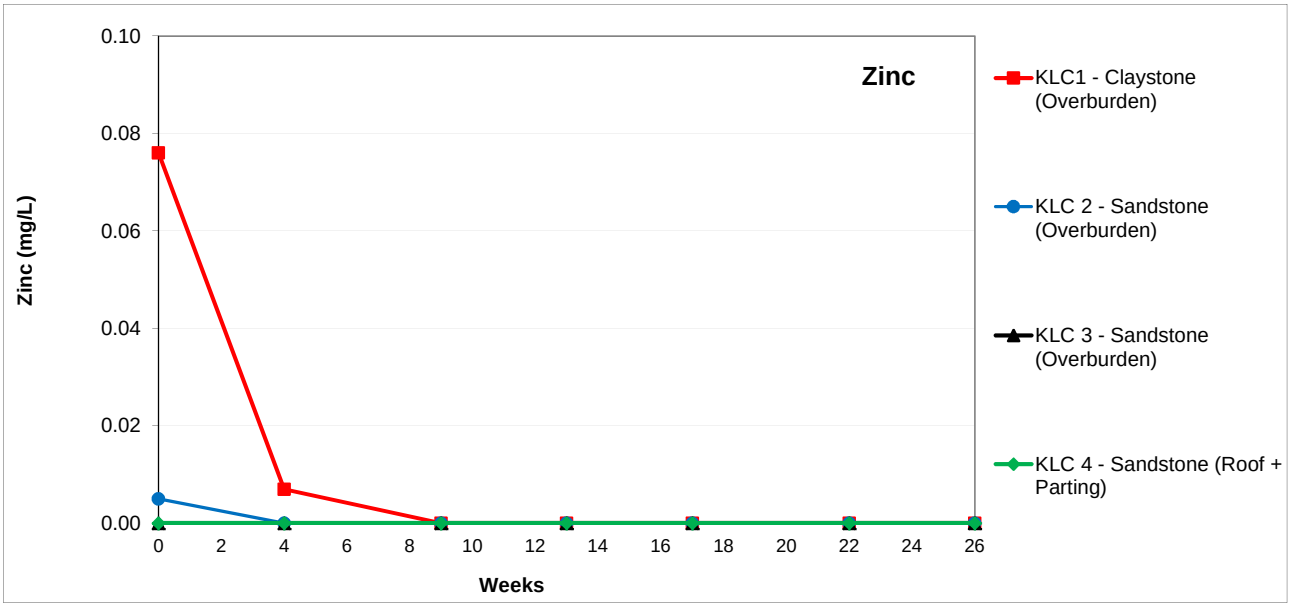

Manganese
Manganese (mg/L)
0.15
0.12
0.09
0.06
0.03
0.00
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)


Mercury
Mercury (mg/L)
0.00010
0.00008
0.00006
0.00004
0.00002
0.00000
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)


Molybdenum
Molybdenum (mg/L)
0.05
0.04
0.03
0.02
0.01
0.00
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)


Nickel
Nickel (mg/L)
0.020
0.015
0.010
0.005
0.000
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)


Selenium
Selenium (mg/L)
0.05
0.04
0.03
0.02
0.01
0.00
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)


Zinc
Zinc (mg/L)
0.10
0.08
0.06
0.04
0.02
0.00
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Weeks
KLC1 - Claystone (Overburden)
KLC 2 - Sandstone (Overburden)
KLC 3 - Sandstone (Overburden)
KLC 4 - Sandstone (Roof + Parting)

ATTACHMENT D

Laboratory Characterisation Results

ALS Laboratory

(Static Tests, KLC Tests)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1606672**	Page	: 1 of 15
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	: 2016003 Kogan Creek	Date Samples Received	: 26-Feb-2016 13:10
Order number	: ----	Date Analysis Commenced	: 29-Mar-2016
C-O-C number	: ----	Issue Date	: 30-Mar-2016 17:15
Sampler	: ----		
Site	: ----		
Quote number	: ----		
No. of samples received	: 63		
No. of samples analysed	: 63		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

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		Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	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.

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.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders EB1606672 AND EB1606676 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: SOIL (Matrix: SOIL)			Client sample ID	121645 KCE15012 0-2	121646 KCE15012 3-9	121647 KCE15012 10-14	121648 KCE15012 14-21	121649 KCE15012 21-28
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-001	EB1606672-002	EB1606672-003	EB1606672-004	EB1606672-005
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**6.2**	**5.6**	**5.6**	**5.6**	**6.1**
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	<0.5	<0.5	<0.5	<0.5	<0.5
Net Acid Production Potential	----	0.5	kg H2SO4/t	<0.5	<0.5	<0.5	<0.5	**-0.7**
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**133**	**496**	**524**	**649**	**548**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	<0.5	<0.5	<0.5	<0.5	**0.7**
ANC as CaCO3	----	0.1	% CaCO3	<0.1	<0.1	<0.1	<0.1	<0.1
Fizz Rating	----	0	Fizz Unit	**0**	**0**	**0**	**0**	**0**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	121650 KCE15012 28-30	121651 KCE15012 30-36	121652 KCE15012 36-42	121653 KCE15012 43-48	121654 KCE15012 48-53.02
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-006	EB1606672-007	EB1606672-008	EB1606672-009	EB1606672-010
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**6.8**	**8.7**	**9.0**	**9.1**	**9.2**
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	<0.5	**0.6**	**0.9**	**0.6**	**0.9**
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-2.7**	**-40.2**	**-33.3**	**-26.0**	**-37.2**
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**316**	**506**	**487**	**467**	**413**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**2.7**	**40.8**	**34.2**	**26.6**	**38.1**
ANC as CaCO3	----	0.1	% CaCO3	**0.3**	**4.2**	**3.5**	**2.7**	**3.9**
Fizz Rating	----	0	Fizz Unit	**0**	**2**	**2**	**1**	**2**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	<0.01	**0.02**	**0.03**	**0.02**	**0.03**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	121655 KCE15012 54.5-54.8	121656 KCE15012 56.5-56.8	121657 KCE15012 57.67-57.9	121658 KCE15012 68.08-68.36	121659 KCE15012 68.36-68.6
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-011	EB1606672-012	EB1606672-013	EB1606672-014	EB1606672-015
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.4	9.1	9.1	9.6	9.6
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	0.9	0.9	1.2	0.9	1.5
Net Acid Production Potential	----	0.5	kg H2SO4/t	-29.9	-15.0	-13.2	-11.7	-10.7
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	311	336	349	388	433
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	30.8	15.9	14.4	12.6	12.2
ANC as CaCO3	----	0.1	% CaCO3	3.1	1.6	1.5	1.3	1.2
Fizz Rating	----	0	Fizz Unit	2	1	1	1	1
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.03	0.03	0.04	0.03	0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	121660 KCE15012 69.12-69.4	121661 KCE15012 70-70.31	121662 KCE15012 74.38-74.68	121663 KCE15012 76.85-77.27	121664 KCE15012 77.27-77-64
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-016	EB1606672-017	EB1606672-018	EB1606672-019	EB1606672-020
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.5	9.7	9.5	9.6	9.4
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	0.9	0.6	0.6	0.6	0.6
Net Acid Production Potential	----	0.5	kg H2SO4/t	-5.7	-74.9	-3.6	-11.1	-5.6
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	270	391	152	309	140
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	6.6	75.5	4.2	11.7	6.2
ANC as CaCO3	----	0.1	% CaCO3	0.7	7.7	0.4	1.2	0.6
Fizz Rating	----	0	Fizz Unit	0	2	0	1	0
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.03	0.02	0.02	0.02	0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	121665 KCE15012 80.67-81.04	121666 KCE15012 81.42-81.75	121667 KCE15012 82.98-83.33	121668 KCE15012 85.17-85.65	121669 KCE15012 86.17-86.44
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-021	EB1606672-022	EB1606672-023	EB1606672-024	EB1606672-025
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.4	9.6	9.6	9.9	9.7
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	1.8	0.9	1.2	1.2	1.8
Net Acid Production Potential	----	0.5	kg H2SO4/t	-5.4	-7.2	-7.1	-69.1	-9.0
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	276	235	234	517	322
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	7.2	8.1	8.3	70.3	10.8
ANC as CaCO3	----	0.1	% CaCO3	0.7	0.8	0.8	7.2	1.1
Fizz Rating	----	0	Fizz Unit	0	0	0	2	1
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.06	0.03	0.04	0.04	0.06

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	121670 KCE15012 89.99-90.37	121671 KCE15012 92.75-93.13	329256 KCE15016 0-1	329257 KCE15016 4-5	329258 KCE15016 9-10
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-026	EB1606672-027	EB1606672-028	EB1606672-029	EB1606672-030
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**10.1**	**10.0**	**7.5**	**6.5**	**5.7**
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	**1.5**	**1.5**	**0.6**	**0.6**	**0.6**
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-299**	**-19.9**	**-37.2**	**0.6**	**0.6**
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**570**	**672**	**494**	**391**	**964**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**301**	**21.4**	**37.8**	<0.5	<0.5
ANC as CaCO3	----	0.1	% CaCO3	**30.7**	**2.2**	**3.8**	<0.1	<0.1
Fizz Rating	----	0	Fizz Unit	**4**	**1**	**2**	**0**	**0**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.05**	**0.05**	**0.02**	**0.02**	**0.02**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329259 KCE15016 14-15	329260 KCE15016 19-20	329261 KCE15016 24-25	329262 KCE15016 29-30	329263 KCE15016 36.84-37.14
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-031	EB1606672-032	EB1606672-033	EB1606672-034	EB1606672-035
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**5.5**	**5.7**	**6.7**	**8.2**	**9.1**
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	**0.6**	**0.6**	**0.6**	**0.6**	**1.2**
Net Acid Production Potential	----	0.5	kg H2SO4/t	**0.6**	**0.6**	**0.6**	**0.6**	**-45.5**
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**859**	**748**	**385**	**521**	**496**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	<0.5	<0.5	<0.5	<0.5	**46.7**
ANC as CaCO3	----	0.1	% CaCO3	<0.1	<0.1	<0.1	<0.1	**4.8**
Fizz Rating	----	0	Fizz Unit	**0**	**0**	**0**	**0**	**2**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.02**	**0.02**	**0.02**	**0.02**	**0.04**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329264 KCE15016 37.36-37.66	329265 KCE15016 40.15-40.47	329266 KCE15016 42.32-42.59	329273 KCE15016 43.89-44.14	329305 KCE15016 51.99-52.23
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-036	EB1606672-037	EB1606672-038	EB1606672-039	EB1606672-040
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.9	9.0	8.9	8.9	8.6
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	1.2	1.2	3.4	2.4	3.4
Net Acid Production Potential	----	0.5	kg H2SO4/t	-16.6	-31.6	-8.6	-11.4	-11.9
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	545	432	440	476	364
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	17.8	32.8	12.0	13.8	15.3
ANC as CaCO3	----	0.1	% CaCO3	1.8	3.3	1.2	1.4	1.6
Fizz Rating	----	0	Fizz Unit	1	2	1	1	1
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.04	0.04	0.11	0.08	0.11

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329319 KCE15016 55.32-55.6	329342 KCE15016 60.42-60.74	329245 KCE15016 65.01-65.31	329352 KCE15016 67-67.3	329360 KCE15016 69.99-69.96
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-041	EB1606672-042	EB1606672-043	EB1606672-044	EB1606672-045
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**8.4**	**8.3**	**9.2**	**9.5**	**9.6**
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	**2.1**	**5.2**	**0.6**	**1.2**	**0.9**
Net Acid Production Potential	----	0.5	kg H2SO4/t	**-5.6**	<0.5	**-10.1**	**-16.4**	**-6.6**
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**309**	**208**	**160**	**381**	**193**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	**7.8**	**5.0**	**10.7**	**17.6**	**7.5**
ANC as CaCO3	----	0.1	% CaCO3	**0.8**	**0.5**	**1.1**	**1.8**	**0.8**
Fizz Rating	----	0	Fizz Unit	**0**	**1**	**1**	**1**	**1**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.07**	**0.17**	**0.02**	**0.04**	**0.03**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329583 KCE15019 0-2	329584 KCE15019 4-5	329585 KCE15019 9-10	329586 KCE15019 14-17	329587 KCE15019 19-20
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-046	EB1606672-047	EB1606672-048	EB1606672-049	EB1606672-050
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**5.6**	**5.6**	**5.2**	**5.4**	**5.6**
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	**0.6**	**0.9**	**0.6**	**0.6**	**0.6**
Net Acid Production Potential	----	0.5	kg H2SO4/t	**0.6**	**0.9**	**0.6**	**0.6**	**0.00**
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**316**	**448**	**616**	**528**	**685**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	<0.5	<0.5	<0.5	<0.5	**0.7**
ANC as CaCO3	----	0.1	% CaCO3	<0.1	<0.1	<0.1	<0.1	<0.1
Fizz Rating	----	0	Fizz Unit	**0**	**0**	**0**	**0**	**0**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.02**	**0.03**	**0.02**	**0.02**	**0.02**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329588 KCE15019 24-25	329589 KCE15019 29-30	329590 KCE15019 34-35	329591 KCE15019 39-40.3	329592 KCE15019 46.76-47.03
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-051	EB1606672-052	EB1606672-053	EB1606672-054	EB1606672-055
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	6.5	7.0	8.6	8.6	8.8
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	0.6	0.6	0.6	0.6	1.8
Net Acid Production Potential	----	0.5	kg H2SO4/t	-0.8	-4.5	-31.8	-63.7	-33.3
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	374	407	509	515	380
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	1.4	5.1	32.4	64.3	35.1
ANC as CaCO3	----	0.1	% CaCO3	0.1	0.5	3.3	6.6	3.6
Fizz Rating	----	0	Fizz Unit	0	0	2	2	1
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.02	0.02	0.02	0.06

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329593 KCE15019 49.39-49.72	329597 KCE15019 50.43-50.71	329651 KCE15019 61.89-62.14	329657 KCE15019 62.95-63.15	329673 KCE15019 66.7-67
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606672-056	EB1606672-057	EB1606672-058	EB1606672-059	EB1606672-060
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.0	8.9	9.1	9.1	9.2
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	0.9	1.2	3.7	1.5	1.2
Net Acid Production Potential	----	0.5	kg H2SO4/t	-244	-12.9	-48.1	-5.9	-71.6
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	257	368	347	309	248
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	245	14.1	51.8	7.4	72.8
ANC as CaCO3	----	0.1	% CaCO3	25.0	1.4	5.3	0.8	7.4
Fizz Rating	----	0	Fizz Unit	3	1	2	1	2
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.03	0.04	0.12	0.05	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329675 KCE15019 68.35-68.66	329682 KCE15019 69.85-70.19	329633 KCE15019	----	----
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	----	----
Compound	CAS Number	LOR	Unit	EB1606672-061	EB1606672-062	EB1606672-063	--------	--------
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.1	9.2	9.2	----	----
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	0.9	1.5	1.2	----	----
Net Acid Production Potential	----	0.5	kg H2SO4/t	-3.3	-23.7	-30.6	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	120	315	280	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	4.2	25.2	31.8	----	----
ANC as CaCO3	----	0.1	% CaCO3	0.4	2.6	3.2	----	----
Fizz Rating	----	0	Fizz Unit	0	1	2	----	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.03	0.05	0.04	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1606676**	Page	: 1 of 14
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	: 2016003 Kogan Creek	Date Samples Received	: 26-Feb-2016 13:10
Order number	: ----	Date Analysis Commenced	: 23-Mar-2016
C-O-C number	: ----	Issue Date	: 23-Mar-2016 18:22
Sampler	: ----		
Site	: ----		
Quote number	: ----		
No. of samples received	: 58		
No. of samples analysed	: 58		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

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*
Andrew Epps	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	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.

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.

- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329710 KCE15020 0-6	329711 KCE15020 6-7	329712 KCE15020 7-8	329713 KCE15020 8-10	329714 KCE15020 10-12
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-001	EB1606676-002	EB1606676-003	EB1606676-004	EB1606676-005
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**4.7**	**5.0**	**5.0**	**5.2**	**5.0**
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	**0.6**	<0.5	<0.5	<0.5	<0.5
Net Acid Production Potential	----	0.5	kg H2SO4/t	**0.6**	<0.5	<0.5	<0.5	<0.5
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**409**	**390**	**496**	**432**	**508**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	<0.5	<0.5	<0.5	<0.5	<0.5
ANC as CaCO3	----	0.1	% CaCO3	<0.1	<0.1	<0.1	<0.1	<0.1
Fizz Rating	----	0	Fizz Unit	**0**	**0**	**0**	**0**	**0**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.02**	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329715 KCE15020 12-14	329716 KCE15020 14-21	329717 KCE15020 21-23	329718 KCE15020 23-25	329719 KCE15020 25-33
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-006	EB1606676-007	EB1606676-008	EB1606676-009	EB1606676-010
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**5.2**	**5.6**	**5.9**	**6.1**	**7.1**
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	<0.5	**0.6**	<0.5	**0.6**	**0.6**
Net Acid Production Potential	----	0.5	kg H2SO4/t	<0.5	**0.6**	<0.5	**0.00**	**0.6**
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**484**	**460**	**522**	**460**	**235**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	<0.5	<0.5	<0.5	**0.8**	<0.5
ANC as CaCO3	----	0.1	% CaCO3	<0.1	<0.1	<0.1	<0.1	<0.1
Fizz Rating	----	0	Fizz Unit	**0**	**0**	**0**	**0**	**0**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	<0.01	**0.02**	<0.01	**0.02**	**0.02**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329720 KCE15020 33-34	329721 KCE15020 34-36	329722 KCE15020 36-39	329723 KCE15020 39-45.02	329724 KCE15020 46.57-46.87
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-011	EB1606676-012	EB1606676-013	EB1606676-014	EB1606676-015
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.8	8.5	8.7	8.7	9.0
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	0.6	0.6	0.9	1.2	1.2
Net Acid Production Potential	----	0.5	kg H2SO4/t	-5.8	-7.4	-23.6	-69.0	-59.4
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	176	253	445	447	322
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	6.4	8.0	24.5	70.2	60.6
ANC as CaCO3	----	0.1	% CaCO3	0.6	0.8	2.5	7.2	6.2
Fizz Rating	----	0	Fizz Unit	0	0	1	2	2
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.02	0.03	0.04	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329725 KCE15020 48.04-48.34	329726 KCE15020 50.63-50.95	329730 KCE15020 51.87-52.14	329785 KCE15020 66.87-67.16	329789 KCE15020 69.17-69.47
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-016	EB1606676-017	EB1606676-018	EB1606676-019	EB1606676-020
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.1	9.0	8.8	8.9	9.4
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	1.2	1.5	1.2	1.2	0.6
Net Acid Production Potential	----	0.5	kg H2SO4/t	-47.2	-18.8	-9.8	-3.1	-249
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	302	359	370	187	269
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	48.4	20.3	11.0	4.3	250
ANC as CaCO3	----	0.1	% CaCO3	4.9	2.1	1.1	0.4	25.5
Fizz Rating	----	0	Fizz Unit	2	1	1	0	3
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.04	0.05	0.04	0.04	0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329790 KCE15020 71.45-71.75	329801 KCE15020 73.88-74.1	329805 KCE15020 74.84-75.14	329806 KCE15020 76.58-76.92	329807 KCE15020 77.67-77.97
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-021	EB1606676-022	EB1606676-023	EB1606676-024	EB1606676-025
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.3	9.4	9.7	9.3	9.5
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	0.6	2.1	0.9	1.5	0.9
Net Acid Production Potential	----	0.5	kg H2SO4/t	-22.2	-6.8	-94.1	-7.7	-209
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	331	366	424	232	433
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	22.8	9.0	95.0	9.2	210
ANC as CaCO3	----	0.1	% CaCO3	2.3	0.9	9.7	0.9	21.4
Fizz Rating	----	0	Fizz Unit	1	1	2	1	3
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.07	0.03	0.05	0.03

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329822 KCE15020 81.94-82.24	329823 KCE15020 83.94-84.24	330274 KCE15029 0-1	330275 KCE15029 4-5	330276 KCE15029 9-10
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-026	EB1606676-027	EB1606676-028	EB1606676-029	EB1606676-030
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.8	9.9	8.1	7.1	6.4
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	2.1	2.4	0.9	0.6	0.6
Net Acid Production Potential	----	0.5	kg H2SO4/t	-98.8	-27.8	-4.5	-1.6	-0.6
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	623	646	367	131	52
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	101	30.2	5.4	2.2	1.2
ANC as CaCO3	----	0.1	% CaCO3	10.3	3.1	0.5	0.2	0.1
Fizz Rating	----	0	Fizz Unit	2	1	0	0	0
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.07	0.08	0.03	0.02	0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	330277 KCE15029 14-15	330278 KCE15029 19-20	330279 KCE15029 24-25	330280 KCE15029 29-30	330281 KCE15029 34-35
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-031	EB1606676-032	EB1606676-033	EB1606676-034	EB1606676-035
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**5.8**	**5.9**	**7.2**	**7.8**	**8.4**
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	**0.6**	**0.6**	**0.6**	<0.5	**1.5**
Net Acid Production Potential	----	0.5	kg H2SO4/t	**0.6**	**-0.7**	**-6.5**	**-7.6**	**-67.7**
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**78**	**85**	**105**	**104**	**422**
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	<0.5	**1.3**	**7.1**	**7.6**	**69.2**
ANC as CaCO3	----	0.1	% CaCO3	<0.1	**0.1**	**0.7**	**0.8**	**7.0**
Fizz Rating	----	0	Fizz Unit	**0**	**0**	**0**	**0**	**2**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.02**	**0.02**	**0.02**	<0.01	**0.05**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	330282 KCE15029 39-40	330283 KCE15029 44-45	330284 KCE15029 49-50.01	330285 KCE15029 51.07-51.4	330286 KCE15029 51.4-51.69
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-036	EB1606676-037	EB1606676-038	EB1606676-039	EB1606676-040
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.4	8.5	8.5	9.0	9.1
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	1.5	1.8	1.2	0.9	1.2
Net Acid Production Potential	----	0.5	kg H2SO4/t	-18.1	-28.0	-54.8	-198	-46.5
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	421	413	301	200	234
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	19.6	29.8	56.0	199	47.7
ANC as CaCO3	----	0.1	% CaCO3	2.0	3.0	5.7	20.3	4.9
Fizz Rating	----	0	Fizz Unit	1	1	2	3	2
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.05	0.06	0.04	0.03	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	330287 KCE15029 52.9-52.32	330290 KCE15029 54.26-54.47	330327 KCE15029 64.6-64.88	330346 KCE15029 69.08-69.37	330347 KCE15029 72.15-72.48
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-041	EB1606676-042	EB1606676-043	EB1606676-044	EB1606676-045
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.9	8.9	9.3	9.4	9.7
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	1.5	1.5	1.2	0.6	0.6
Net Acid Production Potential	----	0.5	kg H2SO4/t	-30.8	-6.0	-169	-4.4	-36.1
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	274	308	338	258	374
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	32.3	7.5	170	5.0	36.7
ANC as CaCO3	----	0.1	% CaCO3	3.3	0.8	17.4	0.5	3.7
Fizz Rating	----	0	Fizz Unit	2	0	3	0	2
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.05	0.05	0.04	0.02	0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	330348 KCE15029 74.37-74.67	330485 KCE15032 0-1	330486 KCE15032 4-5	330487 KCE15032 9-9.99	330488 KCE15032 10.55-10.79
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-046	EB1606676-047	EB1606676-048	EB1606676-049	EB1606676-050
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.4	7.6	6.6	8.6	9.0
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	0.6	0.9	0.9	1.2	1.2
Net Acid Production Potential	----	0.5	kg H2SO4/t	-5.8	-7.2	-2.5	-15.8	-243
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	176	814	700	632	558
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	6.4	8.1	3.4	17.0	244
ANC as CaCO3	----	0.1	% CaCO3	0.6	0.8	0.3	1.7	24.9
Fizz Rating	----	0	Fizz Unit	0	0	0	1	3
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.03	0.03	0.04	0.04

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	330489 KCE15032 13.38-13.69	330490 KCE15032 14.64-14.87	330494 KCE15032 15.84-16.21	330527 KCE15032 24.49-24.79	330548 KCE15032 30.09-30.3
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1606676-051	EB1606676-052	EB1606676-053	EB1606676-054	EB1606676-055
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.3	8.2	9.0	8.8	8.6
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	2.1	1.5	0.9	0.9	6.1
Net Acid Production Potential	----	0.5	kg H2SO4/t	-7.6	-10.9	-13.0	-6.1	-1.7
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	363	276	374	232	330
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	9.8	12.4	13.9	7.0	7.8
ANC as CaCO3	----	0.1	% CaCO3	1.0	1.3	1.4	0.7	0.8
Fizz Rating	----	0	Fizz Unit	1	1	1	0	0
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.07	0.05	0.03	0.03	0.20

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	330564 KCE15032 34.27-34.5	330568 KCE15032 35.56-35.85	330577 KCE15032 38.56-38.77	----	----
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	----	----
Compound	CAS Number	LOR	Unit	EB1606676-056	EB1606676-057	EB1606676-058	--------	--------
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.1	9.2	9.2	----	----
EA009: Nett Acid Production Potential								
Acid Production Potential (APP)	----	0.5	kg H2SO4/t	1.2	1.8	0.9	----	----
Net Acid Production Potential	----	0.5	kg H2SO4/t	-4.4	-8.4	-125	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	139	183	215	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	5.6	10.2	126	----	----
ANC as CaCO3	----	0.1	% CaCO3	0.6	1.0	12.9	----	----
Fizz Rating	----	0	Fizz Unit	0	1	3	----	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.04	0.06	0.03	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1608733**	Page	: 1 of 12
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	: 2016003 Kogan Creek	Date Samples Received	: 03-Apr-2016 11:56
Order number	: ----	Date Analysis Commenced	: 06-Apr-2016
C-O-C number	: ----	Issue Date	: 15-Apr-2016 15:53
Sampler	: ----		
Site	: ----		
Quote number	: ----		
No. of samples received	: 61		
No. of samples analysed	: 16		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

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*
Greg Vogel	Laboratory Manager	Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	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.

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.

- EG005T (Total Metals) Sample EB1608733-051 shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- EG005T (Total Metals by ICP-AES): Sample EB1608930-001 shows poor duplicate result due to sample heterogeneity. Confirmed by visual inspection.
- Moisture Content (EA055-103) removed as samples are pulp.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	329266 - KCE15016 EB1606672-038	329305 - KCE15016 EB1606672-040	329342 - KCE15016 EB1606672-042	329651 - KCE15019 EB1606672-058	330548 - KCE15032 EB1606676-055
			Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit	EB1608733-021	EB1608733-022	EB1608733-023	EB1608733-030	EB1608733-050
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	----	----	----	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	----	----	----	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	**0.070**	**0.071**	**0.084**	**0.077**	**0.085**
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	----	----	----	----
Exchangeable Magnesium	----	0.2	meq/100g	----	----	----	----	----
Exchangeable Potassium	----	0.2	meq/100g	----	----	----	----	----
Exchangeable Sodium	----	0.2	meq/100g	----	----	----	----	----
Cation Exchange Capacity	----	0.2	meq/100g	----	----	----	----	----
Exchangeable Sodium Percent	----	0.2	%	----	----	----	----	----
ED037: Alkalinity								
Total Alkalinity as CaCO3	----	1	mg/kg	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	----	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	----	----	----	----	----
ED038A: Acidity								
Acidity	----	1	mg/kg	----	----	----	----	----
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	----	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	----	----	----	----	----
ED093S: Soluble Major Cations								
Calcium	7440-70-2	10	mg/kg	----	----	----	----	----
Magnesium	7439-95-4	10	mg/kg	----	----	----	----	----
Sodium	7440-23-5	10	mg/kg	----	----	----	----	----
Potassium	7440-09-7	10	mg/kg	----	----	----	----	----
ED093T: Total Major Cations								
Calcium	7440-70-2	50	mg/kg	----	----	----	----	----
Magnesium	7439-95-4	50	mg/kg	----	----	----	----	----
Sodium	7440-23-5	50	mg/kg	----	----	----	----	----
Potassium	7440-09-7	50	mg/kg	----	----	----	----	----
EG005S : Soluble Metals by ICPAES								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	329266 - KCE15016 EB1606672-038	329305 - KCE15016 EB1606672-040	329342 - KCE15016 EB1606672-042	329651 - KCE15019 EB1606672-058	330548 - KCE15032 EB1606676-055
				Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit		EB1608733-021	EB1608733-022	EB1608733-023	EB1608733-030	EB1608733-050
					Result	Result	Result	Result	Result
EG005S : Soluble Metals by ICPAES - Continued									
Boron	7440-42-8	1	mg/kg		----	----	----	----	----
Iron	7439-89-6	1	mg/kg		----	----	----	----	----
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		----	----	----	----	----
Antimony	7440-36-0	5	mg/kg		----	----	----	----	----
Arsenic	7440-38-2	5	mg/kg		----	----	----	----	----
Barium	7440-39-3	10	mg/kg		----	----	----	----	----
Beryllium	7440-41-7	1	mg/kg		----	----	----	----	----
Boron	7440-42-8	50	mg/kg		----	----	----	----	----
Cadmium	7440-43-9	1	mg/kg		----	----	----	----	----
Chromium	7440-47-3	2	mg/kg		----	----	----	----	----
Cobalt	7440-48-4	2	mg/kg		----	----	----	----	----
Copper	7440-50-8	5	mg/kg		----	----	----	----	----
Iron	7439-89-6	50	mg/kg		----	----	----	----	----
Lead	7439-92-1	5	mg/kg		----	----	----	----	----
Manganese	7439-96-5	5	mg/kg		----	----	----	----	----
Molybdenum	7439-98-7	2	mg/kg		----	----	----	----	----
Nickel	7440-02-0	2	mg/kg		----	----	----	----	----
Selenium	7782-49-2	5	mg/kg		----	----	----	----	----
Vanadium	7440-62-2	5	mg/kg		----	----	----	----	----
Zinc	7440-66-6	5	mg/kg		----	----	----	----	----
EG020S: Soluble Metals by ICPMS									
Arsenic	7440-38-2	0.01	mg/kg		----	----	----	----	----
Selenium	7782-49-2	0.1	mg/kg		----	----	----	----	----
Barium	7440-39-3	0.01	mg/kg		----	----	----	----	----
Beryllium	7440-41-7	0.01	mg/kg		----	----	----	----	----
Cadmium	7440-43-9	0.01	mg/kg		----	----	----	----	----
Cobalt	7440-48-4	0.01	mg/kg		----	----	----	----	----
Chromium	7440-47-3	0.01	mg/kg		----	----	----	----	----
Thorium	7440-29-1	0.01	mg/kg		----	----	----	----	----
Copper	7440-50-8	0.01	mg/kg		----	----	----	----	----
Manganese	7439-96-5	0.01	mg/kg		----	----	----	----	----
Molybdenum	7439-98-7	0.01	mg/kg		----	----	----	----	----
Nickel	7440-02-0	0.01	mg/kg		----	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	329266 - KCE15016 EB1606672-038	329305 - KCE15016 EB1606672-040	329342 - KCE15016 EB1606672-042	329651 - KCE15019 EB1606672-058	330548 - KCE15032 EB1606676-055
				Client sampling date / time	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]	[24-Feb-2016]
Compound	CAS Number	LOR	Unit		EB1608733-021	EB1608733-022	EB1608733-023	EB1608733-030	EB1608733-050
					Result	Result	Result	Result	Result
EG020S: Soluble Metals by ICPMS - Continued									
Lead	7439-92-1	0.01	mg/kg		----	----	----	----	----
Antimony	7440-36-0	0.01	mg/kg		----	----	----	----	----
Uranium	7440-61-1	0.01	mg/kg		----	----	----	----	----
Zinc	7440-66-6	0.05	mg/kg		----	----	----	----	----
Vanadium	7440-62-2	0.1	mg/kg		----	----	----	----	----
Aluminium	7429-90-5	0.1	mg/kg		----	----	----	----	----
EG020T: Total Metals by ICP-MS									
Thorium	7440-29-1	0.1	mg/kg		----	----	----	----	----
Uranium	7440-61-1	0.1	mg/kg		----	----	----	----	----
EG035S: Soluble Mercury by FIMS									
Mercury	7439-97-6	0.0005	mg/kg		----	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		----	----	----	----	----
EK040S: Fluoride Soluble									
Fluoride	16984-48-8	1	mg/kg		----	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg		----	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	COMPOSITE - 1 Samples #1 to #4	COMPOSITE - 2 Samples #5 to #10	COMPOSITE - 3 Samples #11 to 15	COMPOSITE - 4 Samples #16 to #20	COMPOSITE - 5 Samples #24 to #29
			Client sampling date / time	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]
Compound	CAS Number	LOR	Unit	EB1608733-051	EB1608733-052	EB1608733-053	EB1608733-054	EB1608733-055
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	5.2	9.1	9.8	8.9	7.6
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	551	452	474	561	864
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	----	----	----	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	4.9	5.1	----	5.9	4.6
Exchangeable Magnesium	----	0.2	meq/100g	6.0	3.6	----	5.3	3.7
Exchangeable Potassium	----	0.2	meq/100g	<0.2	<0.2	----	0.4	<0.2
Exchangeable Sodium	----	0.2	meq/100g	3.6	2.0	----	2.6	1.5
Cation Exchange Capacity	----	0.2	meq/100g	14.5	10.6	----	14.2	9.8
Exchangeable Sodium Percent	----	0.2	%	24.8	18.7	----	18.6	15.7
ED037: Alkalinity								
Total Alkalinity as CaCO3	----	1	mg/kg	302	10900	5830	4110	3640
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	302	10700	4770	3980	3640
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	<5	132	1060	132	<5
ED038A: Acidity								
Acidity	----	1	mg/kg	591	<1	<1	<1	49
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	90	40	170	120
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	840	200	30	340	580
ED093S: Soluble Major Cations								
Calcium	7440-70-2	10	mg/kg	<10	<10	<10	10	90
Magnesium	7439-95-4	10	mg/kg	<10	<10	<10	<10	40
Sodium	7440-23-5	10	mg/kg	530	470	440	590	890
Potassium	7440-09-7	10	mg/kg	<10	10	10	20	20
ED093T: Total Major Cations								
Calcium	7440-70-2	50	mg/kg	2100	13300	6380	7610	6680
Magnesium	7439-95-4	50	mg/kg	2640	4160	4600	4230	3380
Sodium	7440-23-5	50	mg/kg	2300	1730	2700	1890	1780
Potassium	7440-09-7	50	mg/kg	400	960	1530	1160	710
EG005S : Soluble Metals by ICPAES								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	COMPOSITE - 1 Samples #1 to #4	COMPOSITE - 2 Samples #5 to #10	COMPOSITE - 3 Samples #11 to 15	COMPOSITE - 4 Samples #16 to #20	COMPOSITE - 5 Samples #24 to #29
				Client sampling date / time	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]
Compound	CAS Number	LOR	Unit		EB1608733-051	EB1608733-052	EB1608733-053	EB1608733-054	EB1608733-055
					Result	Result	Result	Result	Result
EG005S : Soluble Metals by ICPAES - Continued									
Boron	7440-42-8	1	mg/kg		<1	<1	<1	<1	<1
Iron	7439-89-6	1	mg/kg		<1	<1	<1	<1	<1
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		15500	12100	11900	12700	13700
Antimony	7440-36-0	5	mg/kg		<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg		270	260	180	240	190
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	2
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		49	34	17	43	42
Cobalt	7440-48-4	2	mg/kg		12	20	11	28	16
Copper	7440-50-8	5	mg/kg		6	15	52	20	10
Iron	7439-89-6	50	mg/kg		13600	29500	14200	21700	23100
Lead	7439-92-1	5	mg/kg		12	10	18	11	8
Manganese	7439-96-5	5	mg/kg		510	940	142	906	594
Molybdenum	7439-98-7	2	mg/kg		<2	<2	<2	<2	<2
Nickel	7440-02-0	2	mg/kg		8	13	13	25	13
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		40	42	31	45	52
Zinc	7440-66-6	5	mg/kg		47	82	97	90	67
EG020S: Soluble Metals by ICPMS									
Arsenic	7440-38-2	0.01	mg/kg		<0.01	0.09	0.99	0.05	<0.01
Selenium	7782-49-2	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Barium	7440-39-3	0.01	mg/kg		0.07	0.03	0.02	0.04	0.11
Beryllium	7440-41-7	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	7440-43-9	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	7440-48-4	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	7440-47-3	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Thorium	7440-29-1	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Copper	7440-50-8	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Manganese	7439-96-5	0.01	mg/kg		0.09	<0.01	<0.01	0.01	0.41
Molybdenum	7439-98-7	0.01	mg/kg		<0.01	0.04	0.21	0.15	0.02
Nickel	7440-02-0	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	COMPOSITE - 1 Samples #1 to #4	COMPOSITE - 2 Samples #5 to #10	COMPOSITE - 3 Samples #11 to 15	COMPOSITE - 4 Samples #16 to #20	COMPOSITE - 5 Samples #24 to #29
				Client sampling date / time	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]
Compound	CAS Number	LOR	Unit		EB1608733-051	EB1608733-052	EB1608733-053	EB1608733-054	EB1608733-055
					Result	Result	Result	Result	Result
EG020S: Soluble Metals by ICPMS - Continued									
Lead	7439-92-1	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Uranium	7440-61-1	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Vanadium	7440-62-2	0.1	mg/kg		<0.1	<0.1	**0.6**	<0.1	<0.1
Aluminium	7429-90-5	0.1	mg/kg		<0.1	**0.1**	**0.8**	<0.1	<0.1
EG020T: Total Metals by ICP-MS									
Thorium	7440-29-1	0.1	mg/kg		**2.8**	**2.9**	**4.6**	**3.2**	**2.3**
Uranium	7440-61-1	0.1	mg/kg		**0.2**	**0.4**	**0.5**	**0.5**	**0.4**
EG035S: Soluble Mercury by FIMS									
Mercury	7439-97-6	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EK040S: Fluoride Soluble									
Fluoride	16984-48-8	1	mg/kg		<1	<1	<1	**1**	**2**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg		<0.1	**0.5**	**0.6**	**0.3**	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	COMPOSITE - 6 Samples #30 to #34	COMPOSITE - 7 Samples #35 to #39	COMPOSITE - 8 Samples #40 to #44	COMPOSITE - 9 Samples #45 to #47	COMPOSITE - 10 Samples #48 to #50
				Client sampling date / time	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]
Compound	CAS Number	LOR	Unit		EB1608733-056	EB1608733-057	EB1608733-058	EB1608733-059	EB1608733-060
					Result	Result	Result	Result	Result
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.3	5.3	9.8	8.8	9.0
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		288	463	442	376	338
EA026 : Chromium Reducible Sulfur									
Chromium Reducible Sulphur	----	0.005	%		----	----	----	----	----
ED006: Exchangeable Cations on Alkaline Soils									
Exchangeable Calcium	----	0.2	meq/100g		----	3.7	----	5.8	2.8
Exchangeable Magnesium	----	0.2	meq/100g		----	8.8	----	2.9	2.3
Exchangeable Potassium	----	0.2	meq/100g		----	<0.2	----	0.5	0.3
Exchangeable Sodium	----	0.2	meq/100g		----	3.4	----	1.4	0.7
Cation Exchange Capacity	----	0.2	meq/100g		----	15.9	----	10.6	6.1
Exchangeable Sodium Percent	----	0.2	%		----	21.2	----	13.6	10.8
ED037: Alkalinity									
Total Alkalinity as CaCO3	----	1	mg/kg		6360	571	48100	11900	1990
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg		6160	571	46600	11700	1860
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg		199	<5	1460	199	132
ED038A: Acidity									
Acidity	----	1	mg/kg		<1	553	<1	<1	<1
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		80	<10	40	190	200
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		60	690	30	70	110
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg		<10	<10	<10	20	<10
Magnesium	7439-95-4	10	mg/kg		<10	<10	<10	<10	<10
Sodium	7440-23-5	10	mg/kg		270	420	450	380	320
Potassium	7440-09-7	10	mg/kg		20	<10	10	30	30
ED093T: Total Major Cations									
Calcium	7440-70-2	50	mg/kg		11300	1750	24600	17400	3190
Magnesium	7439-95-4	50	mg/kg		4520	3820	6360	3880	3090
Sodium	7440-23-5	50	mg/kg		980	2150	1840	1030	870
Potassium	7440-09-7	50	mg/kg		1590	530	1450	1470	1590
EG005S : Soluble Metals by ICPAES									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	COMPOSITE - 6 Samples #30 to #34	COMPOSITE - 7 Samples #35 to #39	COMPOSITE - 8 Samples #40 to #44	COMPOSITE - 9 Samples #45 to #47	COMPOSITE - 10 Samples #48 to #50
				Client sampling date / time	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]
Compound	CAS Number	LOR	Unit		EB1608733-056	EB1608733-057	EB1608733-058	EB1608733-059	EB1608733-060
					Result	Result	Result	Result	Result
EG005S : Soluble Metals by ICPAES - Continued									
Boron	7440-42-8	1	mg/kg		<1	<1	<1	<1	<1
Iron	7439-89-6	1	mg/kg		<1	<1	<1	<1	<1
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		8650	19400	10900	10700	8320
Antimony	7440-36-0	5	mg/kg		<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg		<5	5	<5	<5	6
Barium	7440-39-3	10	mg/kg		80	90	150	100	70
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		16	16	21	14	13
Cobalt	7440-48-4	2	mg/kg		6	17	8	24	9
Copper	7440-50-8	5	mg/kg		31	9	37	28	36
Iron	7439-89-6	50	mg/kg		9370	30900	16200	28000	8850
Lead	7439-92-1	5	mg/kg		20	10	14	13	21
Manganese	7439-96-5	5	mg/kg		152	147	146	824	124
Molybdenum	7439-98-7	2	mg/kg		<2	<2	<2	<2	<2
Nickel	7440-02-0	2	mg/kg		8	14	11	23	9
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		22	61	30	50	22
Zinc	7440-66-6	5	mg/kg		65	60	98	86	115
EG020S: Soluble Metals by ICPMS									
Arsenic	7440-38-2	0.01	mg/kg		0.19	<0.01	0.44	0.02	0.03
Selenium	7782-49-2	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Barium	7440-39-3	0.01	mg/kg		0.02	0.05	0.02	<0.01	<0.01
Beryllium	7440-41-7	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	7440-43-9	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	7440-48-4	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	7440-47-3	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Thorium	7440-29-1	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Copper	7440-50-8	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Manganese	7439-96-5	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum	7439-98-7	0.01	mg/kg		0.14	<0.01	0.10	0.02	<0.01
Nickel	7440-02-0	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	COMPOSITE - 6 Samples #30 to #34	COMPOSITE - 7 Samples #35 to #39	COMPOSITE - 8 Samples #40 to #44	COMPOSITE - 9 Samples #45 to #47	COMPOSITE - 10 Samples #48 to #50
				Client sampling date / time	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]	[04-Apr-2016]
Compound	CAS Number	LOR	Unit		EB1608733-056	EB1608733-057	EB1608733-058	EB1608733-059	EB1608733-060
					Result	Result	Result	Result	Result
EG020S: Soluble Metals by ICPMS - Continued									
Lead	7439-92-1	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Uranium	7440-61-1	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Vanadium	7440-62-2	0.1	mg/kg		**0.3**	<0.1	**0.3**	<0.1	<0.1
Aluminium	7429-90-5	0.1	mg/kg		**0.3**	<0.1	**0.8**	<0.1	**0.1**
EG020T: Total Metals by ICP-MS									
Thorium	7440-29-1	0.1	mg/kg		**5.3**	**2.8**	**4.1**	**4.1**	**5.0**
Uranium	7440-61-1	0.1	mg/kg		**0.6**	**0.3**	**0.5**	**0.6**	**0.6**
EG035S: Soluble Mercury by FIMS									
Mercury	7439-97-6	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	**0.1**
EK040S: Fluoride Soluble									
Fluoride	16984-48-8	1	mg/kg		**1**	<1	<1	<1	**1**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg		**0.4**	<0.1	**0.2**	**0.2**	**0.3**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	**DI WATER BLANK DI Water used for 1:5 leachate.**	**----**	**----**	**----**	**----**
				Client sampling date / time	[04-Apr-2016]	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB1608733-061**	**--------**	**--------**	**--------**	**--------**
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**6.06**	**----**	**----**	**----**	**----**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**2**	**----**	**----**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1609695**	Page	: 1 of 4
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 3243 7222
Project	: 2016003 Kogan Creek	Date Samples Received	: 12-Apr-2016 15:20
Order number	: ----	Date Analysis Commenced	: 16-Apr-2016
C-O-C number	: ----	Issue Date	: 27-Apr-2016 09:16
Sampler	: MINGRUI YUAN		
Site	: ----		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

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*
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Kim McCabe	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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
			Client sampling date / time	[12-Apr-2016]	[12-Apr-2016]	[12-Apr-2016]	[12-Apr-2016]	----
Compound	CAS Number	LOR	Unit	EB1609695-001	EB1609695-002	EB1609695-003	EB1609695-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**4.28**	**8.94**	**7.45**	**9.83**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**2640**	**242**	**128**	**181**	----
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	**33**	<1	**72**	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	**34**	**74**	**24**	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	**67**	**74**	**96**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**29**	<1	**2**	<1	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**5**	**18**	**3**	**5**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**864**	**29**	**17**	**6**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**44**	**2**	**1**	<1	----
Magnesium	7439-95-4	1	mg/L	**48**	<1	<1	<1	----
Sodium	7440-23-5	1	mg/L	**396**	**53**	**25**	**39**	----
Potassium	7440-09-7	1	mg/L	**2**	**2**	<1	**1**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.85**	**0.09**	**0.10**	**0.38**	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.008**	<0.001	**0.024**	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Barium	7440-39-3	0.001	mg/L	**0.123**	**0.002**	**0.001**	**0.020**	----
Beryllium	7440-41-7	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0002**	<0.0001	<0.0001	<0.0001	----
Cobalt	7440-48-4	0.001	mg/L	**0.022**	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	**0.006**	**0.006**	**0.002**	**0.001**	----
Manganese	7439-96-5	0.001	mg/L	**0.101**	**0.004**	**0.010**	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.014**	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	**0.002**	**0.001**	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
				Client sampling date / time	[12-Apr-2016]	[12-Apr-2016]	[12-Apr-2016]	[12-Apr-2016]	----
Compound	CAS Number	LOR	Unit		EB1609695-001	EB1609695-002	EB1609695-003	EB1609695-004	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	**0.03**	**----**
Zinc	7440-66-6	0.005	mg/L		**0.076**	**0.005**	<0.005	<0.005	**----**
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.032**	<0.001	**0.030**	**----**
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	**0.09**	**----**
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**	**0.3**	**0.3**	**0.2**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1612199**	Page	: 1 of 4
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	: 2016003 Kogan Creek	Date Samples Received	: 10-May-2016 11:20
Order number	: ----	Date Analysis Commenced	: 12-May-2016
C-O-C number	: ----	Issue Date	: 17-May-2016 08:47
Sampler	: MINGRUI YUAN		
Site	: ----		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

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ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

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- 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

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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.

Analytical Results

Sub-Matrix: LIQUID (Matrix: WATER)			Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
			Client sampling date / time	[10-May-2016]	[10-May-2016]	[10-May-2016]	[10-May-2016]	----
Compound	CAS Number	LOR	Unit	EB1612199-001	EB1612199-002	EB1612199-003	EB1612199-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**4.63**	**8.38**	**6.93**	**7.86**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**890**	**212**	**143**	**64**	----
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	**2**	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	**24**	**7**	**13**	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	**26**	**7**	**13**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**4**	<1	**2**	**2**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**5**	**43**	**25**	**12**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**282**	**18**	**18**	**2**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**6**	**2**	**5**	**2**	----
Magnesium	7439-95-4	1	mg/L	**6**	**1**	**2**	<1	----
Sodium	7440-23-5	1	mg/L	**151**	**41**	**21**	**14**	----
Potassium	7440-09-7	1	mg/L	**1**	**2**	<1	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.05**	**0.32**	**0.15**	**0.54**	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.001**	<0.001	**0.004**	----
Boron	7440-42-8	0.05	mg/L	**0.05**	<0.05	<0.05	<0.05	----
Barium	7440-39-3	0.001	mg/L	**0.022**	**0.002**	**0.002**	**0.023**	----
Beryllium	7440-41-7	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	<0.0001	----
Cobalt	7440-48-4	0.001	mg/L	**0.003**	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	**0.002**	**0.002**	**0.001**	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.018**	**0.005**	**0.012**	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: LIQUID (Matrix: WATER)				Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
				Client sampling date / time	[10-May-2016]	[10-May-2016]	[10-May-2016]	[10-May-2016]	----
Compound	CAS Number	LOR	Unit		EB1612199-001	EB1612199-002	EB1612199-003	EB1612199-004	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		**0.007**	<0.005	<0.005	<0.005	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.009**	<0.001	**0.028**	----
Iron	7439-89-6	0.05	mg/L		<0.05	**0.09**	**0.07**	**0.09**	----
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	<0.1	<0.1	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**8.06**	**1.92**	**1.17**	**0.57**	----
Total Cations	----	0.01	meq/L		**7.39**	**2.02**	**1.33**	**0.71**	----
Ionic Balance	----	0.01	%		**4.37**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1616245**	Page	: 1 of 4
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 3243 7222
Project	: 2016003 Kogan Creek	Date Samples Received	: 21-Jun-2016 14:05
Order number	: ----	Date Analysis Commenced	: 23-Jun-2016
C-O-C number	: ----	Issue Date	: 28-Jun-2016 17:11
Sampler	: MINGRUI YUAN		
Site	: ----		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

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Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

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*
Greg Vogel	Laboratory Manager	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.

- EG020-F (Dissolved Metals by ICP-MS): Limit of reporting raised for sample EB1616245-001 (KLC 1) due to matrix interference.
- EK040-P (Fluoride): Sample 1 (KCL1) was analysed at x10 dilution due to matrix interference; LOR adjusted accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
			Client sampling date / time	[14-Jun-2016]	[14-Jun-2016]	[14-Jun-2016]	[14-Jun-2016]	----
Compound	CAS Number	LOR	Unit	EB1616245-001	EB1616245-002	EB1616245-003	EB1616245-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**4.78**	**8.31**	**6.99**	**6.95**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1170**	**1140**	**281**	**45**	----
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	**3**	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**13**	**146**	**11**	**10**	----
Total Alkalinity as CaCO3	----	1	mg/L	**13**	**149**	**11**	**10**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**590**	<1	**3**	**3**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**12**	**144**	**42**	**11**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**353**	**167**	**40**	**1**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**2**	**13**	**6**	**2**	----
Magnesium	7439-95-4	1	mg/L	**2**	**8**	**3**	<1	----
Sodium	7440-23-5	1	mg/L	**207**	**208**	**41**	**6**	----
Potassium	7440-09-7	1	mg/L	**1**	**6**	<1	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.05	<0.01	**0.53**	**0.12**	----
Antimony	7440-36-0	0.001	mg/L	<0.005	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	<0.005	**0.003**	<0.001	**0.002**	----
Boron	7440-42-8	0.05	mg/L	**0.07**	<0.05	<0.05	<0.05	----
Barium	7440-39-3	0.001	mg/L	**0.005**	**0.012**	**0.003**	**0.024**	----
Beryllium	7440-41-7	0.001	mg/L	<0.005	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0005	<0.0001	<0.0001	<0.0001	----
Cobalt	7440-48-4	0.001	mg/L	<0.005	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L	<0.005	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.005	**0.001**	**0.001**	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.007**	<0.001	**0.012**	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.005	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.005	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.05	**0.03**	<0.01	<0.01	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
				Client sampling date / time	[14-Jun-2016]	[14-Jun-2016]	[14-Jun-2016]	[14-Jun-2016]	----
Compound	CAS Number	LOR	Unit		EB1616245-001	EB1616245-002	EB1616245-003	EB1616245-004	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Vanadium	7440-62-2	0.01	mg/L		<0.05	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		<0.025	<0.005	<0.005	<0.005	----
Molybdenum	7439-98-7	0.001	mg/L		<0.005	**0.024**	<0.001	**0.014**	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	**0.22**	<0.05	----
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		<1.0	**0.3**	**0.2**	<0.1	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**10.5**	**10.7**	**2.22**	**0.46**	----
Total Cations	----	0.01	meq/L		**9.29**	**10.5**	**2.33**	**0.36**	----
Ionic Balance	----	0.01	%		**5.96**	**0.87**	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1617820**	Page	: 1 of 4
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	:
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	: 2016003 Kogan Creek	Date Samples Received	: 12-Jul-2016 13:10
Order number	: ----	Date Analysis Commenced	: 14-Jul-2016
C-O-C number	: ----	Issue Date	: 18-Jul-2016 15:41
Sampler	: MINGRUI YUAN		
Site	: ----		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

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ISO/IEC 17025.

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WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

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*
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Greg Vogel	Laboratory Manager	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.

- EG020- F (Dissolved Metals by ICP-MS): The high failing laboratory control standard for Antimony is deemed acceptable as all results are less than the limit of reporting.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
			Client sampling date / time	[12-Jul-2016]	[12-Jul-2016]	[12-Jul-2016]	[12-Jul-2016]	----
Compound	CAS Number	LOR	Unit	EB1617820-001	EB1617820-002	EB1617820-003	EB1617820-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.98**	**7.06**	**7.05**	**6.79**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**144**	**50**	**170**	**34**	----
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	**4**	**9**	**11**	**7**	----
Total Alkalinity as CaCO3	----	1	mg/L	**4**	**9**	**11**	**7**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**4**	**2**	**2**	**2**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**3**	**10**	**14**	**7**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**32**	**2**	**27**	**1**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	**1**	**2**	----
Magnesium	7439-95-4	1	mg/L	<1	<1	<1	<1	----
Sodium	7440-23-5	1	mg/L	**24**	**6**	**28**	**4**	----
Potassium	7440-09-7	1	mg/L	<1	<1	<1	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.45**	**0.30**	**0.54**	**0.52**	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Barium	7440-39-3	0.001	mg/L	<0.001	**0.001**	**0.001**	**0.031**	----
Beryllium	7440-41-7	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	<0.0001	----
Cobalt	7440-48-4	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	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.002**	**0.001**	**0.007**	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
				Client sampling date / time	[12-Jul-2016]	[12-Jul-2016]	[12-Jul-2016]	[12-Jul-2016]	----
Compound	CAS Number	LOR	Unit		EB1617820-001	EB1617820-002	EB1617820-003	EB1617820-004	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
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	<0.005	<0.005	<0.005	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	**0.009**	----
Iron	7439-89-6	0.05	mg/L		**0.21**	**0.08**	**0.20**	**0.08**	----
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	**0.1**	<0.1	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1619904**	Page	: 1 of 4
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	:
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	: 2016003 Kogan Creek	Date Samples Received	: 09-Aug-2016 14:50
Order number	: ----	Date Analysis Commenced	: 11-Aug-2016
C-O-C number	: ----	Issue Date	: 18-Aug-2016 16:38
Sampler	: MINGRUI YUAN		
Site	: ----		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

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NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

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*
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Greg Vogel	Laboratory Manager	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.

- Ionic Balance out of acceptable limits for sample KLC3 due to analytes not quantified in this report.

Analytical Results

Sub-Matrix: LEACHATE (Matrix: WATER)			Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
			Client sampling date / time	[09-Aug-2016]	[09-Aug-2016]	[09-Aug-2016]	[09-Aug-2016]	----
Compound	CAS Number	LOR	Unit	EB1619904-001	EB1619904-002	EB1619904-003	EB1619904-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.12**	**7.36**	**8.62**	**7.06**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**108**	**48**	**872**	**30**	----
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	**13**	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**5**	**11**	**100**	**7**	----
Total Alkalinity as CaCO3	----	1	mg/L	**5**	**11**	**112**	**7**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**6**	**2**	<1	**2**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**8**	**11**	**39**	**10**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**24**	**3**	**208**	**1**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	**3**	**2**	----
Magnesium	7439-95-4	1	mg/L	<1	<1	**2**	<1	----
Sodium	7440-23-5	1	mg/L	**17**	**8**	**46**	**3**	----
Potassium	7440-09-7	1	mg/L	<1	<1	**1**	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.15**	**0.04**	**0.10**	**0.04**	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.001**	**0.001**	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Barium	7440-39-3	0.001	mg/L	**0.001**	**0.002**	**0.002**	**0.037**	----
Beryllium	7440-41-7	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	<0.0001	----
Cobalt	7440-48-4	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	----
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	**0.002**	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.002**	**0.002**	**0.009**	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: LEACHATE (Matrix: WATER)				Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
				Client sampling date / time	[09-Aug-2016]	[09-Aug-2016]	[09-Aug-2016]	[09-Aug-2016]	----
Compound	CAS Number	LOR	Unit		EB1619904-001	EB1619904-002	EB1619904-003	EB1619904-004	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
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	<0.005	<0.005	<0.005	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.002**	**0.009**	----
Iron	7439-89-6	0.05	mg/L		**0.06**	<0.05	<0.05	<0.05	----
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**	<0.1	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**0.94**	**0.53**	**8.92**	**0.38**	----
Total Cations	----	0.01	meq/L		**0.74**	**0.35**	**2.34**	**0.23**	----
Ionic Balance	----	0.01	%		**----**	**----**	**58.4**	**----**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1622349**	Page	: 1 of 4
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	:
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	: 2016003 Kogan Creek	Date Samples Received	: 13-Sep-2016 14:35
Order number	: ----	Date Analysis Commenced	: 14-Sep-2016
C-O-C number	: ----	Issue Date	: 19-Sep-2016 16:45
Sampler	: MINGRUI YUAN		
Site	: ----		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

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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*
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Kim McCabe	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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
			Client sampling date / time	[13-Sep-2016]	[13-Sep-2016]	[13-Sep-2016]	[13-Sep-2016]	----
Compound	CAS Number	LOR	Unit	EB1622349-001	EB1622349-002	EB1622349-003	EB1622349-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.03**	**6.73**	**7.04**	**6.67**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**66**	**35**	**381**	**40**	----
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	**5**	**9**	**14**	**6**	----
Total Alkalinity as CaCO3	----	1	mg/L	**5**	**9**	**14**	**6**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**5**	**1**	**2**	**2**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**6**	**6**	**29**	**10**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**16**	<1	**85**	**1**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	**6**	**5**	----
Magnesium	7439-95-4	1	mg/L	<1	<1	**3**	<1	----
Sodium	7440-23-5	1	mg/L	**13**	**4**	**68**	**5**	----
Potassium	7440-09-7	1	mg/L	<1	<1	**1**	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.70**	**0.38**	**0.39**	**0.22**	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Barium	7440-39-3	0.001	mg/L	<0.001	**0.002**	**0.002**	**0.039**	----
Beryllium	7440-41-7	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	<0.0001	----
Cobalt	7440-48-4	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	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.001**	**0.003**	**0.005**	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
				Client sampling date / time	[13-Sep-2016]	[13-Sep-2016]	[13-Sep-2016]	[13-Sep-2016]	----
Compound	CAS Number	LOR	Unit		EB1622349-001	EB1622349-002	EB1622349-003	EB1622349-004	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
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	<0.005	<0.005	<0.005	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	**0.002**	**0.013**	----
Iron	7439-89-6	0.05	mg/L		**0.42**	**0.13**	**0.15**	<0.05	----
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	**0.2**	<0.1	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		----	**0.30**	**3.28**	**0.36**	----
Total Cations	----	0.01	meq/L		----	**0.17**	**3.53**	**0.47**	----
Ionic Balance	----	0.01	%		----	----	**3.63**	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1624335**	Page	: 1 of 4
Client	: **RGS ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	:
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	: 2016003 Kogan Creek	Date Samples Received	: 11-Oct-2016 14:05
Order number	: ----	Date Analysis Commenced	: 12-Oct-2016
C-O-C number	: ----	Issue Date	: 17-Oct-2016 16:34
Sampler	: MINGRUI YUAN		
Site	: ----		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

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- 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*
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	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.

Analytical Results

Sub-Matrix: LIQUID (Matrix: WATER)			Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
			Client sampling date / time	[11-Oct-2016]	[11-Oct-2016]	[11-Oct-2016]	[11-Oct-2016]	----
Compound	CAS Number	LOR	Unit	EB1624335-001	EB1624335-002	EB1624335-003	EB1624335-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.83**	**9.00**	**9.27**	**7.69**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**130**	**74**	**199**	**67**	----
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	**7**	**12**	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**4**	**17**	**19**	**14**	----
Total Alkalinity as CaCO3	----	1	mg/L	**4**	**25**	**31**	**14**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**11**	<1	<1	<1	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**3**	**10**	**14**	**16**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**31**	**3**	**31**	**2**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	<1	<1	----
Magnesium	7439-95-4	1	mg/L	<1	<1	<1	<1	----
Sodium	7440-23-5	1	mg/L	**24**	**14**	**43**	**12**	----
Potassium	7440-09-7	1	mg/L	<1	<1	<1	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.60**	**0.93**	**0.66**	**1.06**	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	**0.004**	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	**0.002**	**0.011**	----
Beryllium	7440-41-7	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	<0.0001	----
Cobalt	7440-48-4	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	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.001**	**0.001**	**0.008**	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: LIQUID (Matrix: WATER)				Client sample ID	KLC 1	KLC 2	KLC 3	KLC 4	----
				Client sampling date / time	[11-Oct-2016]	[11-Oct-2016]	[11-Oct-2016]	[11-Oct-2016]	----
Compound	CAS Number	LOR	Unit		EB1624335-001	EB1624335-002	EB1624335-003	EB1624335-004	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
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	<0.005	<0.005	<0.005	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	**0.026**	----
Iron	7439-89-6	0.05	mg/L		**0.31**	**0.23**	**0.24**	**0.17**	----
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	**0.3**	<0.1	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**1.02**	**0.79**	**1.78**	**0.67**	----
Total Cations	----	0.01	meq/L		**1.04**	**0.61**	**1.87**	**0.52**	----

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