



Geochemical Impact Assessment



Continuation of Bengalla Mine Geochemical Impact Assessment

Final report prepared for:

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EXECUTIVE SUMMARY

ES1 Background

RGS Environmental Pty Ltd (RGS) was commissioned by Hansen Bailey Pty Ltd (Hansen Bailey), on behalf of Bengalla Mining Company (BMC) to complete a geochemical impact assessment of the overburden and coal reject material associated with the Continuation of Bengalla Mine Project.

BMC has successfully operated Bengalla Mine (Bengalla) since 1999 and is seeking a Development Consent under Part 4 Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to enable mining to continue west largely within the Mining Leases (ML) for a 24 year period at a rate of up to 15 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal (the Project). For the purpose of this report, both overburden and interburden materials are generally termed overburden.

Bengalla is located in the Upper Hunter Valley of NSW, approximately 130 km north-west of Newcastle and 4 km west of Muswellbrook. Operating as an open cut, strip-mining operation, mining advances generally to the west based on dragline strips approximately 60 m in width. Pre-stripped overburden is removed by loader and/or excavator and trucks, in advance of dragline operation and subsequent coaling. Overburden from progressive strips is used to backfill the eastern side of the pit. Mining is conducted by an equipment fleet consisting of a dragline, loading units, trucks and various other ancillary equipment.

ES2 The Project

BMC will apply for Development Consent under Part 4 Division 4.1 of the EP&A Act to facilitate the continuation of open cut coal mining largely within the current MLs for a further 24 years. The Project will comprise a number of features, which are detailed in **Section 1.2** of this report including:

- Continued open cut coal mining production to a rate of up to 15 Mtpa ROM for 24 years using a dragline and truck/excavator fleet;
- Continue mining to the west of current operations through ML1397 into AL13 within land entirely owned by BMC (excluding a small area of land owned by another mining company); and
- An additional Overburden Emplacement Area (OEA) to the west of Dry Creek which may be utilised for excess spoil material until it is intercepted by mining.

ES3 Scope of Work

The scope of work was to complete a geochemical impact assessment of overburden and coal reject material likely to be generated by the Project. The impact assessment involved:

- A review of any existing geological/geochemical assessments/data in the area and delineation of additional overburden and coal reject sampling and testing requirements;
- Design of a suitable geochemical sampling and testing program for overburden and coal reject likely to be generated by the Project;
- Sampling and geochemical testing of selected drill core samples derived from ongoing exploration drilling programs;
- Sampling and geochemical testing of selected coal reject samples from the Bengalla Coal Handling and Preparation Plant CHPP;
- Coordination of static laboratory geochemical analysis of samples delivered to ALS Brisbane;
- Completion of kinetic leach column (KLC) tests at the RGS in-house laboratory; and
- Preparation of a geochemical impact assessment report specific to the Project, based on existing and additional information.

ES4 Sampling and Testing Program

One hundred and five (105) overburden samples were selected from eight (8) drill holes to provide representative lateral and vertical coverage of the overburden materials likely to be mined at the Project. Nine (9) coal reject samples were selected to represent coal reject derived from processing coal seams (Vaux, Bayswater and Wynn) with varying geochemical characteristics. The sampling strategy was based on existing knowledge of the geology/stratigraphy of the site and from the results of previous geochemical assessment work as described in **Section 4.0**. All overburden and coal reject samples were transferred to ALS Brisbane laboratory by Bengalla personnel for sample preparation and geochemical characterisation tests as described below.

A series of static geochemical tests were completed on individual and composite overburden and coal reject samples at ALS Brisbane as coordinated by RGS. Selected overburden and coal reject samples were then subjected to KLC tests over a period of 12 weeks at the RGS in-house laboratory in Brisbane. All leachate collected from the KLC tests was analysed at ALS Brisbane.

ES5 Conclusions

RGS has completed a geochemical impact assessment of representative overburden and coal reject materials for the Project. RGS has also reviewed and relied upon the results of existing geological, geochemical and water quality monitoring information from the site to draw the following conclusions:

- All overburden material, apart from the Archerfield Sandstone (ASS) located above the Wynn seam, has negligible (<0.1%) sulfur content, excess Acid Neutralising Capacity (ANC), and is classified as Non-Acid Forming (NAF);
- All overburden material, apart from the ASS located above the Wynn seam, has a high factor of safety with respect to potential acid generation. Current management methods for ASS materials at the open cut are sufficient to minimise the risk of any significant impact to the environment;
- The concentration of total metals in overburden (and coal reject materials) is well below applied guideline criteria for soils and is unlikely to present any environmental issues associated with revegetation and rehabilitation;
- Overburden will generate alkaline run-off and seepage with low salinity values following surface exposure. The salinity of run-off and seepage from overburden materials is likely to decrease over time;
- The concentration of trace metals and sulfate in run-off and seepage from overburden will be low;
- Some overburden material may be sodic and have structural stability problems related to potential dispersion and erosion;
- Coal reject contains elevated sulfur content however the only material that is classified as Potentially Acid Forming (PAF) is from the Wynn seam;
- The concentration of trace metals and sulfate from most coal rejects will be low. However, Wynn coal reject materials have the potential to generate elevated concentrations of some metals (Al, Cd, Co, Cu, As, Ni, Se and Zn) if exposed to oxidising conditions; and
- Current management methods for Wynn coal reject and other coal reject materials at the open cut are sufficient to minimise the risk of any significant impact to the environment.

ES6 Potential Management Measures

The ongoing management of overburden (and co-disposed coal reject) materials at the Project should consider the geochemistry of these materials with respect to their potential risk to cause harm to the environment and their suitability for use in construction and revegetation. It is therefore suggested that the BMC:

- Continues with current management methods for PAF ASS overburden and coal reject materials of deep burial under NAF overburden in the backfilled open cut as described in the Acid Rock Drainage Management Plan (BMC, 2009);
- Does not co-dispose ASS or coal rejects within overburden emplacement areas which overlie, or have potential connectivity with alluvial soils and/or Dry Creek. There may be some scope for co-disposal of coal rejects in some areas that drain towards the open pit, but only if existing groundwater/hydrogeological studies completed by BMC clearly demonstrate a low risk of seepage connectivity to alluvial soils and/or dry creek;
- Continues with current practice of pre-stripping topsoil from areas to be disturbed for use in final rehabilitation activities (surface cover or vegetation growth medium); and
- Continues with successful site rehabilitation practices for potentially sodic overburden within the Project area by ensuring that a topsoil cover is utilised as part of final rehabilitation.

Surface water and water collected in the pit (including seepage from overburden and coal reject materials) should continue to be monitored to ensure that key water quality parameters remain within licence limits criteria. It is therefore suggested that BMC continues to monitor the run-off/seepage from the proposed and overburden emplacement areas on a quarterly basis for:

- pH;
- electrical conductivity (EC); and
- Total suspended solids (TSS).

and annually for:

- Dissolved trace metals; and
- Major ions including sulfate.

TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Background	1
1.2	The Project	1
1.3	Scope of Work	2
1.4	Report Structure	2
2.0	GEOLOGY AND COAL RESOURCE	3
2.1	Geology	3
2.2	Coal Resource	3
3.0	METHODOLOGY	4
3.1	Desktop Review	4
3.2	Site Visit	4
3.3	Sampling and Testing Program	4
3.3.1	Sampling Program	4
3.3.2	Geochemical Testing Program	5
4.0	REVIEW OF EXISTING GEOCHEMICAL DATA	6
4.1	Environmental Impact Statement	6
4.2	Management Plan for Spontaneous Combustion and AMD	6
4.3	AMD Management Plan	6
4.4	Acid Rock Drainage and Mineral Waste Management Plan	6
4.5	Ongoing Monitoring of Overburden and Coal Reject	7
5.0	GEOCHEMICAL TEST RESULTS	9
5.1	Acid Base Account Results	9
5.1.1	Overburden	9
5.2	Multi-Element Concentration in Solids	18
5.3	Effective Cation Exchange Capacity and Sodicity	21
5.4	Water Quality	21
5.5	Kinetic Leach Column (KLC) Tests	23
6.0	DISCUSSION	25
6.1	Acid Base Account Test Results	25
6.2	Multi-Element Composition and Water Quality	26
6.2.1	Multi-element composition	26
6.2.2	Water Quality	26
6.3	Revegetation and Rehabilitation	27
6.4	Co-Disposal of Rejects at Overburden Emplacement Area	27
7.0	CONCLUSIONS AND MANAGEMENT MEASURES	28
7.1	Conclusions	28
7.2	Potential Management Measures	28
8.0	REFERENCES	30
9.0	LIMITATIONS	31

LIST OF TABLES

Table 1-1:	Typical Overburden and Coal Seam Thickness at Bengalla
Table 5-1:	Acid-Base Results for Overburden/Interburden Materials
Table 5-2:	Geochemical Classification Criteria for Overburden Materials
Table 5-3:	Acid-Base Results for Coal Reject Materials
Table 5-4:	Geochemical Classification Criteria for Coal Reject Materials
Table 5-5:	Overburden and Coal Reject Samples Selected for Multi-Element Analysis
Table 5-6:	Multi-Element Results for Overburden and Coal Reject Materials
Table 5-7:	Multi-Element Results for Water Extracts from Overburden and Coal Reject Materials
Table 5-8:	Overburden and Coal Reject Samples Selected for KLC Tests
Table 6-1:	Oxidation Rates for Overburden and Coal Reject Materials

LIST OF FIGURES

Figure 1:	Site Location Map
Figure 2:	Indicative Stratigraphic Column
Figure 3:	Drill Hole Locations used for Geochemical Sampling

LIST OF GRAPHS

Graph 1:	Current pH and EC of Overburden
Graph 2:	Total Sulfur of Overburden
Graph 3:	MPA and ANC for Overburden
Graph 4:	NAPP for Overburden
Graph 5:	ANC vs MPA for Overburden
Graph 6:	Current pH and EC of Coal Reject
Graph 7:	Total Sulfur of Coal Reject
Graph 8:	MPA and ANC for Coal Reject
Graph 9:	NAPP for Coal Reject
Graph 10:	ANC vs MPA for Coal Reject

LIST OF ATTACHMENTS

Attachment A:	Figures
Attachment B:	Geochemical Assessment of Mine Waste Materials
Attachment C:	Kinetic Leach Column Test Results and Trends
Attachment D:	ALS Laboratory Results

GLOSSARY OF TERMS

Acid	A measure of hydrogen ion (H^+) concentration; generally expressed as pH.
Acid Base Account	Evaluation of the balance between acid generation and acid neutralisation processes. Generally determines the maximum potential acidity (MPA) and the inherent acid neutralising capacity (ANC), as defined below.
ANC	Acid neutralising capacity, expressed as kg H_2SO_4 per tonne of sample.
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.
ARD	Acid Rock Drainage from mine waste materials characterised by low pH, elevated metal concentrations, high sulfate concentrations and high salinity.
CHPP	Coal Handling and Preparation Plant.
eCEC	Effective Cation Exchange Capacity. The amount of exchangeable major cations in a sample expressed as meq/100g.
EC	Electrical Conductivity, expressed as $\mu S/cm$.
ESP	Exchangeable Sodium Percentage. The proportion of exchangeable sodium in a sample compared to the cation exchange capacity, expressed as a percentage. Used to assess the risk of a material being dispersive/erosive.
Kinetic test	Procedure used to measure the geochemical/weathering behaviour of a sample of mine material over time.
MPA	Maximum Potential Acidity calculated by multiplying the total sulfur content of a sample by 30.6 (stoichiometric factor) and expressed as kg H_2SO_4 per tonne.
NAF	Non-Acid Forming. Geochemical classification criterion for a sample that will not generate acid conditions.
NAG test	Net Acid Generation test. Hydrogen peroxide solution is used to oxidise sulfides in a sample, then any acid generated through oxidation may be consumed by neutralising components in the sample. Any remaining acidity is expressed as kg H_2SO_4 per tonne.
NAPP	Net Acid Producing Potential expressed as kg H_2SO_4 per tonne. Calculated by subtracting the ANC from the MPA.
Overburden	Material overlying a coal resource that must be removed to mine the coal.
PAF	Potentially Acid Forming. Geochemical classification criterion for a sample that has the potential to generate acid conditions.
(Coal) Reject	Mixture of coarse and finely ground materials from which the desired mineral (coal) values have been largely extracted.
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.
(Coal) Tailing	Finely ground materials from which the desired mineral (coal) values have been largely extracted.
Total Sulfur	Total sulfur content of a sample generally measured using a 'Leco' analyser expressed as % S.

1.0 INTRODUCTION

1.1 Background

RGS Environmental Pty Ltd (RGS) was commissioned by Hansen Bailey Pty Ltd (Hansen Bailey), on behalf of Bengalla Mining Company (BMC) to complete a geochemical impact assessment of the overburden and coal reject material associated with the continuation of Bengalla Mine (Bengalla). BMC has successfully operated Bengalla since 1999 and is seeking a Development Consent under Part 4 Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to enable mining to continue west largely within the Mining Leases (ML) for a 24 year period at a rate of up to 15 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal (the Project). For the purpose of this report, both overburden and interburden materials are generally termed overburden.

Bengalla is located in the Upper Hunter Valley of NSW, approximately 130 km north-west of Newcastle and 4 km west of Muswellbrook (**Figure 1, Attachment A**). Operating as an open cut, strip-mining operation, mining advances generally to the west based on dragline strips approximately 60 m in width. Pre-stripped overburden is removed by loader and/or excavator and trucks, in advance of dragline operation and subsequent coaling. Spoils from progressive strips are used to backfill the eastern side of the pit. Mining is conducted by an equipment fleet consisting of a dragline, loading units, trucks, and various other ancillary equipment.

1.2 The Project

BMC will apply for Development Consent under Part 4 Division 4.1 of the EP&A Act to facilitate the continuation of open cut coal mining largely within the current MLs for a further 24 years. The Project will consist of the following features:

- Continued open cut coal mining production to a rate of up to 15 Mtpa ROM for 24 years using a dragline and truck/excavator fleet;
- Continue mining to the west of current operations through ML1397 into AL13 within land entirely owned by BMC (excluding a small area of land owned by another mining company);
- An additional Overburden Emplacement Area (OEA) to the west of Dry Creek which may be utilised for excess spoil material until it is intercepted by mining;
- Processing, handling and transportation of coal via the existing CHPP (to be upgraded) and rail loop for export and domestic sale;
- An additional CHPP coal stockpile and ROM coal stockpile;
- Continued use, expansion and upgrades to existing site infrastructure;
- The construction of a radio tower and relocation of the Explosives Magazine and Reload Facility;
- Relocation of a section of Bengalla Link Road near the existing mine access road to enable coal extraction;
- Diversion of Dry Creek via dams and pipe work with a later permanent realignment of Dry Creek through rehabilitation areas once stability is established;
- Re-location of water storage infrastructure as mining progresses through existing dams (including the staged discharge dam);
- The construction of raw water dams and a clean water dam;
- A workforce of approximately 900 full time equivalent personnel (plus contractors) at peak production; and
- Supporting power reticulation infrastructure.

1.3 *Scope of Work*

The scope of work was to complete a geochemical impact assessment of overburden and coal reject material likely to be generated by the Project. The Geochemical Assessment involved:

- A review of any existing geological/geochemical assessments/data in the area and delineation of additional overburden and coal reject sampling and testing requirements;
- Design of a suitable geochemical sampling and testing program for overburden and coal reject likely to be generated by the Project;
- Sampling and geochemical testing of selected drill core samples derived from ongoing exploration drilling programs;
- Sampling and geochemical testing of selected coal reject samples from the existing Bengalla Coal Handling and Preparation Plant (CHPP);
- Coordination of static laboratory geochemical analysis of samples delivered to ALS Brisbane;
- Completion of kinetic leach column (KLC) tests at the RGS in-house laboratory; and
- Preparation of a geochemical impact assessment report specific to the Project, based on existing and additional information.

1.4 *Report Structure*

There has been a significant amount of geochemical assessment work on overburden and coal reject materials undertaken previously by BMC as well as a database of groundwater and surface water monitoring data compiled over a number of years. Available information provided to RGS and reviewed as part of the geochemical assessment program is provided at **Section 4.0** and referenced at **Section 8.0**.

RGS has worked closely with Hansen Bailey/BMC personnel to develop a targeted overburden and coal reject sampling and testing program as part of the geochemical assessment program to complement the previous work undertaken. The methodology used for the sampling and testing program is described at **Section 3.0**. BMC personnel collected representative samples of overburden and coal rejects materials and transferred these to ALS Brisbane laboratory, to facilitate completion of static and kinetic geochemical test programs. All geochemical test work completed on the overburden samples was co-ordinated by RGS personnel.

The geochemical results obtained for the overburden and coal reject test programs are presented at **Section 5.0** and potential implications for overburden and coal reject management are discussed at **Section 6.0**. The main conclusions and potential measures for ongoing overburden and coal reject management at Bengalla are presented at **Section 7.0**. The list of references relied upon to complete this report is provided at **Section 8.0**.

2.0 GEOLOGY AND COAL RESOURCE

2.1 Geology

Bengalla is located in the north-west of the Hunter Coalfield, an administrative subdivision of the Sydney Basin. Within the deposit area, coal seams sub-crop along the western flank of the north-south trending Muswellbrook Anticline. Coal seams present within the Project Boundary generally dip westwards at around five degrees. Faulting and igneous intrusions are not significant influences on Bengalla's design, although they do have localised impacts on scheduling, wall stability, groundwater and coal quality. Most faulting is high angle normal faults trending in a westerly to north-westerly direction. Two narrow, north-north westerly trending dykes have been encountered previously.

The stratigraphic sequence across the site comprises two distinct units including the Permian coal seam sequence and Quaternary alluvial deposits. The Permian coal seam sequence is comprised of overburden and interburden layers of lithic sandstone, interbedded with siltstone, tuffaceous claystone and mudstone. The Permian sediments are unconformably overlain by thin Quaternary alluvial deposits. Quaternary alluvial deposits consist of sand and gravel along the creek valleys within the Project Boundary, and in the alluvial floodplain of the Hunter River to the south (Hansen Bailey, 2012).

2.2 Coal Resource

Coal seams at Bengalla comprise those of the lower Jerrys Plains and Vane Subgroups of the Late Permian Wittingham Coal Measures. Seams from the Bowfield (uppermost) to the Ramrod Creek are represented. The sequence of interest at Bengalla comprises eight economically viable seams from the Warkworth to Edderton seams forming part of the Wittingham Coal Measures. The Wittingham Coal measures are up to 800 m thick and consist of sandstone, siltstone, claystone, conglomerate and tuff within which intermittent coal seams lie. The Permian rocks form a regular layered sedimentary sequence consisting of the Wittingham Coal Measures that contain the economic coal seams and underlie the whole of the Project Boundary to a depth of about 500 m. Coal seams of the Jerrys Plains and Vane Subgroups (part of the Wittingham Coal Measures) will continue to be mined by the Project

Bengalla is an open cut strip mining operation where mining advances from east to west based on dragline strips approximately 60 m in width. **Figure 2 (Attachment A)** provides an indicative typical stratigraphic profile of the Bengalla coal seams to be mined. The coal seams at Bengalla occur within an approximately 150 metre thick stratigraphic sequence. There are eight distinct coal seams separated by claystone, siltstone, and sandstone interburden and overburden layers. From top to bottom the seams and interburden units are provided at **Table 1-1**. The entire sequence dips between two and seven degrees to the west and strikes roughly north-south (BMC, 2009).

Table 1-1
Typical Interburden and Coal Seam Thickness at Bengalla

Coal Seam (splits)	Typical Coal Seam	Interburden Thickness (m)
Warkworth (4)	2	29
Mt Arthur (2)	5	4
Piercefield (2)	4	18
Vaux (2)	7	29
Broonie (3)	6	25
Bayswater (2)	4	5
Wynn (1)	3	5
Edderton (1)	3	6

3.0 METHODOLOGY

3.1 *Desktop Review*

RGS has completed a review of available geochemical, geological and water quality data associated with the Project. Relevant Project information was supplied to RGS by Hansen Bailey and BMC personnel. Supplied information was used in the development of the overburden sampling and testing program, which complements previous work completed by RGS at Bengalla. This process enabled RGS to make efficient use of existing data and current drilling programs to develop an effective sampling and testing program for overburden for the Project.

3.2 *Site Visit*

No site visit was required as RGS personnel (Alan Robertson) had previously completed a site visit to Bengalla in June 2010 and met with key Project environmental and geological personnel (RGS, 2010). The previous site visit enabled RGS to gain an understanding of Bengalla and overburden and coal reject emplacement strategy. This approach provided sufficient rigour to the geochemical assessment process and ensured that results interpretation and final conclusions were robust and based on a sound sampling and testing methodology.

3.3 *Sampling and Testing Program*

3.3.1 *Sampling Program*

There are no specific regulatory requirements regarding the number of samples required to be obtained and tested for overburden and coal reject materials at coal mines in NSW. As such, existing technical guidelines for geochemical assessment of mine waste in Australia (AMIRA, 2002; DITR, 2007 and ACARP, 2008) and worldwide (INAP, 2009) have been used by RGS as a framework for developing the sampling (and testing) program at the Project.

One hundred and five (105) overburden samples were selected from eight drill holes to provide representative lateral and vertical coverage of the overburden materials to be mined and likely to be emplaced at the Project. Overall, the samples represented the range of overburden lithologies likely to report to the Project emplacement facilities. The location of the drill holes used for geochemical sampling is shown in **Figure 3 (Attachment A)**.

For coal reject, nine samples from the CHPP were selected by BMC personnel with reject sample selection based on the specific coal seam being processed at the time of sampling.

The sampling strategy was based on existing knowledge of the geology/stratigraphy of the site and from the results of previous geochemical assessment work as described in **Section 4.0**. Additional sampling considerations included the potential for significant environmental or health impacts; size of operation; sample representation requirements; material volumes; level of confidence in predictive ability; and cost. BMC provided a suitably qualified person (BMC Senior Geologist) to supervise the collection of representative samples of the required range of overburden and coal reject materials. BMC was provided with the relevant laboratory chain of custody documentation and instructions to allow collection and dispatch of the relevant drill core samples to ALS Brisbane for assay.

All samples were transferred to ALS Brisbane laboratory by BMC for sample preparation and geochemical characterisation tests as described in **Section 3.3.2**.

3.3.2 Geochemical Testing Program

Static Tests

The drill core samples received by ALS Brisbane were prepared (crushed, split, sub-sampled and pulverised) prior to being subjected to a series of geochemical tests. The geochemical test program was designed to assess the degree of risk from oxidation of pyrite, acid generation, and leaching of soluble metals and salts. The assessment also included characterisation of standard soil parameters including salinity, cation exchange capacity, and major metal compositions. A summarised overview of a typical geochemical assessment program for mine waste materials is provided at **Attachment B**.

All of the 105 overburden and nine coal reject samples collected were subjected to initial Acid Base Account (ABA) geochemical testing as part of an initial screening process and tested for:

- pH and Electrical Conductivity (EC) (1:5);
- Total sulfur;
- Acid neutralising capacity (ANC); and
- Net acid producing potential (NAPP).

After the results of the ABA tests were received and reviewed, 14 overburden and six coal reject (composite and individual) samples were prepared and multi-element testing was completed on solid and soluble fractions of pulverised composite samples. The samples were tested for:

- pH and EC (1:5);
- Alkalinity (1:5);
- Total metals (Al, As, B, Cd, Cr, Co, Cu, Fe, Pb, Mn, Mo, N, Ni, P, Sb, Se, Zn) in solids;
- Total cations (Ca, Mg, Na, K) and Exchangeable cations (Ca, Mg, Na, K);
- Soluble metals (Al, As, B, Cd, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, P, Sb, Se, Zn) in 1:5 water extracts;
- Soluble cations (Ca, Mg, Na, K) and soluble anions (Cl, SO₄);
- Cation Exchange Capacity (eCEC); and
- Exchangeable Sodium Percentage (ESP).

Kinetic Leach Column Tests

Two composite samples of overburden and six coal reject samples (crushed material passing nominal 10 mm sieve size) were subjected to kinetic leach column (KLC) tests at the RGS in-house laboratory. The KLC tests commenced in July 2011 and were completed in January 2012. Approximately 2 kg dry weight of each sample was used in each of the KLC tests, which were operated with fortnightly deionised water addition and leachate collection for 12 weeks. 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. All leachate collected was sent to ALS Brisbane for analysis of:

- pH and EC;
- Acidity and alkalinity;
- Soluble metals (Al, B, As, Cd, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, Sb, Se and Zn);
- Soluble cations (Ca, Mg, Na and K); and
- Soluble Anions (Cl, SO₄).

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

4.0 REVIEW OF EXISTING GEOCHEMICAL DATA

4.1 *Environmental Impact Statement*

The original Environmental Impact Statement for Bengalla (HLA Envirosciences, 1992) indicated that overburden consisted of sandstone, siltstone and claystone with minor amounts of tuff, conglomerate and poor quality coal. The geochemical characteristics of 21 overburden samples from two bore holes were assessed and it was concluded that:

- All strata between the Wynn and Bayswater seams (ASS) are saline and Potentially Acid Forming (PAF);
- The weathered Bayswater seam is very saline and sodic; and
- All other strata are Non-Acid Forming (NAF) and are not saline or sodic.

The adopted management strategy for overburden materials was to place material from the Archerfield-Bulga Formation and weathered Bayswater seam in the core of the overburden dump well away from final overburden dump surfaces to avoid potential erosion and revegetation problems.

4.2 *Management Plan for Spontaneous Combustion and AMD*

A spontaneous combustion and Acid Mine Drainage Management Plan (AMDP) at Bengalla was developed in 1998 (Eastwood and Carras, 1998) and utilised additional geochemical analysis of 20 overburden samples from each overburden unit intersected by two bore holes. The AMDP described operational strategies required to minimise the occurrence of spontaneous combustion and acid mine drainage within the constraints of the overall mining plan at Bengalla. Information contained in the plan confirmed ASS located above the Wynn seam as the only overburden material likely to generate AMD. It was also concluded that the Bayswater, Edderton and Mt Arthur overburden were potential acid neutralising materials and that the Broonie, Vaux and Piercefield overburden were inert materials.

4.3 *AMD Management Plan*

The AMDP at Bengalla was reviewed and updated in 2005 (Matrix Plus, 2005). The review confirmed the findings of the 1998 AMD Management Plan and suggested that the geological profile at Bengalla (eight coal seams and overburden) has a net neutralising capacity of -100 kg H₂SO₄/t. Geochemical kinetic testing of ASS indicated a short lag time preceding acid generation of several weeks to months and confirmed that this material is reactive when exposed to air and moisture. However, sampling and geochemical test results indicated that the ASS is not uniformly PAF and can also be NAF.

The report indicated that ASS is dumped in the open pit by dragline and then covered with acid neutralising and inert overburden to a depth of at least 60 m. Drainage from the ASS is contained within the mine water management system and local groundwater flows are directed into the pit, resulting in a very low risk of AMD at the site.

4.4 *Acid Rock Drainage and Mineral Waste Management Plan*

In more recent times, BMC has updated the AMD Management Plan, which is now called the Acid Rock Drainage and Mineral Waste Management Plan (hereafter the ARDMP) in accordance with the Rio Tinto Coal Australia Environmental Standards (BMC, 2009). The ARDMP described geochemical testing of 30 overburden samples from three boreholes and seven reject samples from different coal seams sampled in 2006. In addition to ABA tests, Net Acid Generation (NAG), sulfur speciation and Acid Buffering Characteristic Curve (ABCC) tests were completed. The results indicated that overburden (and interburden) units above the ASS had negligible total sulfur content (mean value of 0.03%). The ASS unit was indicated as containing approximately 1.3% sulfur and was typically PAF. The underlying Edderton overburden also contained up to 0.6 % sulfur, but had a large excess of ANC and was considered NAF. It was also estimated that the weighted mean ANC for the entire overburden sequence at Bengalla was approximately 21 times greater than the mean maximum potential acidity (MPA).

The ARDMP indicated that coal reject material at Bengalla contains significantly higher total sulfur concentrations than overburden (weighted mean of 1.03%). The ANC was also elevated resulting in a NAF classification for all but the Wynn coal seam rejects. Overall, the mean ANC of bulk rejects was estimated to be 1.5 times greater than the MPA. Coal reject materials are co-disposed with overburden in the mine Overburden Emplacement Area (OEA) and make up approximately 5% of the total OEA mass. Overall, the combined overburden and coal reject in the mine spoils was estimated to NAF with a high factor of safety (ANC/MPA ratio of 12).

Water reporting to the open pit is derived from both run-off and seepage from the pit walls and from the spoil backfill and reports to the Endwall Dam. Water quality results for the mine water seepage indicated that the pH values are equal to or higher than background water quality in the area. These data indicate that although there may be localised acidification of rejects and ASS within the OEA backfill, or ASS exposed on the pit walls, the bulk system is buffered at neutral to basic pH.

Salinity data for fresh overburden and coal reject materials acquired in 2006, suggested that only the ASS and oxidised Wynn rejects may have EC values sufficiently high to inhibit the growth of sensitive to moderately sensitive plants (ANZECC, 2000). In addition, rejects from other coal seams were classified as NAF, but could generate elevated EC values as they oxidise to also inhibit the growth of sensitive to moderately sensitive plants. Again pit water quality monitoring data suggests no evidence of a large additional salt load from the spoils/rejects contributing to salinity in the mine water.

Total metals analysis from six overburden samples at Bengalla indicate that some coal rejects and ASS overburden may be enriched with some metals of environmental concern including arsenic in the ASS and arsenic, antimony, cadmium, silver, selenium and tin in coal rejects. Metal enrichment is relatively common in coal reject materials however, most metals are sparingly soluble and immobile at neutral to slightly alkaline pH (BMC, 2009).

4.5 Ongoing Monitoring of Overburden and Coal Reject

As required by the ARDMP(BMC, 2009), an ongoing annual sampling and geochemical testing program of representative samples of overburden materials is completed for two borings located near the north-western and south-western corners of the ML, when available from exploration drilling. Review of geochemical results for 70 overburden samples over the period 2006 to 2010 (Tabrett, 2010) indicates that overburden materials display geochemical characteristics similar to those described in the ARDMP.

For coal reject, BMC has committed in the ARDMP to sampling and geochemically testing a reject sample from Wynn seam and at least one other coal seam from every third strip. This commitment has been addressed for representative coal reject samples by the work completed in the RGS report described herein (see **Section 4.0**).

The most recent geochemical assessment work on overburden materials was completed in 2010 as part of a proposed Modification to the existing Development Consent (DA211/93) for Bengalla (RGS, 2010). The assessment addressed the geochemical and potential leaching characteristics of overburden materials likely to report to the Southern Overburden Emplacement Area (OEA) Extension as proposed in the Modification and also the approved Western OEA.

Nineteen (19) overburden samples were selected from two drill holes to provide lateral and vertical coverage of the overburden materials to be mined and likely to be emplaced as part of the Modification. A series of static geochemical tests were completed on individual and composite overburden samples at ALS Brisbane as coordinated by RGS. The composite overburden samples were then subjected to KLC tests over a period of 12 weeks at the RGS in-house laboratory in Brisbane. All leachate collected from the KLC tests was analysed at ALS Brisbane.

The assessment concluded that:

- All overburden materials (except Archerfield Sandstone (ASS)) are classified as NAF and are likely to have a high factor of safety with respect to potential acid generation;
- The concentration of total metals in overburden materials is low and should not present any environmental issues associated with revegetation and rehabilitation;
- Overburden will generate pH neutral to slightly alkaline run-off/seepage with low salinity values following surface exposure, and salinity should decrease with time;
- The concentration of trace metals and sulfate in run-off and seepage from overburden is low and the risk of potentially significant water quality impacts from overburden materials is low; and
- Some overburden material may be sodic, have structural stability problems related to potential dispersion and erosion.

The report recommended that the adopted management strategies for overburden (and co-disposed coal reject) materials at Bengalla continue including successful site rehabilitation practices for potentially sodic overburden continue which ensure that a topsoil cover is utilised as part of final rehabilitation.

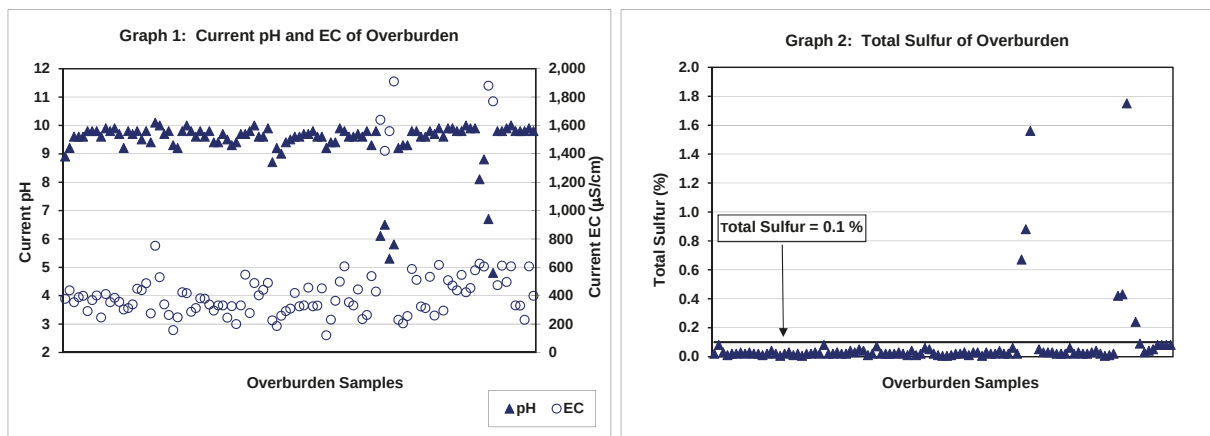
5.0 GEOCHEMICAL TEST RESULTS

5.1 Acid Base Account Results

5.1.1 Overburden

ABA test results for the 105 samples representing overburden materials from Bengalla are summarised below and presented in **Table 5-1** and **Graphs 1, 2, 3, 4** and **5**.

- **pH:** The current pH_{1:5} of the overburden samples ranges from 4.8 to 10.1 and is typically alkaline (median pH 9.7) (**Graph 1**). The lower pH values are for ASS material.
- **EC:** The current EC_{1:5} of the overburden samples range from 120 to 1,910 $\mu\text{S}/\text{cm}$ and is typically low (median 460 $\mu\text{S}/\text{cm}$) (**Graph 1**). The higher EC values are for ASS material.
- **Total sulfur:** The total sulfur content of the overburden samples is typically very low and ranges from <0.01 to 2.7 % (median 0.02 %). Most (92.4 %) of the overburden samples have total sulfur values less than 0.1 % (**Graph 2**). The higher sulfur values are for ASS material.



- **Sulfide Sulfur:** The sulfide sulfur content of nine selected overburden samples with elevated total sulfur content was tested using the chromium reducible sulfur (CRS) test and most of the sulfur is present in the sulfide form.
- **Maximum potential acidity (MPA):** Based on the total sulfur content (and sulfide sulfur content where tested), the MPA that could be generated by the overburden samples ranges from 0.15 to 82.6 kg $\text{H}_2\text{SO}_4/\text{t}$ and is typically very low (median 0.6 kg $\text{H}_2\text{SO}_4/\text{t}$) (**Graph 3**).
- **ANC:** The ANC value for the samples ranges from 0.25 to 403 kg $\text{H}_2\text{SO}_4/\text{t}$ and is typically moderate (median 31.8 kg $\text{H}_2\text{SO}_4/\text{t}$) (**Graph 3**).
- **NAPP:** The calculated NAPP value for the samples ranges from -402.4 to +74.6 kg $\text{H}_2\text{SO}_4/\text{t}$ and is typically negative (median -31.1 kg $\text{H}_2\text{SO}_4/\text{t}$) (**Graph 4**).

Table 5-1: Acid-base Results for Overburden/Interburden Materials

ALS Laboratory Sample ID		Date	Drill Hole ID	Client Sample ID	Sample Interval (m)			Sample Type	Overburden/ Interburden Unit	pH ¹	EC ¹	Total Sulfur	CRS	MPA ²	ANC ²	NAPP ²	ANC/MPA ratio	Sample Classification ³
					From	To	Depth				(µS/cm)	(%)	%	(kg H ₂ SO ₄ /t)				
Overburden and Interburden																		
EB1108039	001	18/03/2011	1350D	4801	27.59	27.94	0.35	Overburden	WW1 OB	8.9	377	0.02		0.6	8.9	-8.3	15	NAF (Barren)
EB1108039	002	18/03/2011	1350D	4802	49.69	50.03	0.34	Interburden	WW3 IB	9.2	437	0.08		2.4	13.4	-11.0	5	NAF (Barren)
EB1108039	003	18/03/2011	1350D	4803	75.24	75.52	0.28	Interburden	WW4IB	9.6	354	0.03		0.9	49.2	-48.3	54	NAF (Barren)
EB1108039	004	18/03/2011	1350D	4804	84.70	85.11	0.41	Interburden	MA2 IB	9.6	389	0.01		0.3	74.2	-73.9	242	NAF (Barren)
EB1108039	005	18/03/2011	1350D	4805	93.44	93.75	0.31	Interburden	PF IB	9.6	399	0.02		0.6	63	-62.4	103	NAF (Barren)
EB1108039	006	18/03/2011	1350D	4806	104.17	104.53	0.36	Interburden	PF2 IB	9.8	291	0.02		0.6	26.2	-25.6	43	NAF (Barren)
EB1108039	007	18/03/2011	1350D	4807	131.07	131.30	0.23	Interburden	VA1 IB	9.8	369	0.03		0.9	17.3	-16.4	19	NAF (Barren)
EB1108039	008	18/03/2011	1350D	4808	173.90	174.25	0.35	Interburden	VA1 IB	9.8	401	0.02		0.6	44.9	-44.3	73	NAF (Barren)
EB1108039	009	18/03/2011	1350D	4809	193.94	194.24	0.30	Interburden	BR2C IB	9.6	246	0.03		0.9	24.3	-23.4	26	NAF (Barren)
EB1108039	010	18/03/2011	1350D	4810	204.65	204.95	0.30	Interburden	BY2C IB	9.9	411	0.02		0.6	63	-62.4	103	NAF (Barren)
EB1108039	011	18/03/2011	1350D	4811	211.13	211.67	0.54	Interburden	WN IB	9.8	353	0.02		0.6	15.3	-14.7	25	NAF (Barren)
EB1108039	012	18/03/2011	1350D	4812	223.55	223.83	0.28	Interburden	ED IB	9.9	385	0.01		0.3	309	-308.7	1010	NAF (Barren)
EB1108039	013	18/03/2011	1351D	4822	17.06	17.33	0.27	Overburden	WW2C OB	9.7	356	0.02		0.6	63	-62.4	103	NAF (Barren)
EB1108039	014	18/03/2011	1351D	4823	26.86	27.12	0.26	Interburden	WW3A IB	9.2	302	0.04		1.2	31.8	-30.6	26	NAF (Barren)
EB1108039	015	18/03/2011	1351D	4824	51.67	52.13	0.46	Interburden	WW4C IB	9.8	312	0.02		0.6	403	-402.4	658	NAF (Barren)
EB1108039	016	18/03/2011	1351D	4825	65.86	66.31	0.45	Interburden	MA2 IB	9.7	339	0.005		0.2	0.3	-0.1	2	NAF (Barren)
EB1108039	017	18/03/2011	1351D	4826	74.39	74.64	0.25	Interburden	PF1 IB	9.8	448	0.02		0.6	148	-147.4	242	NAF (Barren)
EB1108039	018	18/03/2011	1351D	4827	90.61	91.06	0.45	Interburden	PF2 IB	9.5	439	0.03		0.9	53	-52.1	58	NAF (Barren)
EB1108039	019	18/03/2011	1351D	4828	105.85	106.28	0.43	Interburden	VA1 IB	9.8	488	0.01		0.3	163	-162.7	533	NAF (Barren)
EB1108039	020	18/03/2011	1351D	4829	112.33	112.69	0.36	Interburden	VA1 IB	9.4	274	0.02		0.6	34.9	-34.3	57	NAF (Barren)
EB1108039	021	18/03/2011	1351D	4830	159.60	159.99	0.39	Interburden	BR1 IB	10.1	752	0.005		0.2	309	-308.8	2020	NAF (Barren)
EB1108039	022	18/03/2011	1351D	4831	174.82	175.22	0.40	Interburden	BY2 IB	10	530	0.02		0.6	128	-127.4	209	NAF (Barren)
EB1108039	023	18/03/2011	1351D	4832	178.70	178.96	0.26	Interburden	WN IB	9.7	338	0.02		0.6	63	-62.4	103	NAF (Barren)
EB1108039	024	18/03/2011	1351D	4833	189.89	190.36	0.47	Interburden	ED IB	9.8	263	0.03		0.9	58	-57.1	63	NAF (Barren)
EB1108039	025	18/03/2011	1352D	4813	46.25	46.72	0.47	Overburden	WW4 OB	9.3	157	0.02		0.6	38	-37.4	62	NAF (Barren)
EB1108039	026	18/03/2011	1352D	4814	52.63	53.00	0.37	Interburden	MA2 IB	9.2	247	0.08		2.4	106	-103.6	43	NAF (Barren)
EB1108039	027	18/03/2011	1352D	4815	59.25	59.53	0.28	Interburden	PF1B IB	9.8	423	0.02		0.6	128	-127.4	209	NAF (Barren)
EB1108039	028	18/03/2011	1352D	4816	83.41	83.72	0.31	Interburden	PF2 IB	10	417	0.02		0.6	234	-233.4	382	NAF (Barren)
EB1108039	029	18/03/2011	1352D	4817	119.54	119.89	0.35	Interburden	VA1 IB	9.8	286	0.03		0.9	26.2	-25.3	29	NAF (Barren)
EB1108039	030	18/03/2011	1352D	4818	135.14	135.42	0.28	Interburden	VA1 IB	9.6	312	0.02		0.6	38	-37.4	62	NAF (Barren)
EB1108039	031	18/03/2011	1352D	4819	162.27	162.65	0.38	Interburden	BY2 IB	9.8	381	0.02		0.6	50.5	-49.9	83	NAF (Barren)
EB1108039	032	18/03/2011	1352D	4820	169.74	169.99	0.25	Interburden	WN IB	9.6	378	0.04		1.2	32.4	-31.2	26	NAF (Barren)
EB1108039	033	18/03/2011	1352D	4821	178.63	178.97	0.34	Interburden	ED IB	9.8	337	0.03		0.9	50.5	-49.6	55	NAF (Barren)
EB1108039	034	18/03/2011	1353D	4858	24.50	24.80	0.30	Overburden	WW2 OB	9.4	295	0.05		1.5	62.3	-60.8	41	NAF (Barren)
EB1108039	035	18/03/2011	1353D	4859	32.08	32.36	0.28	Interburden	WW3 IB	9.4	331	0.04		1.2	102	-100.8	83	NAF (Barren)
EB1108039	036	18/03/2011	1353D	4860	59.90	60.25	0.35	Interburden	WW4 IB	9.7	331	0.01		0.3	92.3	-92.0	302	NAF (Barren)
EB1108039	037	18/03/2011	1353D	4870	70.75	71.06	0.31	Interburden	MA2 IB	9.5	245	0.02		0.6	99.4	-98.8	162	NAF (Barren)
EB1108039	038	18/03/2011	1353D	4861	81.92	82.25	0.33	Interburden	PF1 IB	9.3	326	0.07		2.1	33.7	-31.6	16	NAF (Barren)

Table 5-1: Acid-base Results for Overburden/Interburden Materials

ALS Laboratory Sample ID		Date	Drill Hole ID	Client Sample ID	Sample Interval (m)			Sample Type	Overburden/ Interburden Unit	pH ¹	EC ¹	Total Sulfur	CRS	MPA ²	ANC ²	NAPP ²	ANC/MPA ratio	Sample Classification ³
					From	To	Depth				(µS/cm)	(%)	%	(kg H ₂ SO ₄ /t)				
EB1108039	039	18/03/2011	1353D	4862	91.94	92.19	0.25	Interburden	PF2 IB	9.4	199	0.02		0.6	38	-37.4	62	NAF (Barren)
EB1108039	040	18/03/2011	1353D	4863	110.24	110.58	0.34	Interburden	VA1 IB	9.7	331	0.02		0.6	61.1	-60.5	100	NAF (Barren)
EB1108039	041	18/03/2011	1353D	4864	127.92	128.16	0.24	Interburden	VA1 IB	9.7	547	0.02		0.6	161	-160.4	263	NAF (Barren)
EB1108039	042	18/03/2011	1353D	4865	154.73	155.01	0.28	Interburden	BR1 IB	9.8	277	0.02		0.6	25.6	-25.0	42	NAF (Barren)
EB1108039	043	18/03/2011	1353D	4866	166.14	166.45	0.31	Interburden	BY1 IB	10	489	0.03		0.9	29.8	-28.9	32	NAF (Barren)
EB1108039	044	18/03/2011	1353D	4867	180.15	180.45	0.30	Interburden	BY2 IB	9.6	402	0.02		0.6	3.5	-2.9	6	NAF (Barren)
EB1108039	045	18/03/2011	1353D	4868	184.70	185.00	0.30	Interburden	WN1 IB	9.6	441	0.01		0.3	53.6	-53.3	175	NAF (Barren)
EB1108039	046	18/03/2011	1353D	4869	195.57	195.52	-0.05	Interburden	ED1 IB	9.9	490	0.04		1.2	18.3	-17.1	15	NAF (Barren)
EB1108039	047	18/03/2011	1355D	4834	17.38	17.70	0.32	Overburden	WW1 OB	8.7	226	0.01		0.3	28.7	-28.4	94	NAF (Barren)
EB1108039	048	18/03/2011	1355D	4835	26.84	27.21	0.37	Interburden	WW2 IB	9.2	185	0.02		0.6	25.6	-25.0	42	NAF (Barren)
EB1108039	049	18/03/2011	1355D	4836	33.75	34.05	0.30	Interburden	WW2A IB	9	258	0.06		1.8	28.7	-26.9	16	NAF (Barren)
EB1108039	050	18/03/2011	1355D	4837	50.65	50.90	0.25	Interburden	WW3 IB	9.4	291	0.05		1.5	26.2	-24.7	17	NAF (Barren)
EB1108039	051	18/03/2011	1355D	4838	84.53	84.83	0.30	Interburden	WW4 IB	9.5	308	0.02		0.6	108	-107.4	176	NAF (Barren)
EB1108039	052	18/03/2011	1355D	4839	89.90	90.18	0.28	Interburden	MA2 IB	9.6	418	0.01		0.3	32.4	-32.1	106	NAF (Barren)
EB1108039	053	18/03/2011	1355D	4840	114.46	114.84	0.38	Interburden	PF2 IB	9.6	324	0.005		0.2	48.6	-48.4	318	NAF (Barren)
EB1108039	054	18/03/2011	1355D	4841	121.00	121.35	0.35	Interburden	VA1 IB	9.7	331	0.005		0.2	63	-62.8	412	NAF (Barren)
EB1108039	055	18/03/2011	1355D	4842	149.75	150.00	0.25	Interburden	VA1 IB	9.7	456	0.01		0.3	26.2	-25.9	86	NAF (Barren)
EB1108039	056	18/03/2011	1355D	4843	154.75	155.00	0.25	Interburden	BR1 IB	9.8	325	0.02		0.6	5.5	-4.9	9	NAF (Barren)
EB1108039	057	18/03/2011	1355D	4844	203.57	203.88	0.31	Interburden	WN IB	9.6	330	0.02		0.6	36.2	-35.6	59	NAF (Barren)
EB1108039	058	18/03/2011	1355D	4845	211.92	212.27	0.35	Interburden	ED1 IB	9.6	451	0.03		0.9	29.9	-29.0	33	NAF (Barren)
EB1108039	059	18/03/2011	1373D	4846	30.93	31.18	0.25	Overburden	WW1 OB	9.2	120	0.01		0.3	38	-37.7	124	NAF (Barren)
EB1108039	060	18/03/2011	1373D	4847	40.82	41.11	0.29	Interburden	WW2 IB	9.4	231	0.03		0.9	36.2	-35.3	39	NAF (Barren)
EB1108039	061	18/03/2011	1373D	4848	50.52	50.83	0.31	Interburden	WW3 IB	9.4	363	0.03		0.9	38	-37.1	41	NAF (Barren)
EB1108039	062	18/03/2011	1373D	4849	74.91	75.03	0.12	Interburden	MA1 IB	9.9	499	0.005		0.2	310	-309.8	2026	NAF (Barren)
EB1108039	063	18/03/2011	1373D	4850	79.80	80.08	0.28	Interburden	MA2 IB	9.8	606	0.03		0.9	104	-103.1	113	NAF (Barren)
EB1108039	064	18/03/2011	1373D	4851	89.72	90.07	0.35	Interburden	PF1 IB	9.6	354	0.02		0.6	49.2	-48.6	80	NAF (Barren)
EB1108039	065	18/03/2011	1373D	4852	109.09	109.33	0.24	Interburden	PF2 IB	9.6	331	0.02		0.6	25.6	-25.0	42	NAF (Barren)
EB1108039	066	18/03/2011	1373D	4853	120.94	121.25	0.31	Interburden	VA1E IB	9.7	444	0.04		1.2	24.2	-23.0	20	NAF (Barren)
EB1108039	067	18/03/2011	1373D	4854	131.74	132.05	0.31	Interburden	VA1C1 IB	9.6	235	0.02		0.6	15.4	-14.8	25	NAF (Barren)
EB1108039	068	18/03/2011	1373D	4855	152.73	153.10	0.37	Interburden	BR1 IB	9.8	263	0.02		0.6	18.3	-17.7	30	NAF (Barren)
EB1108039	069	18/03/2011	1373D	4856	189.94	190.14	0.20	Interburden	BY1 IB	9.3	537	0.06		1.8	18.6	-16.8	10	NAF (Barren)
EB1108039	070	18/03/2011	1373D	4857	210.05	210.31	0.26	Interburden	ED1 IB	9.8	429	0.02		0.6	22.4	-21.8	37	NAF (Barren)
EB1115657	001	25/07/2011	1376D	7071	177.15	177.65	0.50	Interburden	WNIB	6.1	1640	0.67	0.571	17.5	10	7.5	0.6	Potentially acid forming
EB1115657	002	25/07/2011	1376D	7072	177.65	178.65	1.00	Interburden	WNIB	6.5	1420	0.88	0.791	24.2	19.8	4.4	0.8	Low capacity PAF
EB1115657	003	25/07/2011	1376D	7073	178.65	179.56	0.91	Interburden	WNIB	5.3	1560	1.56	1.56	47.7	9	38.7	0.2	Potentially acid forming
EB1115657	004	25/07/2011	1376D	7074	179.56	180.08	0.52	Interburden	WNIB	5.8	1910	2.1	2.1	64.3	8.7	55.6	0.1	Potentially acid forming
EB1115657	005	25/07/2011	1376D	7075	183.4	183.93	0.53	Interburden	EDIB	9.2	230	0.05		1.5	8.6	-7.1	6	NAF (Barren)
EB1115657	006	25/07/2011	1376D	7076	183.93	184.31	0.38	Interburden	EDIB	9.3	205	0.03		0.9	10.4	-9.5	11	NAF (Barren)
EB1115657	007	25/07/2011	1376D	7077	184.31	185.3	0.99	Interburden	EDIB	9.3	256	0.03		0.9	10.7	-9.8	12	NAF (Barren)

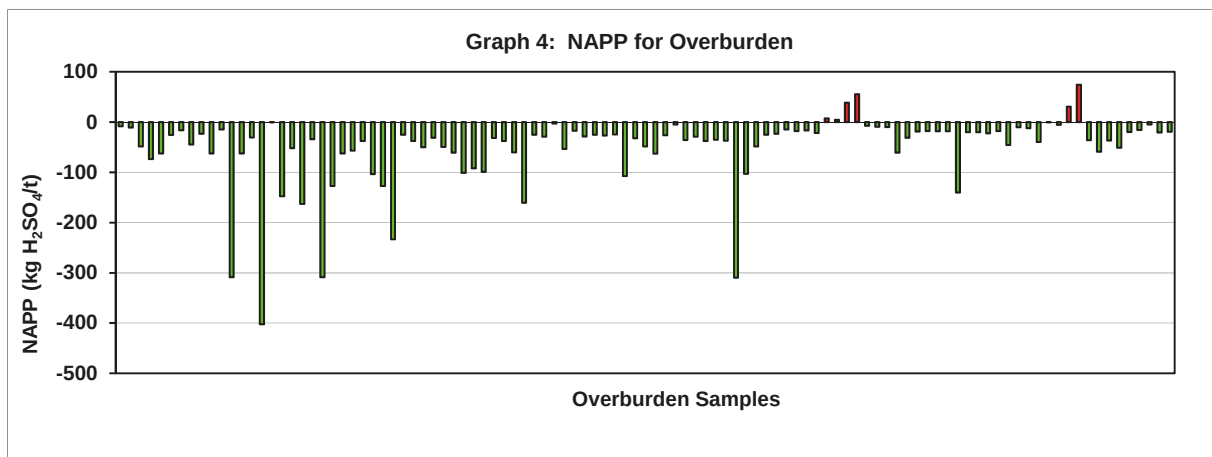
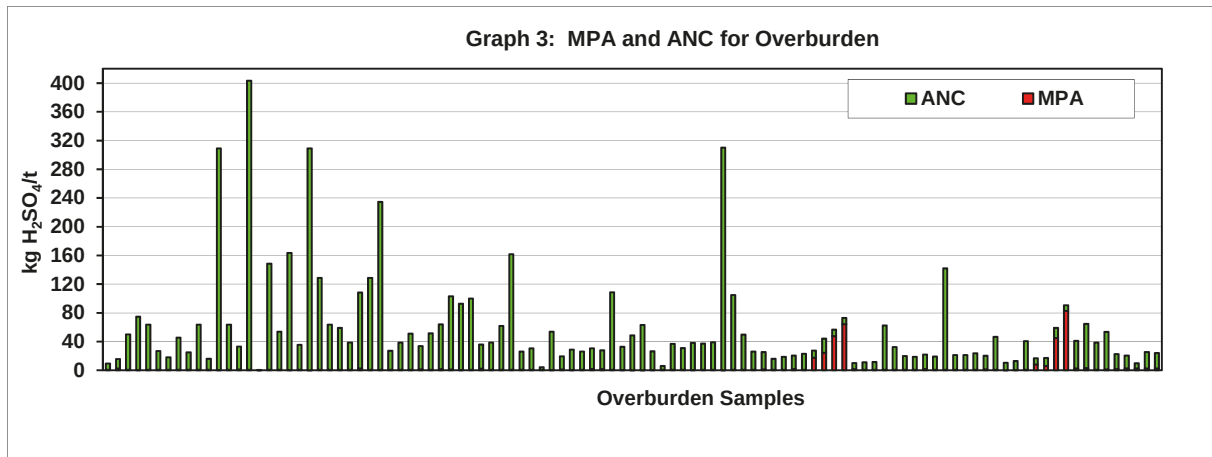
Table 5-1: Acid-base Results for Overburden/Interburden Materials

ALS Laboratory Sample ID		Date	Drill Hole ID	Client Sample ID	Sample Interval (m)			Sample Type	Overburden/ Interburden Unit	pH ¹	EC ¹	Total Sulfur	CRS	MPA ²	ANC ²	NAPP ²	ANC/MPA ratio	Sample Classification ³
					From	To	Depth				(µS/cm)	(%)	%	(kg H ₂ SO ₄ /t)				
EB1115657	008	25/07/2011	1376D	7078	185.3	186.2	0.90	Interburden	EDIB	9.8	588	0.03		0.9	61.7	-60.8	67	NAF (Barren)
EB1115657	009	25/07/2011	1376D	7079	186.2	187.05	0.85	Interburden	EDIB	9.8	511	0.02		0.6	31.7	-31.1	52	NAF (Barren)
EB1115657	010	25/07/2011	1376D	7080	187.05	187.93	0.88	Interburden	EDIB	9.6	323	0.02		0.6	19.3	-18.7	32	NAF (Barren)
EB1115657	011	25/07/2011	1376D	7081	187.93	188.92	0.99	Interburden	EDIB	9.6	312	0.02		0.6	18.1	-17.5	30	NAF (Barren)
EB1115657	012	25/07/2011	1376D	7082	188.92	189.83	0.91	Interburden	EDIB	9.8	532	0.06		1.8	20	-18.2	11	NAF (Barren)
EB1115657	013	25/07/2011	1376D	7083	189.83	190.78	0.95	Interburden	EDIB	9.7	260	0.02		0.6	18.6	-18.0	30	NAF (Barren)
EB1115657	014	25/07/2011	1376D	7084	190.78	191.70	0.92	Interburden	EDIB	9.9	616	0.03		0.9	141	-140.1	154	NAF (Barren)
EB1115657	015	25/07/2011	1376D	7085	191.70	192.48	0.78	Interburden	EDIB	9.6	295	0.02		0.6	20.7	-20.1	34	NAF (Barren)
EB1115657	016	25/07/2011	1376D	7086	192.48	193.46	0.98	Interburden	EDIB	9.9	509	0.02		0.6	20.6	-20.0	34	NAF (Barren)
EB1115657	017	25/07/2011	1376D	7087	193.46	194.39	0.93	Interburden	EDIB	9.9	471	0.03		0.9	22.9	-22.0	25	NAF (Barren)
EB1115657	018	25/07/2011	1376D	7088	194.39	194.91	0.52	Interburden	EDIB	9.8	437	0.04		1.2	18.8	-17.6	15	NAF (Barren)
EB1115657	019	25/07/2011	1376D	7089	194.91	195.46	0.55	Interburden	EDIB	9.8	546	0.02		0.6	46.1	-45.5	75	NAF (Barren)
EB1115657	020	25/07/2011	1379D	7055	187.72	188.22	0.50	Interburden	WNIB	10	424	0.005		0.2	10.2	-10.0	67	NAF (Barren)
EB1115657	021	25/07/2011	1379D	7056	188.22	189.23	1.01	Interburden	WNIB	9.9	454	0.01		0.3	12.7	-12.4	42	NAF (Barren)
EB1115657	022	25/07/2011	1379D	7057	189.23	190.28	1.05	Interburden	WNIB	9.9	579	0.02		0.6	40.1	-39.5	66	NAF (Barren)
EB1115657	023	25/07/2011	1379D	7058	190.28	191.26	0.98	Interburden	WNIB	8.1	625	0.42	0.264	8.1	8.6	-0.5	1.1	Uncertain
EB1115657	024	25/07/2011	1379D	7059	191.26	192.22	0.96	Interburden	WNIB	8.8	605	0.43	0.193	5.9	11.1	-5.2	1.9	Uncertain
EB1115657	025	25/07/2011	1379D	7060	192.22	192.92	0.70	Interburden	WNIB	6.7	1880	1.75	1.47	45.0	14.0	31.0	0.3	Potentially acid forming
EB1115657	026	25/07/2011	1379D	7061	192.92	193.48	0.56	Interburden	WNIB	4.8	1770	2.7	2.7	82.6	8.0	74.6	0.1	Potentially acid forming
EB1115657	027	25/07/2011	1379D	7062	196.89	197.47	0.58	Interburden	EDIB	9.8	474	0.24	0.076	2.3	38.6	-36.3	17	NAF (Barren)
EB1115657	028	25/07/2011	1379D	7063	197.47	198.42	0.95	Interburden	EDIB	9.8	611	0.09		2.8	61.7	-58.9	22	NAF (Barren)
EB1115657	029	25/07/2011	1379D	7064	198.42	199.32	0.90	Interburden	EDIB	9.9	496	0.03		0.9	37.7	-36.8	41	NAF (Barren)
EB1115657	030	25/07/2011	1379D	7065	199.32	200.28	0.96	Interburden	EDIB	10	606	0.04		1.2	52.1	-50.9	43	NAF (Barren)
EB1115657	031	25/07/2011	1379D	7066	200.28	201.26	0.98	Interburden	EDIB	9.8	331	0.05		1.5	21	-19.5	14	NAF (Barren)
EB1115657	032	25/07/2011	1379D	7067	201.26	202.12	0.86	Interburden	EDIB	9.8	330	0.08		2.4	18.1	-15.7	7	NAF (Barren)
EB1115657	033	25/07/2011	1379D	7068	202.12	203.01	0.89	Interburden	EDIB	9.8	229	0.08		2.4	7.2	-4.8	3	NAF (Barren)
EB1115657	034	25/07/2011	1379D	7069	203.01	203.64	0.63	Interburden	EDIB	9.9	606	0.08		2.4	22.9	-20.5	9	NAF (Barren)
EB1115657	035	25/07/2011	1379D	7070	203.64	204.13	0.49	Interburden	EDIB	9.8	398	0.08		2.4	21.7	-19.3	9	NAF (Barren)

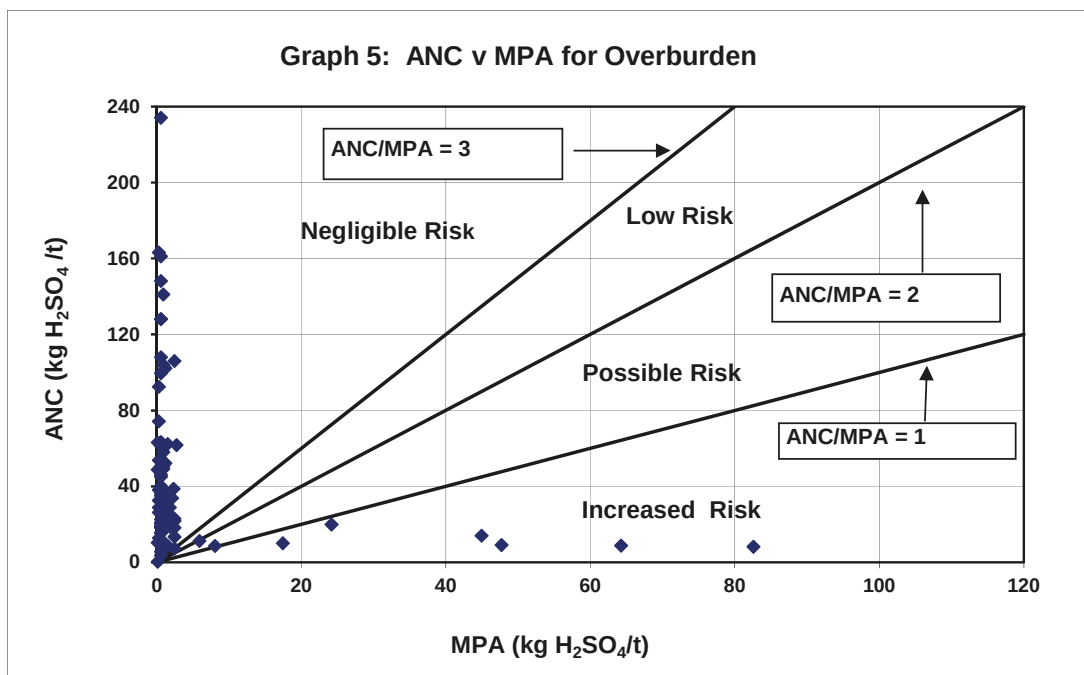
Notes

1. Current pH and EC provided for 1:5 sample:water extracts
2. MPA = Maximum potential acidity; ANC = Acid neutralising capacity; and NAPP = Net acid producing potential
3. Sample classification detail provided in report text.
4. WW = Warkworth; MA = Mount Arthur; PF = Piercefield, VA = Vaux; BR = Broonie; and BY = Bayswater; WN = Wynn and ED = Edderton

Graph 3 illustrates that the ANC value significantly exceeds the MPA value in most overburden samples tested and consequently, most of the overburden samples have negative NAPP values as illustrated at **Graph 4**.



Graph 5 (overleaf) shows a plot of ANC versus MPA for the overburden samples. The ANC/MPA ratio of the samples ranges from 0.1 to 2026 and is typically very high (median 41.5). ANC/MPA ratio lines have been plotted on the graph to illustrate the factor of safety associated with the samples. Generally those samples with an ANC/MPA ratio of greater than 2 are considered to have a low to negligible risk of acid generation and a high factor of safety in terms of potential for acid generation (DITR, 2007; INAP, 2009). The results indicate that 92.4 % of the overburden samples tested have negligible risk of acid generation and a very high factor of safety. A few samples have a lower factor of safety and hence an increased risk of acid generation. All of these increased risk samples were derived from ASS material located between the Wynn and Bayswater coal seams.



The ABA results presented in this section have been used to classify the acid forming nature of the 105 overburden samples as shown in **Table 5-1**. The geochemical criteria used by RGS to classify the acid forming nature of the overburden samples are provided in **Table 5-2**.

Table 5-2

Geochemical Classification Criteria for Overburden Materials

Geochemical Classification	Total or Sulfide Sulfur [#] (%)	NAPP (kg H ₂ SO ₄ /t)	ANC/MPA Ratio	Number of Samples (total = 105)	Percentage of Samples (%)
NAF - Barren ¹	≤ 0.1	-	-	97	92.4
Non Acid Forming (NAF)	≥ 0.1	≤ - 5	≥ 2	0	0.0
Uncertain	≥ 0.1	> - 5 and ≤ +5	<2	2	1.9
Potentially Acid Forming - Low Capacity	≥ 0.1	> +5 and ≤ +10	<2	1	1.0
Potentially Acid Forming	≥ 0.1	> +10	<2	5	4.8

Notes: [#] If total sulfur or sulfide 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 sulfur.

The results in **Table 5-2** indicate that 92.4% of the overburden samples tested fall in the NAF-Barren geochemical classification category. Overall, from an acid-base perspective, the overburden material tested (except the ASS) can be regarded as a NAF-barren unit. Most overburden materials also have significant excess buffering capacity that should be available to more than adequately buffer the negligible amount of acid that could theoretically be produced. Some of the ASS samples are PAF and have a lower factor of safety.

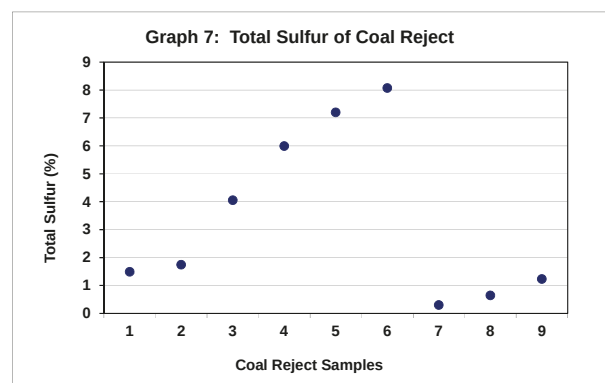
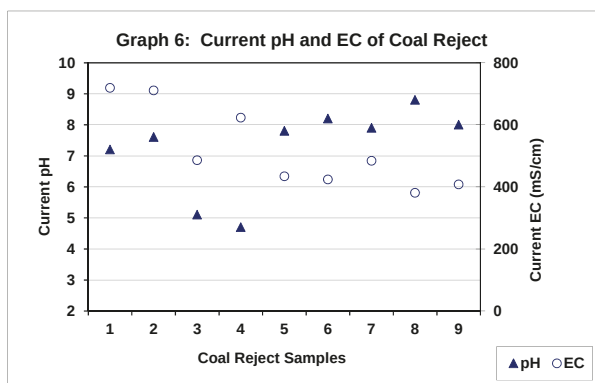
¹ A sample classified as NAF can be further described as 'barren' if the total sulfur or sulfide sulfur content is less than or equal to 0.1 per cent, as the sample essentially has negligible acid generating capacity.

The results of the ABA tests on representative samples of overburden materials and any potential implications for OEA management at the Project are discussed further in **Section 6.0**.

5.1.2 Coal Reject

Acid Base Account (ABA) test results for nine samples of coal reject material from Bengalla are summarised below and presented in **Table 5-3** and **Graphs 6, 7, 8, 9** and **10**.

- **pH:** The current pH_{1.5} of the coal reject samples range from 4.7 to 8.8 and is typically pH neutral (median pH 7.8) (**Graph 6**).
- **EC:** The current EC_{1.5} of the coal reject samples range from 381 to 719 $\mu\text{S}/\text{cm}$ and is typically low (median 484 $\mu\text{S}/\text{cm}$) (**Graph 6**).
- **Total sulfur:** The total sulfur content of the coal reject samples ranges from low to high (0.3 to 8.1 %) and is typically elevated (median 1.7 %) (**Graph 7**).
- **Sulfide Sulfur:** The sulfide sulfur content of the nine reject samples was tested using the CRS test and most of the sulfur is present in the sulfide form.



- **MPA:** Based on the sulfide sulfur content, the MPA that could be generated by the coal reject samples ranges from low to high (1.4 to 249 $\text{kg H}_2\text{SO}_4/\text{t}$) and is typically elevated (median 19.6 $\text{kg H}_2\text{SO}_4/\text{t}$) (**Graph 8**).
- **ANC:** The ANC value for the samples ranges from 3.7 to 43.4 $\text{kg H}_2\text{SO}_4/\text{t}$ and is typically low (median 5.9 $\text{kg H}_2\text{SO}_4/\text{t}$) (**Graph 8**).
- **NAPP:** The calculated NAPP value for the samples ranges from -37.7 to +228.3 $\text{kg H}_2\text{SO}_4/\text{t}$ and is typically positive (median +14.7 $\text{kg H}_2\text{SO}_4/\text{t}$) (**Graph 9**).

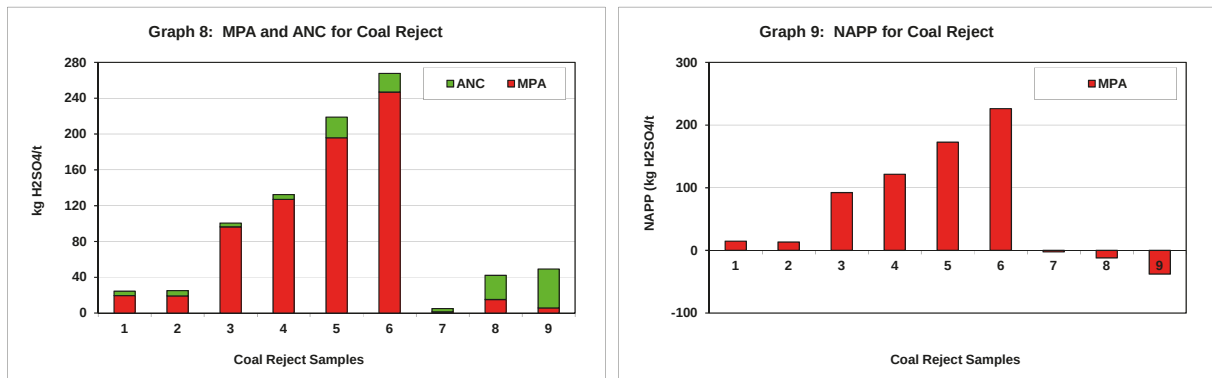
Table 5-3: Acid-base Results for Coal Reject Materials

ALS Laboratory Sample ID	Date	Client Sample ID	Sample Type	pH ¹	EC ¹	Total Sulfur	CRS	MPA ²	ANC ²	NAPP ²	ANC/MPA ratio	Sample Classification ³
					(μS/cm)	(%)	(kg H ₂ SO ₄ /t)					
Coal Reject												
EB1115900002	28/07/2011	Bolt Press Filter Cake TH70	Wynn coal reject	7.2	719	1.49	0.64	19.6	4.9	14.7	0.25	Potentially acid forming
EB1115900004	28/07/2011	Bolt Press filter Cake TH70	Wynn coal reject	7.6	711	1.74	0.63	19.2	5.9	13.3	0.31	Potentially acid forming
EB1115900005	28/07/2011	SC403	Wynn coal reject	5.1	486	4.05	3.15	96.4	4.2	92.2	0.04	Potentially acid forming
EB1115900001	28/07/2011	SC503	Wynn coal reject	4.7	623	5.99	4.15	127.0	5.4	121.6	0.04	Potentially acid forming
EB1115900003	28/07/2011	SC702	Wynn coal reject	7.8	434	7.20	6.40	195.8	23.1	172.7	0.12	Potentially acid forming
EB1115900006	28/07/2011	SC701	Wynn coal reject	8.2	424	8.07	8.07	246.9	20.8	226.1	0.08	Potentially acid forming
EB1122094001	14/10/2011	VA PF2	Reject from press filter	7.9	484	0.30	0.04	1.3	3.7	-2.4	2.7	NAF (Barren)
EB1122094002	14/10/2011	VA 1/2	Reject from press filter	8.8	381	0.64	0.50	15.1	27.0	-11.9	1.8	Non Acid Forming (NAF)
EB1108821001	23/04/2011	BMC_REJECT_BAY2_01	Coal washery reject	8.0	408	1.23	0.19	5.7	43.4	-37.7	7.6	Non Acid Forming (NAF)

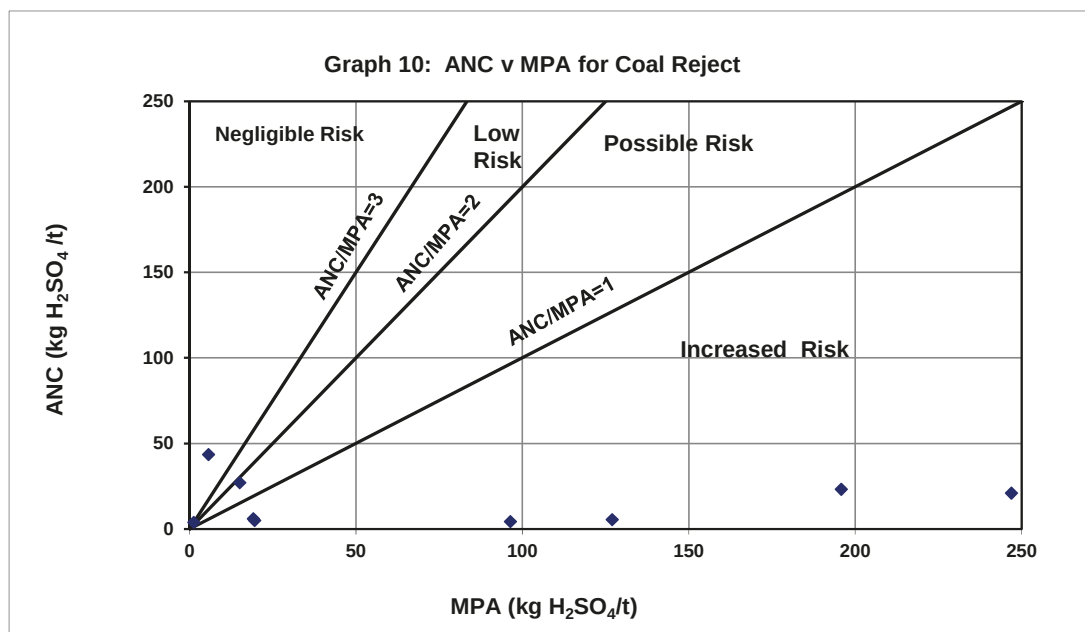
Notes

1. Current pH and EC provided for 1:5 sample:water extracts
2. CRS = Chromium Reducible Sulfur; MPA = Maximum potential acidity; ANC = Acid neutralising capacity; and NAPP = Net acid producing potential
3. Sample classification detail provided in report text.
4. WW = Warkworth; MA = Mount Arthur; PF = Piercefield, VA = Vaux; BR = Broonie; BY = Bayswater; WN = Wynn and ED = Edderton

Graph 8 illustrates that the ANC value significantly exceeds the MPA value in 6 out of 9 coal reject samples tested (all from the Wynn seam) and consequently, these samples have positive NAPP values, as illustrated at **Graph 9**. Conversely, the coal reject samples from the Vaux and Bayswater seams have much smaller MPA values and consequently negative NAPP values.



Graph 10 shows a plot of ANC versus MPA for the nine coal reject samples. The ANC/MPA ratio of the samples ranges from 0.04 to 7.6 and is typically low (median 0.25). ANC/MPA ratio lines have been plotted on the graph to illustrate the factor of safety associated with the samples. Generally those samples with an ANC/MPA ratio of greater than 2 are considered to have a negligible risk of acid generation and a high factor of safety in terms of potential for acid generation (DITR, 2007; INAP, 2009). The results indicate that coal reject samples from the Wynn seam have an increased risk of acid generation and a lower factor of safety whilst those from the Vaux and Bayswater seams have a higher factor of safety and a lower risk of acid generation.



The ABA results presented in this section have been used to classify the acid forming nature of the coal reject samples as shown in **Table 5-3**. The geochemical criteria used by RGS to classify the acid forming nature of the coal reject samples are provided in **Table 5-4**.

Table 5-4
Geochemical Classification Criteria for Coal Reject Materials

Geochemical Classification	Total or Sulfide Sulfur [#] (%)	NAPP (kg H ₂ SO ₄ /t)	ANC/MPA Ratio	Number of Samples (total = 9)	Percentage of Samples (%)
NAF - Barren	≤ 0.1	-	-	1	11.1
Non Acid Forming (NAF)	≥ 0.1	≤ - 5	≥ 2	2	22.2
Uncertain	≥ 0.1	> - 5 and ≤ +5	<2	0	0
Potentially Acid Forming - Low Capacity	≥ 0.1	> +5 and ≤ +10	<2	0	0
Potentially Acid Forming	≥ 0.1	> +10	<2	6	66.7

Notes: [#] If total sulfur or sulfide 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 sulfur.

The results in **Table 5-4** indicate that all of the coal reject samples tested from the Wynn seam are classified as PAF, whilst those coal reject samples from the Vaux and Bayswater seams fall in the NAF geochemical classification category.

The results of the ABA tests on coal reject samples and any potential implications for coal reject dump management at the Project are discussed further in **Section 6.0**.

5.2 Multi-Element Concentration in Solids

Multi-element scans are completed to identify any elements (particularly metals) present in mine waste material at concentrations that may be of environmental concern with respect to revegetation (and surface water/seepage quality). The results are then compared to potentially relevant guideline criteria to determine any concerns related to mine operation and final rehabilitation. For total metal concentrations in overburden or potential coal reject materials in NSW, there are no specific guidelines and/or regulatory criteria. In the absence of these and to provide relevant context, RGS has compared the total metal concentration in overburden and potential coal reject materials (solids) to health-based investigation levels (HIL(E)) that apply to soils in parks, recreational open spaces and playing fields (NEPC, 1999a). The applicability of this guideline stems from the potential final land use of the mine following closure (eg. forestry, ecological values and agricultural activities).

Fourteen overburden samples and six coal reject samples were subjected to multi-element test work. The makeup of the individual and composite samples in the test program is provided at **Table 5-5**.

The results from multi-element testing (total metals) of the composite overburden samples are presented in **Table 5-6**. The acquired data indicates that the overburden materials have total metal concentrations in solids well within the applied NEPC guideline criteria for soils.

Table 5-5: Overburden and Coal Reject Samples Selected for Multi-Element Analysis

Composite name	ALS Laboratory Sample ID		Date	Drill Hole ID	Client Sample ID	Sample Interval (m)			Overburden/ Interburden
	From	To				Interval	Unit		
Overburden									
ME_BR_comp	EB1108039	021	18/03/2011	1351D	4830	159.60	159.99	0.39	BR1 IB
	EB1108039	042	18/03/2011	1353D	4865	154.73	155.01	0.28	BR1 IB
	EB1108039	056	18/03/2011	1355D	4843	154.75	155.00	0.25	BR1 IB
	EB1108039	068	18/03/2011	1373D	4855	152.73	153.10	0.37	BR1 IB
	EB1108039	009	18/03/2011	1350D	4809	193.94	194.24	0.30	BR2C IB
ME_BY_comp	EB1108039	043	18/03/2011	1353D	4866	166.14	166.45	0.31	BY1 IB
	EB1108039	069	18/03/2011	1373D	4856	189.94	190.14	0.20	BY1 IB
	EB1108039	022	18/03/2011	1351D	4831	174.82	175.22	0.40	BY2 IB
	EB1108039	031	18/03/2011	1352D	4819	162.27	162.65	0.38	BY2 IB
	EB1108039	044	18/03/2011	1353D	4867	180.15	180.45	0.30	BY2 IB
ME_ED_comp	EB1108039	010	18/03/2011	1350D	4810	204.65	204.95	0.30	BY2C IB
	EB1108039	012	18/03/2011	1350D	4812	223.55	223.83	0.28	ED IB
	EB1108039	024	18/03/2011	1351D	4833	189.89	190.36	0.47	ED IB
	EB1108039	033	18/03/2011	1352D	4821	178.63	178.97	0.34	ED IB
	EB1108039	046	18/03/2011	1353D	4869	195.57	195.52	-0.05	ED1 IB
ME_MA_comp	EB1108039	058	18/03/2011	1355D	4845	211.92	212.27	0.35	ED1 IB
	EB1108039	070	18/03/2011	1373D	4857	210.05	210.31	0.26	ED1 IB
	EB1108039	062	18/03/2011	1373D	4849	74.91	75.13	0.22	MA1 IB
	EB1108039	004	18/03/2011	1350D	4804	84.70	85.11	0.41	MA2 IB
	EB1108039	016	18/03/2011	1351D	4825	65.86	66.31	0.45	MA2 IB
ME_PF_comp	EB1108039	026	18/03/2011	1352D	4814	52.63	53.00	0.37	MA2 IB
	EB1108039	037	18/03/2011	1353D	4870	70.75	71.06	0.31	MA2 IB
	EB1108039	052	18/03/2011	1355D	4839	89.90	90.18	0.28	MA2 IB
	EB1108039	063	18/03/2011	1373D	4850	79.80	75.13	-4.67	MA2 IB
	EB1108039	005	18/03/2011	1350D	4805	93.44	93.75	0.31	PF IB
	EB1108039	017	18/03/2011	1351D	4826	74.39	74.64	0.25	PF1 IB
	EB1108039	038	18/03/2011	1353D	4861	81.92	82.25	0.33	PF1 IB
	EB1108039	064	18/03/2011	1373D	4851	89.72	90.07	0.35	PF1 IB
	EB1108039	027	18/03/2011	1352D	4815	59.25	59.53	0.28	PF1B IB
	EB1108039	006	18/03/2011	1350D	4806	104.17	104.53	0.36	PF2 IB
	EB1108039	018	18/03/2011	1351D	4827	90.61	91.06	0.45	PF2 IB
	EB1108039	028	18/03/2011	1352D	4816	83.41	83.72	0.31	PF2 IB
	EB1108039	039	18/03/2011	1353D	4862	91.94	92.19	0.25	PF2 IB
ME_VA_comp	EB1108039	053	18/03/2011	1355D	4840	114.46	114.84	0.38	PF2 IB
	EB1108039	065	18/03/2011	1373D	4852	109.90	109.33	-0.57	PF2 IB
	EB1108039	007	18/03/2011	1350D	4807	131.07	131.30	0.23	VA1 IB
	EB1108039	008	18/03/2011	1350D	4808	173.90	174.25	0.35	VA1 IB
	EB1108039	019	18/03/2011	1351D	4828	105.85	106.28	0.43	VA1 IB
	EB1108039	020	18/03/2011	1351D	4829	112.33	112.69	0.36	VA1 IB
	EB1108039	029	18/03/2011	1352D	4817	119.54	119.89	0.35	VA1 IB
	EB1108039	030	18/03/2011	1352D	4818	135.14	135.42	0.28	VA1 IB
	EB1108039	040	18/03/2011	1353D	4863	110.24	110.58	0.34	VA1 IB
	EB1108039	041	18/03/2011	1353D	4864	127.92	128.16	0.24	VA1 IB
	EB1108039	054	18/03/2011	1355D	4841	121.00	121.35	0.35	VA1 IB
	EB1108039	055	18/03/2011	1355D	4842	149.75	150.00	0.25	VA1 IB
	EB1108039	067	18/03/2011	1373D	4854	131.74	132.05	0.31	VA1C1 IB
ME_WN_comp	EB1108039	066	18/03/2011	1373D	4853	120.94	121.25	0.31	VA1E IB
	EB1108039	011	18/03/2011	1350D	4811	211.13	211.67	0.54	WN IB
	EB1108039	023	18/03/2011	1351D	4832	178.70	178.96	0.26	WN IB
	EB1108039	032	18/03/2011	1352D	4820	169.74	169.99	0.25	WN IB
	EB1108039	057	18/03/2011	1355D	4844	203.57	203.88	0.31	WN IB
ME_WW_comp	EB1108039	045	18/03/2011	1353D	4868	184.70	185.00	0.30	WN1 IB
	EB1108039	001	18/03/2011	1350D	4801	27.59	27.94	0.35	WW1 OB
	EB1108039	047	18/03/2011	1355D	4834	17.38	17.70	0.32	WW1 OB
	EB1108039	059	18/03/2011	1373D	4846	30.93	31.18	0.25	WW1 OB
	EB1108039	048	18/03/2011	1355D	4835	26.84	27.21	0.37	WW2 IB
	EB1108039	060	18/03/2011	1373D	4847	40.82	41.11	0.29	WW2 IB
	EB1108039	034	18/03/2011	1353D	4858	24.50	24.80	0.30	WW2 OB
	EB1108039	049	18/03/2011	1355D	4836	33.75	34.05	0.30	WW2A IB
	EB1108039	013	18/03/2011	1351D	4822	17.06	17.33	0.27	WW2C OB
	EB1108039	002	18/03/2011	1350D	4802	49.69	50.03	0.34	WW3 IB
	EB1108039	035	18/03/2011	1353D	4859	32.08	32.36	0.28	WW3 IB
	EB1108039	050	18/03/2011	1355D	4837	50.65	50.90	0.25	WW3 IB
	EB1108039	061	18/03/2011	1373D	4848	50.52	50.83	0.31	WW3 IB
	EB1108039	014	18/03/2011	1351D	4823	26.86	27.12	0.26	WW3A IB
	EB1108039	036	18/03/2011	1353D	4860	59.90	60.25	0.35	WW4 IB
	EB1108039	051	18/03/2011	1355D	4838	84.53	84.83	0.30	WW4 IB
	EB1108039	025	18/03/2011	1352D	4813	46.25	46.72	0.47	WW4 OB
	EB1108039	015	18/03/2011	1351D	4824	51.67	52.13	0.46	WW4C IB
EB1108039	003	18/03/2011	1350D	4803	75.24	75.52	0.28	WW4IB	
7071	EB1115657	001	25/07/2011	1376D	7071	177.15	177.65	0.50	WNIB
7082	EB1115657	012	25/07/2011	1376D	7082	188.92	189.83	0.91	EDIB
7056	EB1115657	021	25/07/2011	1379D	7056	188.22	189.23	1.01	WNIB
7058	EB1115657	023	25/07/2011	1379D	7058	190.28	191.26	0.98	WNIB
7061	EB1115657	026	25/07/2011	1379D	7061	192.92	193.48	0.56	WNIB
7070	EB1115657	035	25/07/2011	1379D	7070	203.64	204.13	0.49	EDIB
Coal Reject									
1	EB1115900002		28/07/2011	Bolt Press Filter Cake TH70					Wynn Coal reject
	EB1115900004		28/07/2011	Bolt Press Filter Cake TH70					Wynn Coal reject
2	EB1115900005		28/07/2011	SC403					Wynn Coal reject
	EB1115900001		28/07/2011	SC503					Wynn Coal reject
3	EB1115900003		28/07/2011	SC702					Wynn Coal reject
	EB1115900006		28/07/2011	SC701					Wynn Coal reject
PF2	EB1122094001		14/10/2011	PF2					Reject from press filter
VA 1/2	EB1122094002		14/10/2011	VA 1/2					Reject from press filter
BMC REJECT BAY2 01	EB1108821001	001	23/04/2011	BMC REJECT BAY2 01					Coal washery Reiect

Table 5-6: Multi-Element Results for Overburden and Coal Reject Materials

			Overburden														Coal Reject							
			RGS composite number -->		ME_BR_c omp	ME_BY_co mp	ME_ED_c omp	ME_MA_c omp	ME_PF_co mp	ME_VA_c omp	ME_WN_c omp	ME_WW_c omp	7071	7082	7056	7058	7061	7070	BMC_REJEC T_BAY2_01	Comp1	Comp2	Comp3	PF2	VA1/2
			Material description -->		Broonie Interburden	Bayswater Interburden	Edderton Interburden	Mt Arthur Interburden	Piercefield Interburden	Vaux Interburden	Wynn Interburden	Warkworth Interburden	WN Interburden	ED Interburden	WN Interburden	WN Interburden	WN Interburden	ED Interburden	Reject	Reject	Reject	Reject	Reject	Reject
Parameters	Detection Limit	NEPC ¹ Health-Based Investigation Level	Broonie Interburden	Bayswater Interburden	Edderton Interburden	Mt Arthur Interburden	Piercefield Interburden	Vaux Interburden	Wynn Interburden	Warkworth Interburden	WN Interburden	ED Interburden	WN Interburden	WN Interburden	WN Interburden	ED Interburden	Reject	Reject	Reject	Reject	Reject	Reject		
Elements	All units mg/kg																							
Aluminium (Al)	50	-	4950	6720	5060	18700	8880	8510	6460	5270	4990	3640	3560	3420	4090	6280	4330	2120	2470	1870	2060	2250		
Antimony (Sb)	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
Arsenic (As)	5	200	<5	<5	<5	<5	13	<5	<5	8	24	14	<5	17	36	6	<5	6	6	18	<5	<5		
Boron (B)	50	6,000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		
Cadmium (Cd)	1	40	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Calcium (Ca)	10	-	16600	10300	44200	30300	14100	8990	3480	11600	2020	11300	2030	740	1600	3790	4290	1740	26400	5320	860	11300		
Chromium (Cr) total	2	.*	8	15	12	14	16	12	27	14	18	6	16	9	16	9	5	2	<2	<2	2	2		
Cobalt (Co)	2	200	8	10	5	2	15	7	4	10	17	12	6	19	13	6	2	6	10	16	5	8		
Copper (Cu)	5	2,000	27	9	11	5	18	18	<5	23	12	27	<5	17	10	14	16	29	43	57	17	36		
Iron (Fe)	50	-	19600	13800	22800	15600	15900	19100	6880	25700	17400	130000	6510	11200	35400	16400	28100	10300	14700	77400	5640	32100		
Lead (Pb)	5	600	11	9	8	24	10	9	7	14	20	14	10	23	15	12	15	11	17	15	8	12		
Magnesium (Mg)	10	-	4870	3700	10500	7860	4610	3980	1500	5230	1980	9520	1120	990	950	3390	2350	980	520	2020	940	4410		
Manganese (Mn)	5	3,000	313	167	386	263	275	301	68	474	130	3110	73	79	555	115	705	58	42	323	45	308		
Molybdenum (Mo)	2	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	6	<2	<2	<2	<2	3	<2	<2		
Nickel (Ni)	2	600	11	11	6	4	22	9	3	21	23	14	4	28	18	6	4	9	12	24	5	10		
Potassium (K)	10	-	1340	980	840	580	1080	1090	960	1140	1280	1300	980	1220	1140	870	730	670	440	420	840	860		
Selenium (Se)	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
Sodium (Na)	10	-	3800	5640	3580	15500	6680	6440	5200	2520	3860	2360	2880	2780	3060	5760	490	2710	2580	1890	1340	350		
Zinc (Zn)	5	14,000	73	48	43	50	65	63	46	71	84	90	60	91	69	71	<5	46	35	53	22	51		
Exchangeable Cations	All units meq/100g (except Exchangeable Sodium Percentage (%))																							
Exch. Calcium	0.1	-	16.1	6.5	18.0	18.0	12.9	3.3	3.0	10.6	4.8	7.2	3.1	1.1	5.1	2.9	-	-	-	-	-	-		
Exch. Magnesium	0.1	-	0.6	0.7	0.7	1.0	0.8	1.2	1.0	4.5	2.8	0.8	0.6	0.5	1.6	0.6	-	-	-	-	-	-		
Exch. Potassium	0.1	-	0.8	0.7	0.6	0.4	0.8	0.8	0.7	0.6	1.0	0.9	0.8	0.9	0.2	0.7	-	-	-	-	-	-		
Exch. Sodium	0.1	-	9.0	7.6	4.5	5.5	5.6	6.5	7.1	2.9	8.5	5.9	7.0	8.1	7.0	8.2	-	-	-	-	-	-		
Cation Exchange Capacity	0.1	-	26.6	15.6	23.8	24.9	20.1	11.7	11.8	18.7	17.2	15.0	11.6	10.6	13.8	12.5	-	-	-	-	-	-		
Exchangeable Sodium Percentage	0.1 %	-	33.8	48.7	18.9	22.1	27.9	55.6	60.2	15.5	49.4	39.3	60.3	76.4	50.7	65.6	-	-	-	-	-	-		
Calcium/Magnesium Ratio	0.1 %	-	26.8	9.3	25.7	18.0	16.1	2.8	3.0	2.4	1.7	9.0	5.2	2.2	3.2	4.8	-	-	-	-	-	-		

Notes < indicates less than the analytical detection limit. Shaded cells exceed applied guideline limit.

1. NEPC (1999)a. National Environmental Protection Council (NEPC). National Environmental Protection (Assessment of Site Contamination) Measure (NEPM). Guideline on investigation levels for soil and groundwater. HIL(E); parks, recreation open space and playing fields.

* Guideline level for Cr(VI) = 200 mg/kg. Guideline level for Cr(III) = 24% of total Cr.

5.3 *Effective Cation Exchange Capacity and Sodicity*

The effective cation exchange capacity (eCEC) results presented in **Table 5-6** indicate that the eCEC of the overburden samples is moderate and ranges from 10.6 to 26.6 meq/100g. The exchangeable sodium percentage (ESP) results presented in **Table 5-6** indicate that the sodicity of overburden samples is typically high and ranges from 18.8 to 76.4 % (median 49.1 %).

The results of the cation exchange capacity and sodicity tests on composite overburden samples and any potential implications for overburden management at Bengalla are discussed in **Section 6.0**.

5.4 *Water Quality*

In order to evaluate the likely initial water quality and solubility of multi-elements from overburden and coal reject material, water extract (1:5 w/v sample:water) tests were completed for the 14 overburden and six coal reject samples described in **Sections 5.2** and **5.3**, and results are provided in **Table 5-7**.

The water extracts are typically alkaline and range from pH 4.8 to 9.9 (median 9.4). Samples with pH values at the lower end of the pH range comprise material from the Wynn coal seam or ASS just above this seam. The current total alkalinity of the water extracts is elevated (median 248 mg/L CaCO₃) and ranges from 10 to 8,340 mg/L CaCO₃. The elevated alkalinity is mainly due to the presence bicarbonate although carbonate is also present in some overburden samples. The dominant major soluble cation is typically sodium and the dominant major soluble anions are typically bicarbonate, carbonate, chloride and sulfate. The concentration of soluble sulfate ranges from low to moderate (2 to 980 mg/L) and are currently below the applied ANZECC (2000) water quality guideline criterion (1,000 mg/L). The water extracts with the highest sulfate concentrations are derived from the Wynn seam and ASS interburden located above the Wynn seam.

The samples have EC values ranging from 291 to 1,770 µS/cm (median 442 µS/cm); generally indicating low salinity (and low concentrations of dissolved solids). The highest salinity values are derived from the Wynn seam and ASS interburden above the Wynn seam.

There are no specific regulatory criteria for metal concentrations in leachate from overburden and coal reject materials on mine sites in NSW. As such, RGS has compared the multi-element results in water extracts from overburden and coal reject samples with Australian guidelines to provide some context for discussion of test results (ANZECC, 2000 and NEPC, 1999b). The concentration of most trace metals tested in the water extracts is low, predominantly below the laboratory limit of reporting, and below the applied water quality guideline criteria where these exist. One minor exception is the concentration of selenium (Se), which is slightly elevated compared to the applied water quality guidelines (ANZECC, 2000) in two interburden samples from between the Edderton and Wynn seams. Overall, the results indicate that most metals are sparingly soluble at the typically alkaline pH of the water extracts. The significance of these results for management of overburden and coal reject materials at the Project is discussed at **Section 6.0**.

Table 5-7: Multi-Element Results for Water Extracts from Overburden and Potential Coal Reject Materials

			Overburden														Coal Reject						
			RGS Composite No. -->	ME_BR_comp	ME_BY_comp	ME_ED_comp	ME_MA_comp	ME_PF_comp	ME_VA_comp	ME_WN_comp	ME_WW_comp	7071	7082	7056	7058	7061	7070	BMC_REJE CT_BAY2_01	Comp1	Comp2	Comp3	PF2 ²	VA1/2 ³
Parameters	Material description -->		Broonie Interburden	Bayswater Interburden	Edderton Interburden	Mt Arthur Interburden	Piercefield Interburden	Vaux Interburden	Wynn Interburden	Warkworth Interburden	Wynn Interburden	Edderton Interburden	Wynn Interburden	Wynn Interburden	Wynn Interburden	Edderton Interburden	Reject	Reject	Reject	Reject	Reject	Reject	
	Detection Limit	Guideline Levels ¹																					
pH	0.1 pH unit	-	9.8	9.7	9.8	9.6	9.6	9.7	9.7	9.2	6.1	9.8	9.9	8.1	4.8	9.8	8.0	7.2	5.1	7.8	7.5	7.9	
Electrical Conductivity	1 µS/cm	-	373	458	393	392	359	373	368	291	1,640	532	454	625	1,770	398	408	715	555	430	907	983	
Total Alkalinity (mgCaCO ₃ /L)	0.2 mg/L	-	8,340	1,694	260	312	<1	260	326	310	24	276	258	24	10	248	96	89	57	81	10	21	
Bicarbonate Alkalinity (mgCaCO ₃ /L)	0.2 mg/L	-	7,920	1,434	104	130	163	130	260	212	24	68	71	24	10	149	96	89	57	81	10	21	
Carbonate Alkalinity (mgCaCO ₃ /L)	0.2 mg/L	-	416	260	156	182	130	130	65	98	<0.2	208	188	<0.2	<0.2	99	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Major Ions			All element concentrations in mg/L																				
Calcium (Ca)	2	1,000	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<3	<2	<2	<2	<2	<2	<2	
Magnesium (Mg)	2	-	<2	<2	<2	<2	<2	<2	<2	<2	8	<2	<2	<2	20	<2	44	<2	<2	<2	4	3	
Sodium (Na)	2	-	16	12	12	<2	12	12	10	8	314	104	92	134	308	88	76	340	140	128	27	34	
Potassium (K)	2	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Chloride (Cl)	2	-	6	6	<2	<2	<2	8	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Sulfate (SO ₄)	2	1,000	<2	6	2	<2	4	<2	4	2	746	22	22	280	980	26	344	376	240	136	52	47	
Metals			All element concentrations in mg/L																				
Aluminium (Al)	0.2	5	<0.2	<0.2	<0.2	<0.2	0.600	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Antimony (Sb)	0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.020	<0.02	<0.02	<0.02	<0.02	
Arsenic (As)	0.02	0.5	<0.02	<0.02	<0.02	<0.02	0.020	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Boron (B)	0.2	5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Cadmium (Cd)	0.02	0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Chromium (Cr)	0.02	1 / -	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Cobalt (Co)	0.02	1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.200	<0.02	<0.02	<0.02	0.360	<0.02	<0.02	<0.02	<0.02	<0.02	0.001	<0.02	
Copper (Cu)	0.02	1 / 0.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.001	0.0004	
Iron (Fe)	0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.200	<0.2	<0.2	<0.2	7.600	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Lead (Pb)	0.02	0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Manganese (Mn)	0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Molybdenum (Mo)	0.02	0.15	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.04	<0.02	<0.02	0.04	<0.02	0.04	<0.02	<0.02	0.01	0.01	
Nickel (Ni)	0.02	1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.2	<0.02	<0.02	<0.02	0.4	<0.02	<0.02	<0.02	<0.02	<0.02	0.001	0.001	
Selenium (Se)	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	0.02	<0.02	<0.02	0.04	0.02	0.02	<0.02	<0.02	<0.02	<0.02	
Zinc (Zn)	0.02	20	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.0	<0.02	<0.02	<0.02	0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	

Notes: < Indicates concentration less than the detection limit. Shaded cells indicate values which exceed applied ANZECC/NEPC guideline values.

- The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999). Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.
 - ANZECC and ARMCANZ, 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). Livestock drinking water (cattle).
 - NEPC (1999b). National Environment Protection Council (NEPC). National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) Guideline on investigation levels for soil and groundwater. Groundwater Investigations Levels (Agricultural: Livestock).
- The solid:water ratio for this sample was different than the normal 1:5. The ratio was from KLC=
- The solid:water ratio for this sample was different than the normal 1:5. The ratio was from KLC=

5.5 Kinetic Leach Column (KLC) Tests

KLC tests were completed for a total of eight overburden and coal reject samples. The samples used in the KLC tests comprised two composite overburden samples, three composite coal reject samples, and three individual coal reject samples using the methodology described in **Section 3.3.2**. The samples used in the KLC tests are provided at **Table 5-8**. The KLC tests commenced in July 2011, and were completed over a staggered experimental period depending upon the date of receipt of samples, in January 2012.

Table 5-8
Overburden and Coal Reject Samples Selected for KLC Tests

KLC No.	ALS Laboratory Sample ID	Date	Drill Hole ID	Client Sample ID	Sample Interval (m)			Sample Type	Overburden/Interburden Unit or Coal Seam	Sample Classification	
					From	To	Depth				
Overburden											
KLC1	EB1108039	001	18/03/2011	1350D	4801	27.59	27.94	0.35	Overburden	WW1 OB	NAF (Barren)
	EB1108039	002	18/03/2011	1350D	4802	49.69	50.03	0.34	Interburden	WW3 IB	NAF (Barren)
	EB1108039	003	18/03/2011	1350D	4803	75.24	75.52	0.28	Interburden	WW4IB	NAF (Barren)
	EB1108039	004	18/03/2011	1350D	4804	84.70	85.11	0.41	Interburden	MA2 IB	NAF (Barren)
	EB1108039	005	18/03/2011	1350D	4805	93.44	93.75	0.31	Interburden	PF IB	NAF (Barren)
	EB1108039	006	18/03/2011	1350D	4806	104.17	104.53	0.36	Interburden	PF2 IB	NAF (Barren)
	EB1108039	007	18/03/2011	1350D	4807	131.07	131.30	0.23	Interburden	VA1 IB	NAF (Barren)
	EB1108039	008	18/03/2011	1350D	4808	173.90	174.25	0.35	Interburden	VA1 IB	NAF (Barren)
	EB1108039	009	18/03/2011	1350D	4809	193.94	194.24	0.30	Interburden	BR2C IB	NAF (Barren)
	EB1108039	010	18/03/2011	1350D	4810	204.65	204.95	0.30	Interburden	BY2C IB	NAF (Barren)
	EB1108039	011	18/03/2011	1350D	4811	211.13	211.67	0.54	Interburden	WN IB	NAF (Barren)
	EB1108039	012	18/03/2011	1350D	4812	223.55	223.83	0.28	Interburden	ED IB	NAF (Barren)
KLC2	EB1108039	013	18/03/2011	1351D	4822	17.06	17.33	0.27	Overburden	WW2C OB	NAF (Barren)
	EB1108039	014	18/03/2011	1351D	4823	26.86	27.12	0.26	Interburden	WW3A IB	NAF (Barren)
	EB1108039	015	18/03/2011	1351D	4824	51.67	52.13	0.46	Interburden	WW4C IB	NAF (Barren)
	EB1108039	016	18/03/2011	1351D	4825	65.86	66.31	0.45	Interburden	MA2 IB	NAF (Barren)
	EB1108039	017	18/03/2011	1351D	4826	74.39	74.64	0.25	Interburden	PF1 IB	NAF (Barren)
	EB1108039	018	18/03/2011	1351D	4827	90.61	91.06	0.45	Interburden	PF2 IB	NAF (Barren)
	EB1108039	019	18/03/2011	1351D	4828	105.85	106.28	0.43	Interburden	VA1 IB	NAF (Barren)
	EB1108039	020	18/03/2011	1351D	4829	112.33	112.69	0.36	Interburden	VA1 IB	NAF (Barren)
	EB1108039	021	18/03/2011	1351D	4830	159.60	159.99	0.39	Interburden	BR1 IB	NAF (Barren)
	EB1108039	022	18/03/2011	1351D	4831	174.82	175.22	0.40	Interburden	BY2 IB	NAF (Barren)
	EB1108039	023	18/03/2011	1351D	4832	178.70	178.96	0.26	Interburden	WN IB	NAF (Barren)
	EB1108039	024	18/03/2011	1351D	4833	189.89	190.36	0.47	Interburden	ED IB	NAF (Barren)
Coal Reject											
KLC3	EB1108021	001	23/04/2011	BMC REJECT BAY2 01					Coal Washery Reject	NAF	
KLC4	EB1115900	002	28/07/2011	Bolt Press Filter Cake TH70					Wynn Coal reject	PAF	
	EB1115900	004	28/07/2011	Bolt Press Filter Cake TH70					Wynn Coal reject	PAF	
KLC5	EB1115900	005	28/07/2011	SC403					Wynn Coal reject	PAF	
	EB1115900	001	28/07/2011	SC503					Wynn Coal reject	PAF	
KLC6	EB1115900	003	28/07/2011	SC702					Wynn Coal reject	PAF	
	EB1115900	006	28/07/2011	SC701					Wynn Coal reject	PAF	
KLC7	EB1122094	001	14/10/2011	VA PF2					Press Filter Reject	NAF (Barren)	
KLC8	EB1122094	002	14/10/2011	VA 1/2					Press Filter Reject	NAF	

The geochemical results and trends obtained for the eight KLC tests on composite overburden and coal reject samples are presented at **Attachment C**. Tables **KLC1** to **KLC8** provide KLC test data, selected components of which are shown graphically at **Figures KLC1** to **KLC8**. The KLC test results obtained over the 12 week test period indicate that:

- Leachate from the overburden tests (KLC1 and KLC2) is typically alkaline and ranges from pH 9.23 to 9.79 through the test period. For coal reject tests from the Wynn seam (KLC4, KLC5 and KLC6), leachate pH ranges from slightly alkaline (8.39) to acidic (2.03). The trend for leachate from the Wynn seam coal reject KLC tests is to become more acidic through the test period. Leachate for coal reject from the Vaux and Bayswater seams (KLC 3, KLC 7 and KLC 8) is typically pH neutral.

- Leachate from the overburden tests has a relatively low EC value ranging from 147 to 267 $\mu\text{S}/\text{cm}$ and is typically low (median 191 $\mu\text{S}/\text{cm}$). The EC of leachate from the Wynn seam coal rejects ranges from 53 to 14,300 $\mu\text{S}/\text{cm}$ and is typically elevated and increases through the test period. Leachate from the Vaux and Bayswater coal rejects has an EC that ranges from 88 to 1060 $\mu\text{S}/\text{cm}$ and has remained relatively steady over the test period;
- The acidity of leachate from the overburden tests is low and typically below the laboratory limit of reporting (LoR). The leachate alkalinity ranges from 42 to 226 $\text{mg CaCO}_3/\text{L}$ and is typically moderate. Similarly, the acidity of leachate from Vaux and Bayswater coal reject is low and ranges from 1 to 29 $\text{mg CaCO}_3/\text{L}$, but is typically less than 10 $\text{mg CaCO}_3/\text{L}$. The alkalinity values typically exceed the acidity values and the net alkalinity value is typically positive. Leachate from the Wynn seam coal reject has an acidity value ranging from <1 to 38,300 $\text{mg CaCO}_3/\text{L}$ and acidity values have tended to increase over the test period. Corresponding alkalinity levels are typically low and often less than the laboratory LoR resulting in a negative net alkalinity value;
- The concentrations of soluble calcium and magnesium in leachate from the KLC tests have been used to calculate the residual ANC in the sample materials. The results indicate that overburden has retained at least 99.8 % of its ANC over the test period and should continue to provide buffering and excess alkalinity for a significant period of time. The residual ANC in the coal rejects from the Vaux and Bayswater seams has also retained a high percentage of the original ANC (> 93 %) and should also continue to provide buffering and excess alkalinity. In contrast, the residual ANC in coal rejects from the Wynn seam is being more rapidly consumed and at the current rate of consumption could be completely eliminated within about 6 to 9 months;
- The concentration of soluble sulfate in leachate from the KLC tests has been used to calculate the residual sulfur content of the sample materials. The results indicate that the low sulfur concentration in overburden is diminishing, but at a rate that is less than the alkalinity that is being produced. A similar outcome is found for the coal rejects from the Vaux and Bayswater seams. In contrast, sulfur concentration in coal rejects from the Wynn seam remains high but is still reacting faster and generating more acidity than can be consumed by the alkalinity that is being produced;
- The concentration of soluble sulfate in leachate from the overburden is typically low and remains an order of magnitude lower than the applied ANZECC (2000)/NEPC (1999b)² water quality guideline for this anion (1,000 mg/L). For coal rejects from the Vaux and Bayswater seams, the sulfate concentration in leachate is elevated, but still remain within the guideline criterion. In contrast, the sulfate concentration in leachate from Wynn seam rejects generally exceeds the guideline criterion and has tended to increase through the test period; and
- The concentration of soluble trace metals in leachate from all KLC tests, except coal rejects from the Wynn seam is typically low and remains within applied (ANZECC/NEPC) water quality guidelines criteria. The concentrations of soluble trace metals in leachate from Wynn coal rejects can exceed the applied (ANZECC/NEPC) water quality guideline criteria for Al, As, Cd, Co, Cu, Ni, Se and Zn.

Potential implications of these results with respect to management of overburden and coal reject materials at the Project are discussed at **Section 6.0**.

² There are no guidelines and regulatory criteria specifically related to runoff and seepage from overburden spoil and coal reject materials since guidelines (and regulatory criteria) will depend upon the end-use and receiving environment. Therefore, to provide relevant context, RGS has compared the soluble concentration of each element leached from KLC test materials to NEPC (1999b) investigation levels for groundwater and ANZECC (2000) livestock drinking water guidelines. These guidelines allow for concentrations of individual parameters appropriate for an industrial facility in a rural area and are more appropriate (in the context of the project) than guidelines designed for water to be used for human consumption or being directly discharged into an aquatic environment (eg. stream, river or lake).

6.0 DISCUSSION

6.1 Acid Base Account Test Results

The results of the ABA tests presented in **Section 5.1**, indicate that all of overburden and interburden material (except for the ASS above the Wynn seam) is likely to be NAF and have a high factor of safety with respect to potential acid generation. The overburden samples tested have negligible/background (< 0.1 %) total sulfur content and are therefore mostly classified as NAF-barren. Most overburden materials also appear to have a significant acid buffering capacity (moderate ANC value), which will be more than enough to buffer the negligible amount of acidity that could theoretically be generated from these materials. Overall, from an acid-base perspective, the overburden and interburden material tested can be regarded as a NAF-barren unit containing excess neutralising capacity.

The exception is the ASS interburden material above the Wynn seam which is likely to be PAF and have a low factor of safety with respect to potential acid generation. The PAF nature of the ASS material has been recognised since before mining commenced at Bengalla and is managed at the open pit by covering the ASS material with acid neutralising and inert overburden to a depth of at least 60 m. Calculation of residual ANC remaining in overburden materials in the current KLC tests indicates that much of the original measured ANC remains in these materials after a period of exposure to oxidising conditions and is likely to continue to provide excess alkalinity for a significant period of time.

The concentration of soluble sulfate in leachate from the KLC tests for overburden and coal rejects from the Vaux and Bayswater seams is typically low and reasonably consistent throughout the 12 week test period. In contrast, the soluble sulfate concentration from Wynn seam coal rejects is elevated and shows an increasing trend. The average sulfate generation rate for each of the overburden and coal reject samples used in the KLC tests has been calculated as shown in **Table 6-1**.

Table 6-1
Oxidation Rates for Overburden and Coal Reject Materials

KLC Sample Name	Sulfate Generation Rate (mg/kg/week)	Oxidation Rate (kg O ₂ /m ³ /s)
KLC1 Overburden 1	5.1	5.16 x 10 ⁻⁹
KLC2 Overburden 2	3.9	3.82 x 10 ⁻⁹
KLC3 Coal Reject 1	46.4	5.07 x 10 ⁻⁸
KLC4 Coal Reject 2	189.2	3.24 x 10 ⁻⁷
KLC5 Coal Reject 3	498.1	5.52 x 10 ⁻⁷
KLC6 Coal Reject 4	1,714.1	1.44 x 10 ⁻⁶
KLC7 Coal Reject 5	43.3	5.84 x 10 ⁻⁸
KLC8 Coal Reject 6	86.9	9.31 x 10 ⁻⁸

The sulfate generation rate from the overburden samples ranges from 3.9 to 5.1 mg/kg/week, which indicates that the rate of sulfide oxidation in these materials is low (equivalent to an oxidation rate ranging from 3.82 to 5.16 x 10⁻⁹ kg O₂/m³/s). The sulfate generation rate from the Vaux and Bayswater coal reject samples ranges from 43.3 to 86.9 mg/kg/week, which suggests that the rate of sulfide oxidation is also relatively low in these materials (equivalent to an oxidation rate ranging from 5.07 to 9.31 x 10⁻⁸ kg O₂/m³/s). The sulfate generation rate from the Wynn coal reject samples ranges from 189.2 to 1,714.1 mg/kg/week, which suggests that the rate of sulfide oxidation is high in these materials (equivalent to an oxidation rate ranging from 3.24 x 10⁻⁷ to 1.44 x 10⁻⁶ kg O₂/m³/s).

Results of previous KLC test work completed as part of a mining industry sponsored study program (AMIRA, 1995) indicate that mine materials with an oxidation rate of less than $5 \times 10^{-8} \text{ kg O}_2/\text{m}^3/\text{s}$ and low to moderate ANC levels have a high factor of safety and are likely to generate pH neutral to alkaline leachate. Therefore the overburden and Vaux/Bayswater coal rejects have a relatively high factor of safety with respect to potential acid generation. In contrast, the Wynn coal rejects have a lower factor of safety and an increasing trend in oxidation rate and are likely to generate acid in a relatively short period of time (weeks to a few months).

6.2 Multi-Element Composition and Water Quality

6.2.1 Multi-element composition

The multi-element composition of composite overburden samples are presented at **Section 6.2**, along with a comparison with applied guideline concentrations. The acquired data indicate that all total metal concentrations in samples are well below the NEPC (1999a) HIL (E) guideline values, where such guideline levels exist. Hence, materials represented by these composite samples should not present a significant risk to the environment with respect to total metal concentrations in solids.

6.2.2 Water Quality

KLC test results indicate that ongoing surface run-off/seepage from overburden materials and coal reject materials from the Vaux and Bayswater seams is likely to be pH neutral to alkaline and from the Wynn seam coal rejects is likely to be acidic.

The major ion chemistry from all materials will initially be dominated by sodium, carbonate, bicarbonate, chloride and sulfate and the concentration of all of these ions in run-off and seepage is expected to decrease over time. If ASS interburden or PAF coal rejects were left exposed to atmospheric conditions for a significant period of time, it is likely that the sulfate concentration is surface runoff/seepage would increase over time.

The salinity of run-off and seepage from overburden is likely to be low and is also likely to decrease with time as soluble salts are flushed from exposed materials. The concentration of sulfate in run-off/seepage from overburden materials is comparable to background concentrations and is likely to remain well within the applied water quality guideline concentration criterion. Hence, the risk of potential impact on the quality of surface and groundwater from the Project should be low for overburden materials, although this finding should be confirmed by the current groundwater/hydrogeological studies being completed by BMC (Briese, 2010). The highest salinity values are derived from the Wynn seam and ASS interburden above the Wynn seam and these materials should continue to be managed at the open pit by covering the ASS material with acid neutralising and inert overburden to a depth of at least 60 m. No ASS or coarse reject materials should report to out of pit overburden emplacement areas, to avoid any potential connectivity with the adjacent Dry Creek.

Most trace metals in overburden and coal reject from the Vaux and Bayswater seams are sparingly soluble at the predicted neutral to alkaline pH of surface run-off/seepage and dissolved concentrations are expected to be low compared to the applied water quality guideline criteria (ANZECC, 2000; and NEPC, 1999b) livestock drinking water guidelines. RGS has compared the quality of KLC tests leachate derived from overburden and coal reject samples, with the above guidelines to provide some context for discussion of test results.

For the coal reject from the Wynn seam the KLC test results indicate that ongoing surface run-off/seepage from these materials, if left uncovered, would be acidic, saline and contain elevated concentrations of several trace metals and sulfate.

6.3 *Revegetation and Rehabilitation*

The following discussion provides some context to the soil chemistry of overburden materials, should these report to final OEA surfaces. From a soil chemistry viewpoint, the overburden materials are likely to be alkaline. The materials will generally have low salinity levels, and display moderate to high eCEC values.

Overburden materials have elevated ESP values, which indicate that these materials may be sodic. Where the EC is relatively low, such as in the overburden samples, soils are considered sodic if the ESP value is greater than 6% and less than 14% and strongly sodic if the ESP is 15 or more (Isbell, 2002; and Northcote and Skene, 1972). Materials classified as sodic may be prone to dispersion and erosion. Hence, overburden materials likely to report to overburden emplacement areas at Bengalla may have structural stability problems related to potential dispersion. The ESP values were obtained for samples comprising a range of overburden lithologies and it is possible that some lithologies are less sodic than others and may be more suitable for revegetation and rehabilitation activities (in final landform surfaces or as a growth medium) for the Project. It is recommended that Bengalla site rehabilitation practices for potentially sodic overburden continue to include a topsoil cover as part of final rehabilitation to limit the risk of dispersion and erosion of surface materials.

6.4 *Co-Disposal of Rejects at Overburden Emplacement Area*

The RGS review of existing geochemical information on overburden and coal reject materials at Bengalla (**Section 4.0**) indicates that coal reject materials are currently co-disposed with overburden in the OEA and make up approximately 5% of the total overburden emplacement mass. Coal reject materials generated at Bengalla have significantly higher total sulfur concentration than overburden, although elevated ANC typically results in a NAF classification for all but the Wynn coal seam rejects. The mean ANC of bulk rejects is estimated to be 1.5 times greater than the MPA and the combined overburden and coal reject is estimated to NAF with a high factor of safety (ANC/MPA ratio of 12).

Notwithstanding, RGS recommends that coal reject materials are not co-disposed with overburden materials within any part of the overburden emplacement areas that have been identified to overly alluvial soils. There may be some scope for co-disposal of coal rejects in some areas that drain towards the open pit, but only if existing groundwater/hydrogeological studies completed by BMC clearly demonstrate a low risk of seepage connectivity to alluvial soils.

The basis of the above recommendation is that although most coal rejects are likely to be NAF, others are classified as PAF, and may generate elevated EC and sulfate levels as they oxidise, which can impact upon vegetation growth and surface water/groundwater quality.

7.0 CONCLUSIONS AND MANAGEMENT MEASURES

7.1 *Conclusions*

RGS has completed a geochemical impact assessment of representative overburden and coal reject materials for the Project. RGS has also reviewed and relied upon the results of existing geological, geochemical and water quality monitoring information from the site to draw the following conclusions:

- All overburden material, apart from the ASS located above the Wynn seam, has negligible (<0.1%) sulfur content, excess ANC, and is classified as NAF;
- All overburden material, apart from the ASS located above the Wynn seam, has a high factor of safety with respect to potential acid generation. Current management methods for ASS materials at the open pit are sufficient to minimise the risk of any significant impact to the environment;
- The concentration of total metals in overburden (and coal reject materials) is well below applied guideline criteria for soils and is unlikely to present any environmental issues associated with revegetation and rehabilitation;
- Overburden will generate alkaline run-off and seepage with low salinity values following surface exposure. The salinity of run-off and seepage from overburden materials is likely to decrease over time;
- The concentration of trace metals and sulfate in run-off and seepage from overburden will be low;
- Most overburden material is likely to be sodic and may have structural stability problems related to potential dispersion and erosion;
- Coal reject contains elevated sulfur content however the only material that is classified as PAF is from the Wynn seam;
- The concentration of trace metals and sulfate from most coal rejects will be low. However, Wynn coal reject materials have the potential to generate elevated concentrations of some metals (Al, Cd, Co, Cu, As, Ni, Se and Zn) if exposed to oxidising conditions; and
- Current management methods for Wynn coal reject and other coal reject materials (deep burial under NAF overburden) at the open pit are sufficient to minimise the risk of any significant impact to the environment.

7.2 *Potential Management Measures*

The ongoing management of overburden (and co-disposed coal reject) materials at the Project should consider the geochemistry of these materials with respect to their potential risk to cause harm to the environment and their suitability for use in construction and revegetation. It is therefore suggested that the BMC:

- Continues with current management methods for PAF ASS overburden and coal reject materials of deep burial under NAF overburden in the backfilled open cut as described in the ARDMP (BMC, 2009);
- Does not co-dispose ASS or coal rejects within overburden emplacement areas which overlie, or have potential connectivity with, alluvial soils and/or Dry Creek. There may be some scope for co-disposal of coal rejects in some areas that drain towards the open pit, but only if existing groundwater/hydrogeological studies completed by BMC clearly demonstrate a low risk of seepage connectivity to alluvial soils and/or dry creek;
- Continues with current practice of pre-stripping topsoil from areas to be disturbed for use in final rehabilitation activities (surface cover or vegetation growth medium); and
- Continues with successful site rehabilitation practices for potentially sodic overburden within the Project area by ensuring that a topsoil cover is utilised as part of final rehabilitation.

Surface water and water collected in the pit (including seepage from overburden and coal reject materials) should continue to be monitored to ensure that key water quality parameters remain within licence limits criteria. It is therefore suggested that BMC continues to monitor the run-off/seepage from the proposed and overburden emplacement areas on a quarterly basis for:

- pH;
- electrical conductivity (EC); and
- Total suspended solids (TSS).

and annually for:

- Dissolved trace metals; and
- Major ions including sulfate.

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9.0 LIMITATIONS

RGS has prepared this report for the use of Hansen Bailey and BMC. It is based on accepted consulting practices and standards and no other warranty is made as to the professional advice included in this report. It is prepared in accordance with Hansen Bailey Consulting Agreement No. 0984 dated 28 June 2011.

This report was prepared from July 2011 to June 2013 and is based on the information provided by Hansen Bailey and BMC at the time of preparation. RGS disclaims responsibility for any changes that may have occurred after this time.

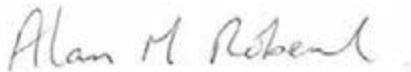
The sources of information and methodology used by RGS are outlined in this report and no independent verification of this information has been made. RGS assumes no responsibility for any inaccuracies or omissions, although no indication was found that any information contained in this report as provided 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) 3856 5591 or (+61) 431 620 623.

Yours sincerely,

RGS ENVIRONMENTAL PTY LTD



Dr. Alan M. Robertson
Principal Geochemist/Director

ATTACHMENT A

Figures

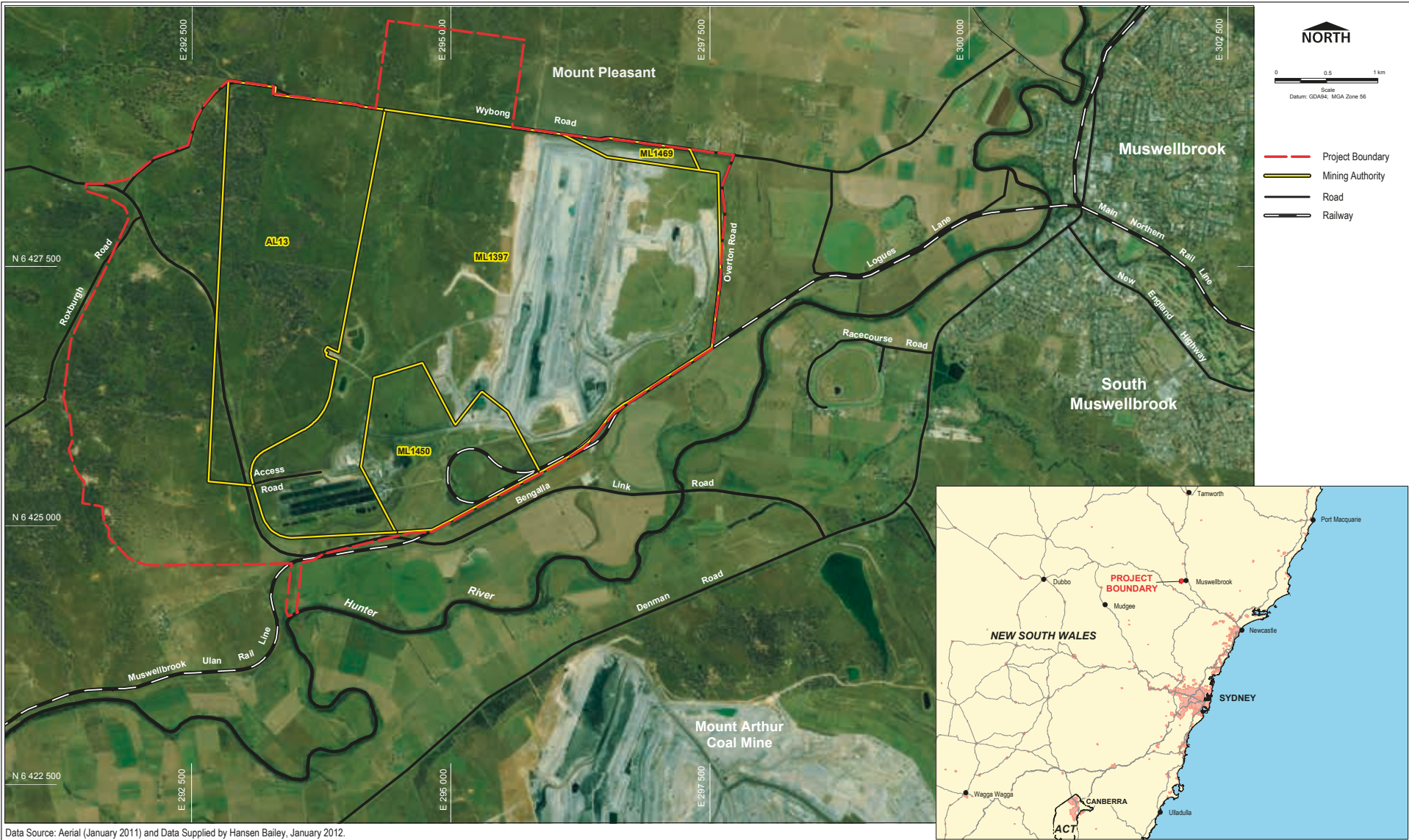
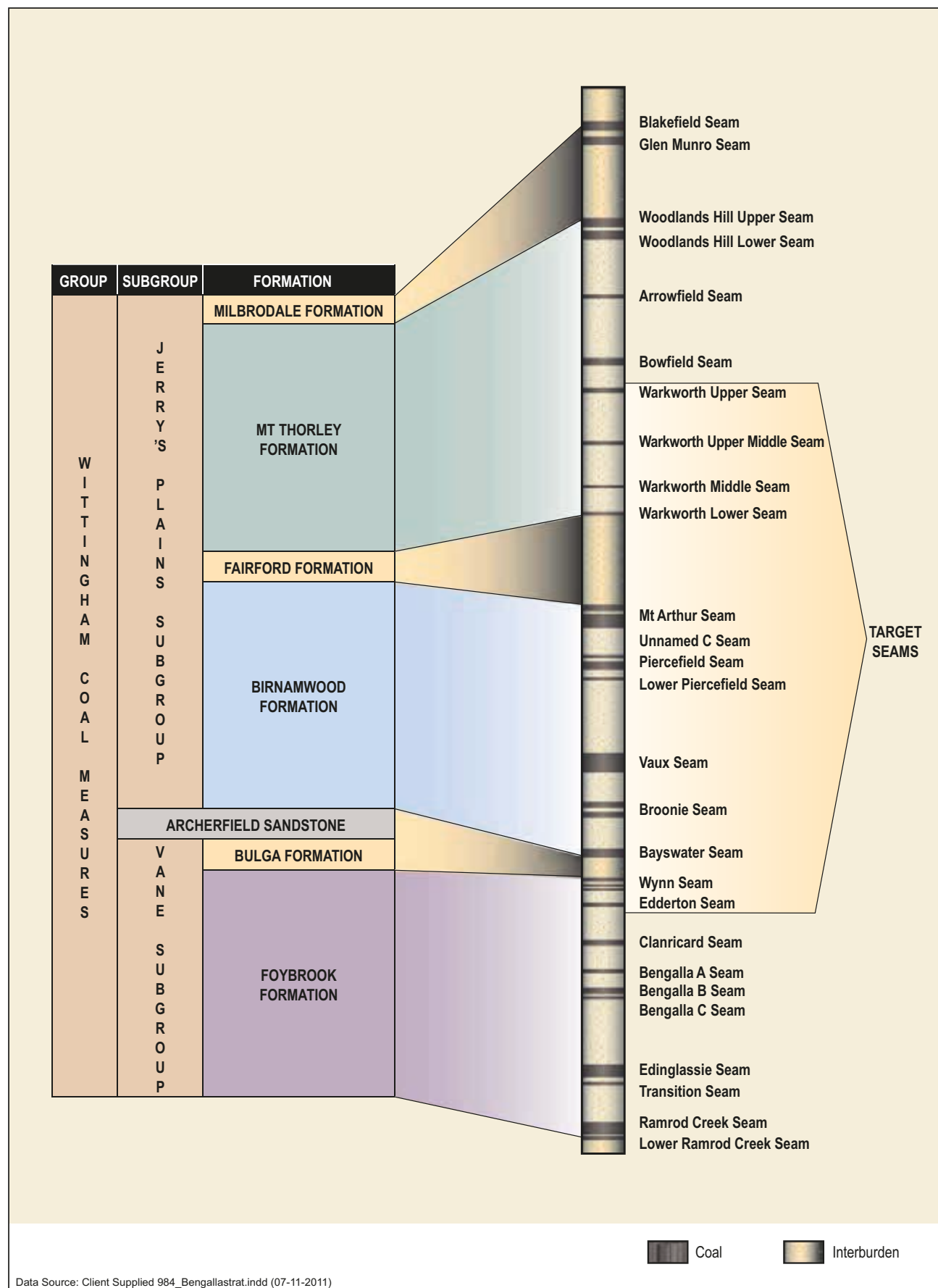


Figure: 1
SITE LOCATION MAP

CONTINUATION OF BENGALLA MINE
GEOCHEMICAL IMPACT ASSESSMENT

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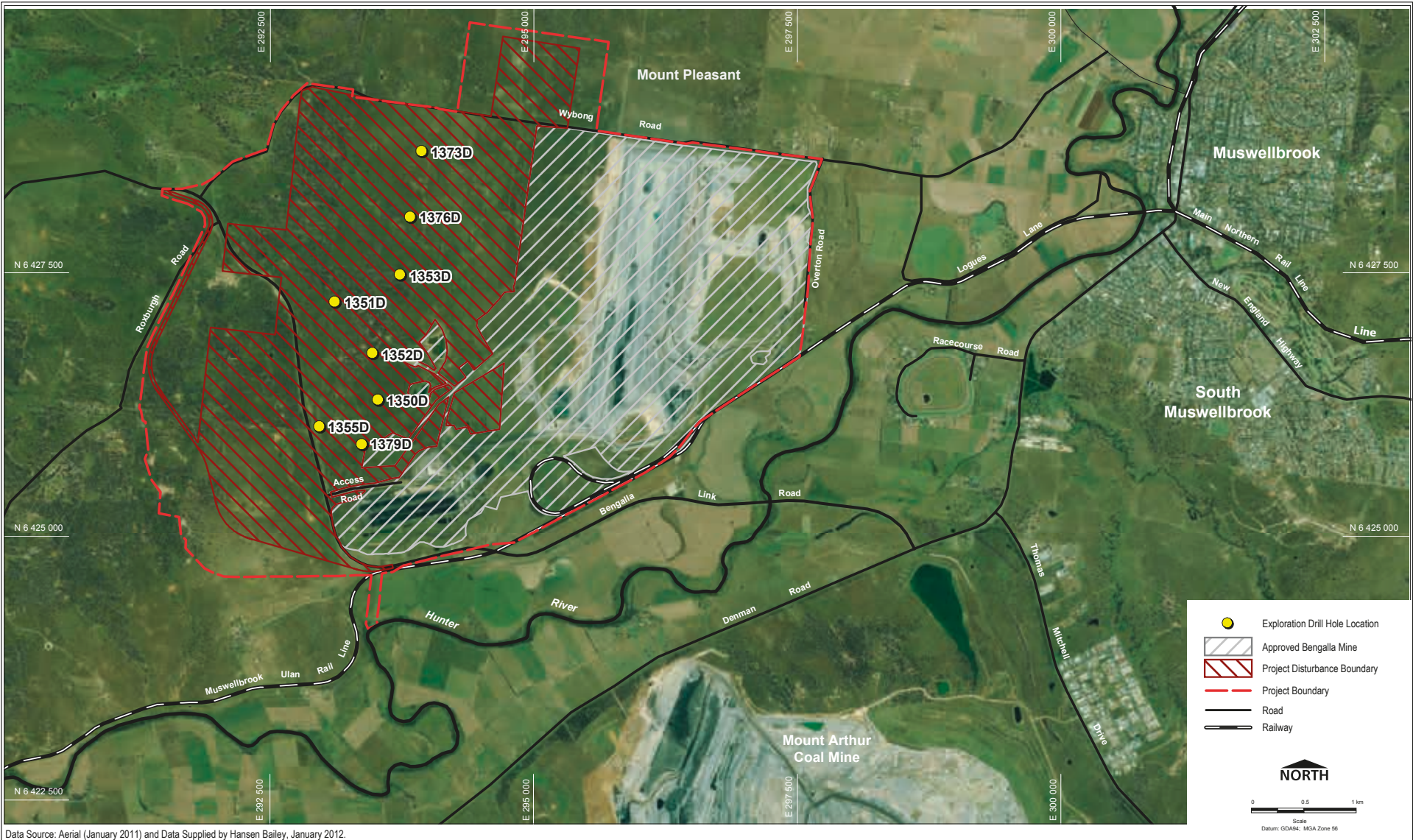
Data Source: Client Supplied 984_Bengallastrat.indd (07-11-2011)

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CONTINUATION OF BENGALLA MINE GEOCHEMICAL IMPACT ASSESSMENT

Figure: 2
**INDICATIVE
 STRATIGRAPHIC COLUMN**



CONTINUATION OF BENGALLA MINE
GEOCHEMICAL IMPACT ASSESSMENT

Figure: 3
DRILL HOLE LOCATIONS
USED FOR
GEOCHEMICAL SAMPLING

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ATTACHMENT B

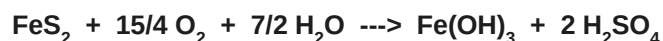
Geochemical Assessment of Mine Waste Materials

ATTACHMENT B

GEOCHEMICAL ASSESSMENT OF MINE WASTE MATERIALS

ACID GENERATION AND PREDICTION

Acid generation is caused by the exposure of sulfide minerals, most commonly pyrite (FeS_2), to atmospheric oxygen and water. Sulfur assay results are used to calculate the maximum 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:



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 balance of the acid generation and neutralisation components.

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 sulfide sulfur content, and the acid neutralising capacity (ANC) of the material, which is determined experimentally. By convention, the NAPP result is expressed in units of kg H_2SO_4 /t sample. If the capacity of the solids to neutralise acid (ANC) exceeds their capacity to generate acid (MPA), then the NAPP of the material is negative. Conversely, if the MPA exceeds the ANC, the NAPP of the material is positive. A NAPP assessment involves a series of analytical tests that include:

Determination of pH and EC

pH and EC measured on 1:5 w/w water extract. This gives an indication of the inherent acidity and salinity of the waste material when initially exposed in a waste 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 sodium hydroxide (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 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 $\text{NAG}_{\text{pH}} < 4.5$) 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 $\text{NAG}_{\text{pH}} > 4.5$ 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 is used to refine the results of the theoretical NAPP predictions. The NAG test can sometimes be used as a stand-alone test at some hard rock mines, but is recommended that this only be considered after site specific calibration work is carried out. The NAG test can generate false positive results for waste materials from coal mines containing elevated organic carbon and is generally not used by RGS for coal mine wastes.

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 sample:deionised water).

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 (*e.g.* 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 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.

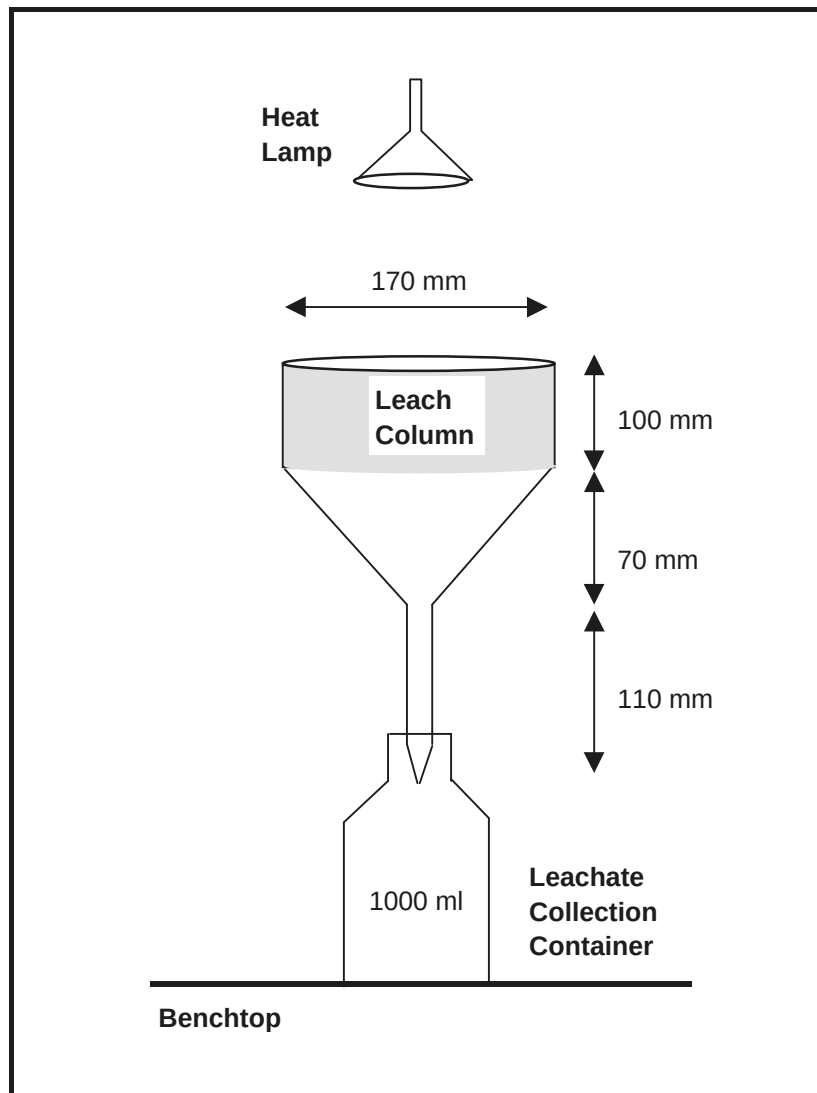
The kinetic tests simulate the weathering process that leads to acid and base generation and reaction under laboratory controlled or site conditions. The kinetic tests allow an assessment of the acid forming characteristics and indicate the rate of acid generation, over what period it will occur, and what management controls may be required.

In kinetic column leach 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 2-3 kg of sample is generally used in the leach columns and depending on the physical nature of the material and particle size can be used on an as-received basis (*i.e.* no crushing as with process residues) or 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 500 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 500 ml/kg per month 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 °C.

Figure B1
Kinetic Leach Column Setup



Reference:

AMIRA (2002). AMIRA International. *ARD Test Handbook. Project P387A Prediction & Kinetic Control of Acid Mine Drainage.* Ian Wark Institute and Environmental Geochemistry International Pty Ltd. May 2002, Melbourne, VIC.

ATTACHMENT C

Kinetic Leach Column Test Results and Trends

Table KLC1
KLC1 Test Results: Overburden 1

Sample Weight (kg)	1.7	Total S (%)		0.0258	ANC (kg H2SO4/t)		59.06	
pH(1:5)	9.5	CRS (%)		-	NAPP (kg H2SO4/t)		-58.3	
EC(1:5) (µS/cm)	368	MPA (kg H2SO4/t)		0.8	ANC:MPA ratio		74.7	
Date	07-Jul-11	19-Jul-11	03-Aug-11	18-Aug-11	31-Aug-11	15-Sep-11	29-Nov-11	
Leach Number	1	2	3	4	5	6	7	
Volume Collected (L)	0.586	0.735	0.751	0.75	0.809	0.81	0.781	
Cum. Volume (L)	0.59	1.32	2.07	2.82	3.63	4.44	5.22	
Pore Volumes	0.4	1.0	1.5	2.1	2.7	3.3	3.9	
pH	9.27	9.23	9.79	9.51	9.61	9.66	9.63	
EC (mS/cm)	267	226	189	166	193	169	145	
Acidity (mg/L)*	<1	<1	<1	<1	<1	<1	<1	
Alkalinity (mg/L)*	109	65	48	48	53	43	42	
Net Alkalinity (mg/L)*	109	65	48	48	53	43	42	
Dissolved elements (mg/L)								Guideline Levels1
Al	2.45	2.4	1.8	134	3.23	3.3	2.39	5
As	0.023	0.02	0.016	0.025	0.017	0.015	0.008	0.5
B	<0.05	<0.05	<0.05	0.09	<0.05	<0.05	<0.05	5
Ca	4	0.5	0.5	0.5	0.5	0.5	0.5	1000
Cd	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	0.01
Cl	13	16	8	8	10	6	5	-
Co	<0.001	<0.001	<0.001	0.023	<0.001	<0.001	<0.001	1
Cr	0.002	0.004	0.002	0.109	0.003	0.003	<0.001	1 / -
Cu	<0.001	<0.001	<0.001	0.023	<0.001	<0.001	<0.001	1 / 0.5
Fe	0.08	0.1	0.11	13.5	0.28	0.25	0.08	-
K	2	2	2	2	2	1	<1	-
Mg	4	0.5	0.5	0.5	0.5	0.5	0.5	-
Mn	<0.001	<0.001	<0.001	0.052	0.001	0.001	<0.001	-
Mo	0.013	0.046	0.03	0.03	0.036	0.028	0.018	0.15
Na	50	48	38	35	39	35	28	-
Ni	<0.001	<0.001	<0.001	0.042	<0.001	<0.001	<0.001	1
Pb	<0.001	<0.001	<0.001	0.03	<0.001	<0.001	<0.001	0.1
SO4	15	34	26	21	24	24	15	1,000
Sb	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	-
Se	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Zn	<0.005	<0.005	<0.005	0.097	<0.005	<0.005	<0.005	20
RESULTS**								
SO4 Release Rate	5.2	14.9	11.6	9.4	11.6	11.6	7.0	
Cumulative SO4 Release	5.2	20.1	31.7	41.1	52.7	64.2	71.2	
Ca Release Rate	10.0	0.2	0.2	0.2	0.2	0.2	0.2	
Cumulative Ca Release	10.0	10.2	10.4	10.7	10.9	11.1	11.4	
Mg Release Rate	2.9	0.2	0.2	0.2	0.2	0.2	0.2	
Cumulative Mg Release	3.0	3.2	3.4	3.7	3.9	4.1	4.4	
Residual ANC (%)	99.90	99.80	99.93	99.93	99.93	99.93	99.92	
Residual Sulfur (%)	99.3	97.4	95.9	94.7	93.2	91.7	90.8	
SO4/(Ca+Mg) molar ratio	0.6	10.7	8.2	6.6	7.6	7.6	4.7	

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg CaCO₃ /L

** SO₄, Ca and Mg release rates calculated in mg/kg/flush.

Total S = Total Sulfur, SCR = Chromium Reducible Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential
1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999) . Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

Table KLC2
KLC2 Test Results: Overburden 2

Sample Weight (kg)	1.8	Total S (%)		0.02	ANC (kg H ₂ SO ₄ /t)		121.25	
pH(1:5)	9.6	CRS (%)		-	NAPP (kg H ₂ SO ₄ /t)		-120.6	
EC(1:5) (µS/cm)	403	MPA (kg H ₂ SO ₄ /t)		0.6	ANC:MPA ratio		198.0	
Date	07-Jul-11	19-Jul-11	03-Aug-11	18-Aug-11	31-Aug-11	15-Sep-11	29-Nov-11	
Leach Number	1	2	3	4	5	6	7	
Volume Collected (L)	0.62	0.728	0.744	0.785	0.827	0.84	0.835	
Cum. Volume (L)	0.62	1.35	2.09	2.88	3.70	4.54	5.38	
Pore Volumes	0.5	1.0	1.5	2.1	2.7	3.4	4.0	
pH	9.32	9.36	9.72	9.56	9.65	9.64	9.67	
EC (µS/cm)	260	226	196	151	158	239	171	
Acidity (mg/L)*	<1	<1	<1	<1	<1	<1	<1	
Alkalinity (mg/L)*	137	226	70	62	57	75	63	
Net Alkalinity (mg/L)*	137	226	70	62	57	75	63	
Dissolved elements (mg/L)								Guideline Levels ¹
Al	1.92	1.88	2.16	50.9	2.54	3.29	2.96	5
As	0.011	0.014	0.014	0.029	0.01	0.017	0.007	0.5
B	<0.05	<0.05	<0.05	0.09	<0.05	<0.05	<0.05	5
Ca	6	1	1	3	1	0.5	0.5	1000
Cd	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	0.0002	0.01
Cl	8	11	7	6	6	8	4	-
Co	<0.001	<0.001	<0.001	0.023	<0.001	<0.001	<0.001	1
Cr	<0.001	<0.001	<0.001	0.111	<0.001	<0.001	<0.001	1 / -
Cu	<0.001	<0.001	<0.001	0.025	<0.001	<0.001	<0.001	1 / 0.5
Fe	<0.05	<0.05	<0.05	11.3	0.08	0.06	<0.05	-
K	5	3	2	15	2	1	1	-
Mg	6	0.5	0.5	3	0.5	0.5	0.5	-
Mn	<0.001	<0.001	<0.001	0.102	0.001	0.001	0.001	-
Mo	0.004	0.018	0.016	0.015	0.015	0.03	0.013	0.15
Na	48	48	39	33	31	50	33	-
Ni	<0.001	<0.001	<0.001	0.037	<0.001	<0.001	0.004	1
Pb	<0.001	<0.001	<0.001	0.033	<0.001	<0.001	<0.001	0.1
SO ₄	10	26	21	13	15	32	12	1,000
Sb	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	-
Se	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.02
Zn	<0.005	<0.005	<0.005	0.096	<0.005	<0.005	0.007	20
RESULTS**								
SO ₄ Release Rate	3.4	10.5	8.7	5.7	6.9	14.9	5.6	
Cumulative SO ₄ Release	3.4	14.0	22.6	28.3	35.2	50.1	55.7	
Ca Release Rate	2.1	0.4	0.4	1.3	0.5	0.2	0.2	
Cumulative Ca Release	2.1	2.5	2.9	4.2	4.7	4.9	5.1	
Mg Release Rate	2.1	0.2	0.2	1.3	0.2	0.2	0.2	
Cumulative Mg Release	2.1	2.3	2.5	3.8	4.0	4.2	4.5	
Residual ANC (%)	99.99	99.99	99.99	99.98	99.98	99.98	99.97	
Residual Sulfur (%)	99.4	97.7	96.2	95.3	94.1	91.6	90.7	
SO ₄ /(Ca+Mg) molar ratio	0.3	5.9	4.8	0.7	3.4	10.1	3.8	

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg CaCO₃/L

** SO₄, Ca and Mg release rates calculated in mg/kg/flush.

Total S = Total Sulfur, S_{CR} = Chromium Reducible Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999). Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

Table KLC3
KLC3 Test Results: Coal Reject 1

Sample Weight (kg)	1.3	Total S (%)		1.23	ANC (kg H ₂ SO ₄ /t)		43.4	
pH(1:5)	8.0	CRS (%)		-	NAPP (kg H ₂ SO ₄ /t)		-5.7	
EC(1:5) (μS/cm)	408	MPA (kg H ₂ SO ₄ /t)		37.7	ANC:MPA ratio		1.2	
Date	07-Jul-11	19-Jul-11	03-Aug-11	18-Aug-11	31-Aug-11	15-Sep-11	29-Nov-11	
Leach Number	1	2	3		5	6	7	
Volume Collected (L)	0.865	0.729	0.666	0.716	0.725	0.82	0.766	
Cum. Volume (L)	0.87	1.59	2.26	2.98	3.70	4.52	5.29	
Pore Volumes	0.8	1.4	2.0	2.6	3.2	3.9	4.6	
pH	7.25	7.09	7.22	7.01	7.22	7.09	7.07	
EC (μS/cm)	408	228	376	363	342	508	399	
Acidity (mg/L)*	<1	2	2	2	2	4	1	
Alkalinity (mg/L)*	20	7	7	9	10	12	8	
Net Alkalinity (mg/L)*	20	5	5	7	8	8	7	
Dissolved elements (mg/L)								Guideline Levels ¹
Al	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	5
As	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.5
B	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	5
Ca	10	6	8	12	11	15	16	1000
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.01
Cl	8	5	2	3	3	3	2	-
Co	<0.001	<0.001	0.002	0.002	0.002	0.001	0.003	1
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	1 / -
Cu	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	1 / 0.5
Fe	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
K	<1	<1	<1	1	<1	1	1	-
Mg	8	4	9	12	9	20	15	-
Mn	<0.001	<0.001	0.037	0.04	0.026	0.022	0.074	-
Mo	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	0.15
Na	51	36	51	45	45	56	36	-
Ni	<0.001	0.001	0.004	0.003	0.003	0.002	0.004	1
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.1
SO ₄	136	88	152	156	146	225	168	1,000
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Se	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.02
Zn	<0.005	<0.005	0.006	0.007	0.009	0.008	0.016	20
RESULTS**								
SO ₄ Release Rate	93	51	80	89	84	146	102	
Cumulative SO ₄ Release	93	144	225	313	397	544	646	
Ca Release Rate	7	3	4	7	6	10	10	
Cumulative Ca Release	7	10	15	21	28	37	47	
Mg Release Rate	5	2	4.8	7	5	13	9	
Cumulative Mg Release	5	8	13	19	25	38	47	
Residual ANC (%)	99.91	99.87	99.80	99.70	99.62	99.44	99.30	
Residual Sulfur (%)	99.75	99.61	99.39	99.15	98.92	98.52	98.25	
SO ₄ /(Ca+Mg) molar ratio	2.4	2.9	2.8	2.0	2.4	2.0	1.7	

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg CaCO₃/L

** SO₄, Ca and Mg release rates calculated in mg/kg/flush.

Total S = Total Sulfur, S_{CR} = Chromium Reducible Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999). Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

Table KLC4
KLC4 Test Results: Coal Reject 2

Sample Weight (kg)	0.73	Total S (%)		1.62	ANC (kg H ₂ SO ₄ /t)		5.4	
pH(1:5)	7.4	CRS (%)		0.634	NAPP (kg H ₂ SO ₄ /t)		14.0	
EC(1:5) (µS/cm)	715	MPA (kg H ₂ SO ₄ /t)		19.4	ANC:MPA ratio		0.3	
Date	03-Sep-11	23-Sep-11	06-Oct-11	20-Oct-11	3-Nov-11	18-Nov-11	4-Nov-11	
Leach Number	1	2	3	4	5	6	7	
Volume Collected (L)	0.88	0.916	0.913	0.878	0.844	0.907	0.906	
Cum. Volume (L)	0.88	1.80	2.71	3.59	4.43	5.34	6.24	
Pore Volumes	0.7	1.3	2.0	2.7	3.3	4.0	4.6	
pH	8.39	7.25	7.35	7.28	6.69	6.36	5.75	
EC (µS/cm)	3440	53	234	290	462	588	223	
Acidity (mg/L)*	<1	2	3	3	21	4	27	
Alkalinity (mg/L)*	335	4	9	9	6	5	4	
Net Alkalinity (mg/L)*	335	2	6	6	-15	1	-23	
Dissolved elements (mg/L)								Guideline Levels ¹
Al	0.04	0.06	0.42	<0.01	<0.01	<0.01	0.02	5
As	0.003	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.5
B	0.18	<0.05	0.21	<0.05	<0.05	<0.05	<0.05	5
Ca	12	0.5	16	15	39	31	31	1000
Cd	<0.0001	<0.0001	0.0194	<0.0001	0.0002	0.0009	0.0011	0.01
Cl	370	1	1	<1	1	3	2	-
Co	0.001	<0.001	1.08	0.007	0.016	0.049	0.029	1
Cr	0.002	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	1 / -
Cu	<0.001	<0.001	0.073	<0.001	<0.001	<0.001	0.009	1 / 0.5
Fe	<0.05	<0.05	0.46	<0.05	<0.05	<0.05	<0.05	-
K	5	<1	<1	5	1	2	2	-
Mg	6	0.5	4	4	9	18	20	-
Mn	0.029	0.003	4.33	0.063	0.148	0.364	0.19	-
Mo	0.092	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.15
Na	768	8	28	29	30	54	32	-
Ni	<0.001	<0.001	0.834	0.009	0.017	0.054	0.034	1
Pb	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	0.1
SO ₄	862	16	96	115	200	272	208	1,000
Sb	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Se	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	0.02
Zn	<0.005	<0.005	0.678	<0.005	0.01	0.04	0.103	20
RESULTS**								
SO ₄ Release Rate	1039	20	120	138	231	338	258	
Cumulative SO ₄ Release	1039	1059	1179	1318	1549	1887	2145	
Ca Release Rate	14.5	0.6	20.0	18.0	45.1	38.5	38.5	
Cumulative Ca Release	14.5	15.1	35.1	53.1	98.2	136.8	175.2	
Mg Release Rate	7.2	0.6	5.0	4.8	10.4	22.4	24.8	
Cumulative Mg Release	7.2	7.9	12.9	17.7	28.1	50.4	75.3	
Residual ANC (%)	98.8	98.7	97.5	96.3	93.5	90.0	86.4	
Residual Sulfur (%)	97.9	97.8	97.6	97.3	96.8	96.1	95.6	
SO ₄ /(Ca+Mg) molar ratio	16.4	5.0	1.8	2.2	1.5	1.9	1.4	

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg CaCO₃/L

** SO₄, Ca and Mg release rates calculated in mg/kg/flush.

Total S = Total Sulfur, S_{CR} = Chromium Reducible Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999). Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

Table KLC5
KLC5 Test Results: Coal Reject 3

Sample Weight (kg)	1.1	Total S (%)		5.02	ANC (kg H ₂ SO ₄ /t)		4.8	
pH(1:5)	4.9	CRS (%)		3.65	NAPP (kg H ₂ SO ₄ /t)		107.0	
EC(1:5) (µS/cm)	554	MPA (kg H ₂ SO ₄ /t)		111.8	ANC:MPA ratio		0.0	
Date	09-Sep-11	23-Sep-11	06-Oct-11	20-Oct-11	3-Nov-11	18-Jan-11	4-Nov-11	
Leach Number	1	2	3	4	5	6	7	
Volume Collected (L)	0.898	0.781	0.857	0.798	0.786	0.821	0.771	
Cum. Volume (L)	0.90	1.68	2.54	3.33	4.12	4.94	5.71	
Pore Volumes	0.8	1.5	2.2	2.9	3.6	4.3	5.0	
pH	2.73	2.74	2.64	2.51	2.42	2.2	2.24	
EC (µS/cm)	2340	1860	3530	3210	4010	4840	4760	
Acidity (mg/L)*	461	307	1050	869	2310	2600	2730	
Alkalinity (mg/L)*	<1	<1	<1	<1	<1	<1	<1	
Net Alkalinity (mg/L)*	-461	-307	-1050	-869	-2310	-2600	-2730	
Dissolved elements (mg/L)								Guideline Levels ¹
Al	3.72	2.2	19.8	19.5	58.1	75.1	80.6	5
As	0.007	0.012	0.022	0.112	0.222	0.392	0.358	0.5
B	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	5
Ca	34	17	29	28	30	35	36	1000
Cd	0.0155	0.0086	0.0419	0.0296	0.0523	0.0462	0.0421	0.01
Cl	2	<1	<1	<1	<1	<1	<1	-
Co	0.422	0.277	1.63	1	2	1.85	1.5	1
Cr	0.001	0.002	0.007	0.008	0.015	0.015	0.026	1 / -
Cu	0.792	0.452	2.62	1.96	4.2	4.6	4.3	1 / 0.5
Fe	95.4	102	265	307	623	799	812	-
K	1	<1	<1	4	<1	<1	<1	-
Mg	14	11	67	50	96	94	104	-
Mn	0.671	0.616	3.59	3.72	8.46	10.4	11.3	-
Mo	<0.001	0.001	<0.001	0.005	0.006	0.012	<0.010	0.15
Na	288	169	437	219	178	139	85	-
Ni	0.358	0.266	1.34	0.979	1.88	1.93	1.65	1
Pb	0.025	0.002	<0.001	0.002	<0.001	<0.001	<0.010	0.1
SO ₄	1100	758	2060	1650	2580	3290	2660	1,000
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.010	-
Se	<0.01	<0.01	0.01	<0.01	0.02	0.02	<0.10	0.02
Zn	1.59	0.942	4.98	3	5.39	4.97	3.96	20
RESULTS**								
SO ₄ Release Rate	885	530	1582	1180	1817	2420	1838	
Cumulative SO ₄ Release	885	1416	2998	4177	5994	8415	10252	
Ca Release Rate	27	11.9	22.3	20.0	21.1	25.7	24.9	
Cumulative Ca Release	27	39	62	82	103	128	153	
Mg Release Rate	11.3	7.7	51.5	35.8	67.6	69.2	71.8	
Cumulative Mg Release	11.3	19.0	70.4	106.2	173.8	242.9	314.8	
Residual ANC (%)	97.7	96.4	91.0	86.9	80.2	73.1	65.8	
Residual Sulfur (%)	99.4	99.1	98.0	97.2	96.0	94.4	93.2	
SO ₄ /(Ca+Mg) molar ratio	8.0	9.0	6.2	6.2	5.7	7.2	5.3	

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg CaCO₃/L

** SO₄, Ca and Mg release rates calculated in mg/kg/flush.

Total S = Total Sulfur, S_{CR} = Chromium Reducible Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999). Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

Table KLC6
KLC6 Test Results: Coal Reject 4

Sample Weight (kg)	1.6	Total S (%)	7.64	ANC (kg H ₂ SO ₄ /t)	21.95			
pH(1:5)	8.0	CRS (%)	7.27	NAPP (kg H ₂ SO ₄ /t)	200.7			
EC(1:5) (μS/cm)	429	MPA (kg H ₂ SO ₄ /t)	222.6	ANC:MPA ratio	0.1			
Date	08-Sep-11	23-Sep-11	06-Oct-11	20-Oct-11	3-Nov-11	18-Nov-11	4-Dec-11	
Leach Number	1	2	3	4	5	6	7	
Volume Collected (L)	0.744	0.641	0.737	0.561	0.544	0.603	0.573	
Cum. Volume (L)	0.74	1.39	2.12	2.68	3.23	3.83	4.40	
Pore Volumes	0.6	1.2	1.8	2.3	5.5	3.3	3.8	
pH	7.71	3.85	3.99	3.33	2.52	2.05	2.03	
EC (μS/cm)	3180	6590	4920	4770	7270	14300	13900	
Acidity (mg/L)*	10	34	28	180	2000	18500	38300	
Alkalinity (mg/L)*	240	<1	<1	<1	<1	<1	<1	
Net Alkalinity (mg/L)*	230	-34	-28	-180	-2000	-18500	-38300	
Dissolved elements (mg/L)								Guideline Levels ¹
Al	<0.01	1.08	0.4	1.95	7.92	213	258	5
As	0.001	0.001	<0.001	0.002	0.019	1.07	1.66	0.5
B	0.11	0.28	0.2	0.06	<0.05	<0.10	<0.10	5
Ca	13	141	193	244	282	326	254	1000
Cd	<0.0001	0.0214	0.019	0.0404	0.123	0.338	0.182	0.01
Cl	281	35	4	1	<1	<5	<1	-
Co	0.006	1.18	1.09	1.74	4.14	14.1	6.88	1
Cr	<0.001	<0.001	<0.001	<0.001	0.009	0.165	0.172	1 / -
Cu	0.001	0.206	0.089	0.415	2.44	18.6	16.1	1 / 0.5
Fe	<0.05	20.1	0.45	39.4	508	8150	12000	-
K	4	15	12	26	21	<1	<1	-
Mg	5	84	110	254	672	1480	1040	-
Mn	0.022	3.09	4.3	13.5	43	175	182	-
Mo	0.031	<0.001	<0.001	<0.001	<0.001	<0.010	0.013	0.15
Na	751	1440	930	604	418	122	2	-
Ni	0.006	0.884	0.831	1.46	3.86	17	9.74	1
Pb	<0.001	0.009	0.003	0.024	0.121	0.029	<0.010	0.1
SO ₄	933	3710	2860	3030	5790	24800	27500	1,000
Sb	0.002	<0.001	<0.001	<0.001	<0.001	<0.010	<0.010	-
Se	<0.01	0.11	0.04	0.05	0.06	0.21	0.22	0.02
Zn	<0.005	1.62	0.67	1.9	7.5	33.6	16.5	20
RESULTS**								
SO ₄ Release Rate	433	1483	1315	1060	1965	9328	9829	
Cumulative SO ₄ Release	433	1916	3231	4291	6256	15584	25413	
Ca Release Rate	6	56.4	88.7	85.4	95.7	122.6	90.8	
Cumulative Ca Release	6	62	151	237	332	455	546	
Mg Release Rate	2.3	33.6	50.6	88.9	228.0	556.7	371.7	
Cumulative Mg Release	2.3	35.9	86.5	175.4	403.4	960.0	1331.7	
Residual ANC (%)	99.9	98.6	96.7	94.1	88.9	77.3	69.5	
Residual Sulfur (%)	99.8	99.2	98.6	98.1	97.3	93.2	88.9	
SO ₄ /(Ca+Mg) molar ratio	18.3	5.5	3.2	1.9	1.7	3.7	5.8	

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg CaCO₃/L

** SO₄, Ca and Mg release rates calculated in mg/kg/flush.

Total S = Total Sulfur, S_{CR} = Chromium Reducible Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999). Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

Table KLC7
KLC7 Test Results: Coal Reject 5

Sample Weight (kg)	1.5	Total S (%)		0.30	ANC (kg H ₂ SO ₄ /t)		3.7	
pH(1:5)	7.9	CRS (%)		0.044	NAPP (kg H ₂ SO ₄ /t)		-2.4	
EC(1:5) (μS/cm)	404	MPA (kg H ₂ SO ₄ /t)		1.3	ANC:MPA ratio		2.7	
Date	28/10/2011	11/11/2011	25/11/2011	8/12/2011	23-Dec-11	6-Jan-12	20-Jan-12	
Leach Number	1	2	3	4	5	6	7	
Volume Collected (L)	0.942	0.934	0.805	0.684	0.738	0.722	0.82	
Cum. Volume (L)	0.94	1.88	2.68	3.37	4.10	4.83	5.65	
Pore Volumes	0.8	1.6	2.3	2.9	5.5	4.2	4.9	
pH	7.5	5.55	5.53	6.68	6.97	7.18	7.27	
EC (μS/cm)	907	68	199	1060	308	153	88	
Acidity (mg/L)*	3	1	6	4	29	1	8	
Alkalinity (mg/L)*	50	1	3	8	12	9	6	
Net Alkalinity (mg/L)*	47	0	-3	4	-17	8	-2	
Dissolved elements (mg/L)								Guideline Levels ¹
Al	<0.01	0.02	<0.01	0.01	<0.5	<0.01	0.02	5
As	0.002	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.5
B	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.05	5
Ca	16	0.5	4	33	6	4	3	1000
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01
Cl	83	5	12	32	18.00	11.00	5.00	-
Co	0.006	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	1
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	1 / -
Cu	0.004	0.005	<0.001	0.002	<0.001	<0.001	<0.001	1 / 0.5
Fe	<0.05	<0.05	0.08	0.42	<0.5	<0.05	<0.05	-
K	6	<1	<1	3	1.00	<1	<1	-
Mg	21	1	4	38	8	4	3	-
Mn	0.292	0.008	0.01	0.026	<0.01	0.001	<0.001	-
Mo	0.026	0.002	0.01	0.004	0.02	0.011	0.005	0.15
Na	136	8	23	105	38.00	20.00	11.00	-
Ni	0.005	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	1
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.1
SO ₄	260	15	56	330	84	47	31	1,000
Sb	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	-
Se	<0.01	<0.01	<0.01	0.01	<0.1	<0.01	<0.01	0.02
Zn	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	20
RESULTS**								
SO ₄ Release Rate	163	9	30	150	41	23	17	
Cumulative SO ₄ Release	163	173	203	353	394	417	434	
Ca Release Rate	10	0.3	2.1	15.0	3.0	1.9	1.6	
Cumulative Ca Release	10	10	13	28	31	32	34	
Mg Release Rate	13.2	0.6	2.1	17.3	3.9	1.9	1.6	
Cumulative Mg Release	13.2	13.8	16.0	33.3	37.2	39.1	40.8	
Residual ANC (%)	97.9	97.8	97.4	94.6	93.9	93.6	93.3	
Residual Sulfur (%)	98.2	98.1	97.7	96.1	95.6	95.4	95.2	
SO ₄ /(Ca+Mg) molar ratio	2.1	2.9	2.2	1.4	1.8	1.9	1.6	

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg CaCO₃/L

** SO₄, Ca and Mg release rates calculated in mg/kg/flush.

Total S = Total Sulfur, S_{CR} = Chromium Reducible Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999). Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

Table KLC8
KLC8 Test Results: Coal Reject 6

Sample Weight (kg)	1.5	Total S (%)		0.64	ANC (kg H ₂ SO ₄ /t)		27	
pH(1:5)	8.8	CRS (%)		0.495	NAPP (kg H ₂ SO ₄ /t)		-11.8	
EC(1:5) (µS/cm)	381	MPA (kg H ₂ SO ₄ /t)		15.2	ANC:MPA ratio		1.8	
Date	28/10/2011	11/11/2011	25/11/2011	8/12/2011	23-Dec-11	6-Jan-12	20-Jan-12	
Leach Number	1	2	3	4	5	6	7	
Volume Collected (L)	0.96	0.691	0.683	0.705	0.586	0.648	0.534	
Cum. Volume (L)	0.96	1.65	2.33	3.04	3.63	4.27	4.81	
Pore Volumes	0.8	1.4	2.0	2.6	5.5	3.7	4.2	
pH	7.85	6.94	6.69	7.08	7.14	7.34	7.46	
EC (µS/cm)	983	1040	925	424	308	960	951	
Acidity (mg/L)*	5	7	7	<1	17	3	4	
Alkalinity (mg/L)*	106	13	8	9	16	17	14	
Net Alkalinity (mg/L)*	101	6	1	9	-1	14	10	
Dissolved elements (mg/L)								Guideline Levels ¹
Al	<0.01	<0.01	<0.01	0.01	<0.5	<0.01	<0.01	5
As	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.5
B	<0.05	<0.05	<0.05	<0.05	<0.5	0.05	<0.05	5
Ca	12	18	23	9	56	53	58	1000
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01
Cl	94	51	32	29	19.00	18.00	8.00	-
Co	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	1
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	1 / -
Cu	0.002	<0.001	0.002	0.001	<0.001	0.002	0.001	1 / 0.5
Fe	<0.05	<0.05	0.08	0.06	<0.5	<0.05	<0.05	-
K	6	4	5	2	8.00	7.00	6.00	-
Mg	16	22	26	8	59	55	60	-
Mn	0.001	0.001	0.006	0.011	0.05	0.009	0.015	-
Mo	0.033	0.008	0.005	0.031	<0.01	0.003	0.003	0.15
Na	169	153	117	45	101.00	68.00	50.00	-
Ni	0.004	0.002	0.002	<0.001	0.003	0.002	0.002	1
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.1
SO ₄	233	369	362	105	535	435	458	1,000
Sb	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	0.01	-
Se	<0.01	0.02	0.01	<0.01	<0.1	<0.01	<0.01	0.02
Zn	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	20
RESULTS**								
SO ₄ Release Rate	147	168	163	49	206	185	161	
Cumulative SO ₄ Release	147	315	478	526	733	918	1079	
Ca Release Rate	8	8.2	10.3	4.2	21.6	22.6	20.4	
Cumulative Ca Release	8	16	26	30	52	74	95	
Mg Release Rate	10.1	10.0	11.7	3.7	22.7	23.4	21.1	
Cumulative Mg Release	10.1	20.1	31.8	35.5	58.2	81.7	102.8	
Residual ANC (%)	99.8	99.6	99.3	99.2	98.7	98.1	97.6	
Residual Sulfur (%)	99.2	98.4	97.5	97.3	96.2	95.2	94.4	
SO ₄ /(Ca+Mg) molar ratio	2.5	2.8	2.3	2.0	1.5	1.3	1.2	

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg CaCO₃/L

** SO₄, Ca and Mg release rates calculated in mg/kg/flush.

Total S = Total Sulfur, S_{CR} = Chromium Reducible Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999). Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

Figure KLC1a: pH and EC trends for Overburden 1

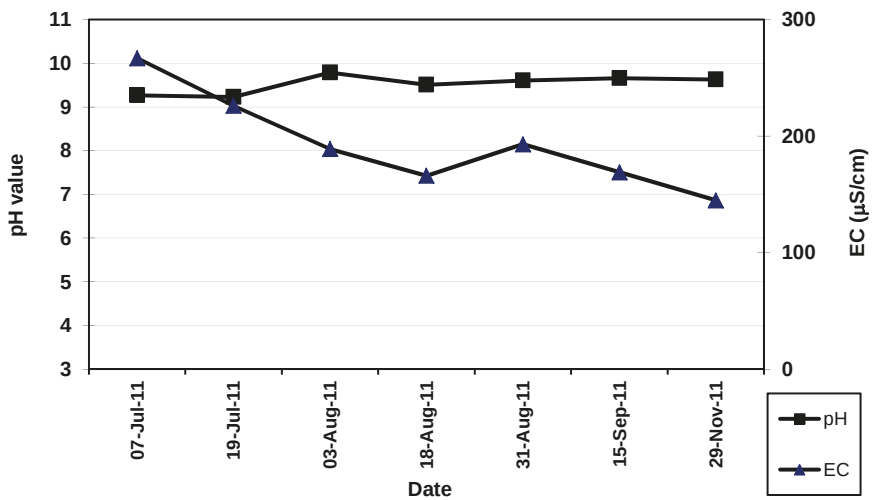


Figure KLC1c: Soluble Metal Trends for Overburden 1

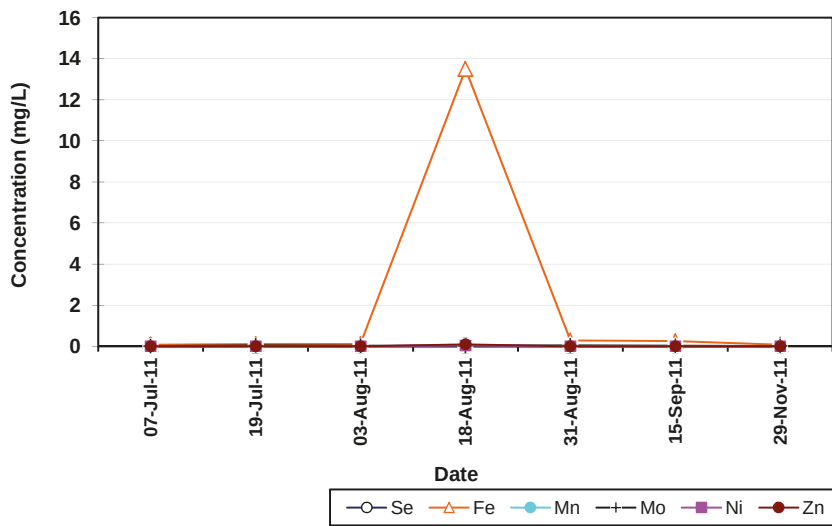


Figure KLC1b: Sulfate Release Rate and Net Alkalinity trends for

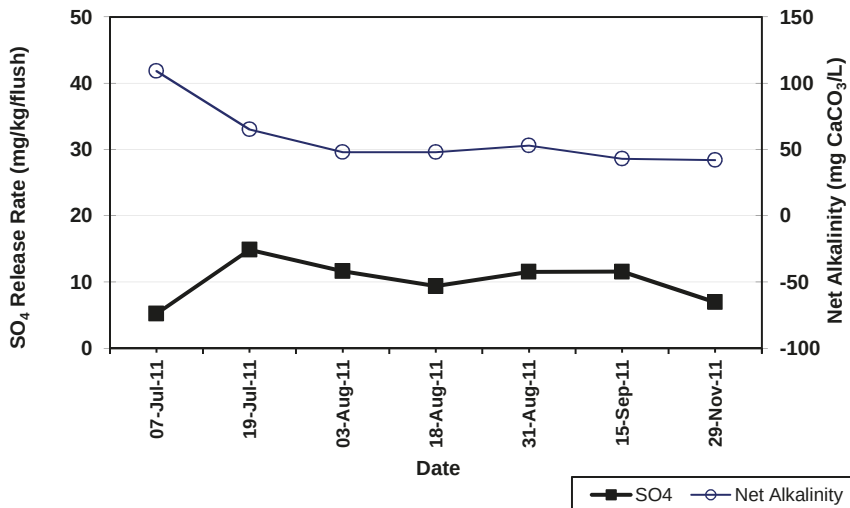


Figure KLC1d: Residual ANC and $\text{SO}_4:(\text{Ca}+\text{Mg})$ Trends for Overburden 1

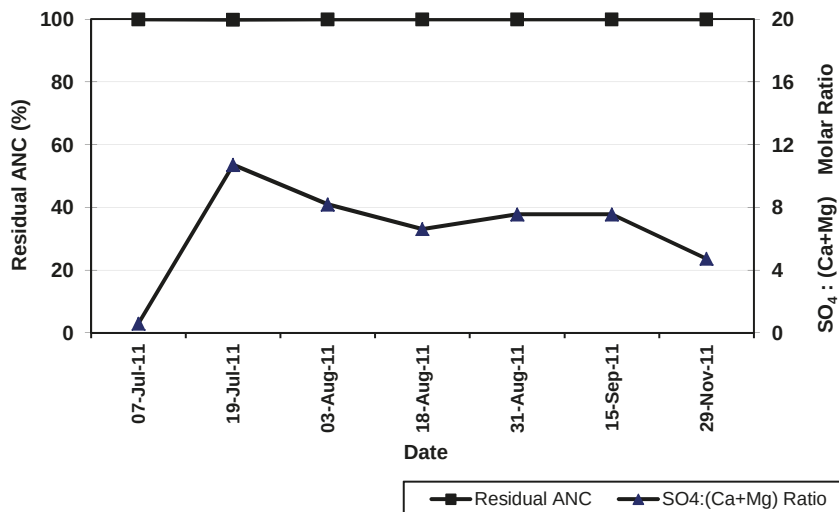


Figure KLC2c: Soluble Metal Trends for Overburden 2

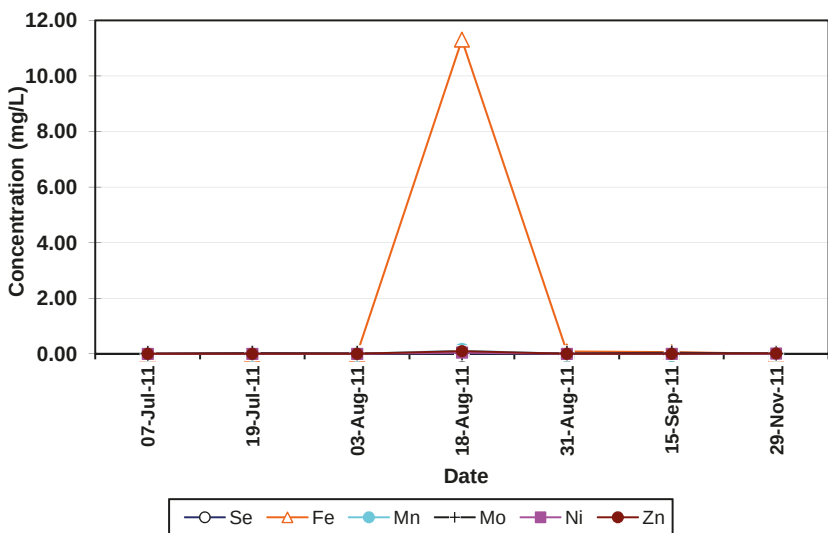


Figure KLC2d: Residual ANC and $\text{SO}_4:(\text{Ca}+\text{Mg})$ Trends for Overburden 2

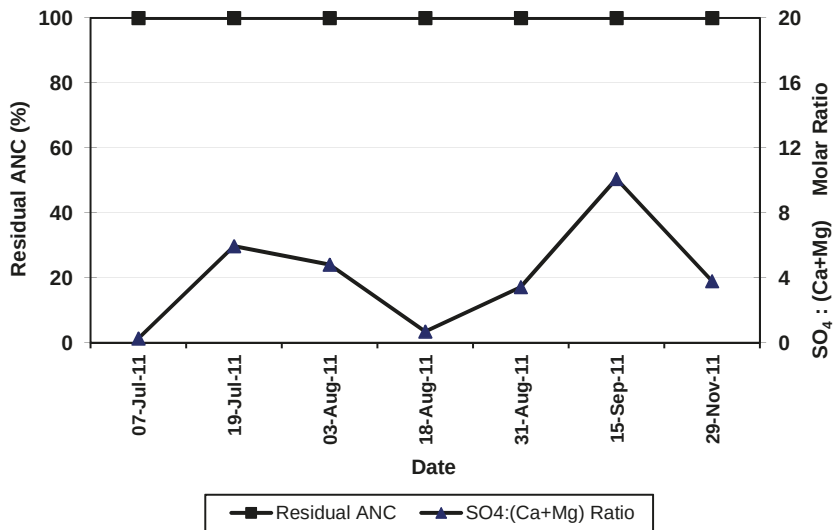


Figure KLC2a: pH and EC trends for Overburden 2

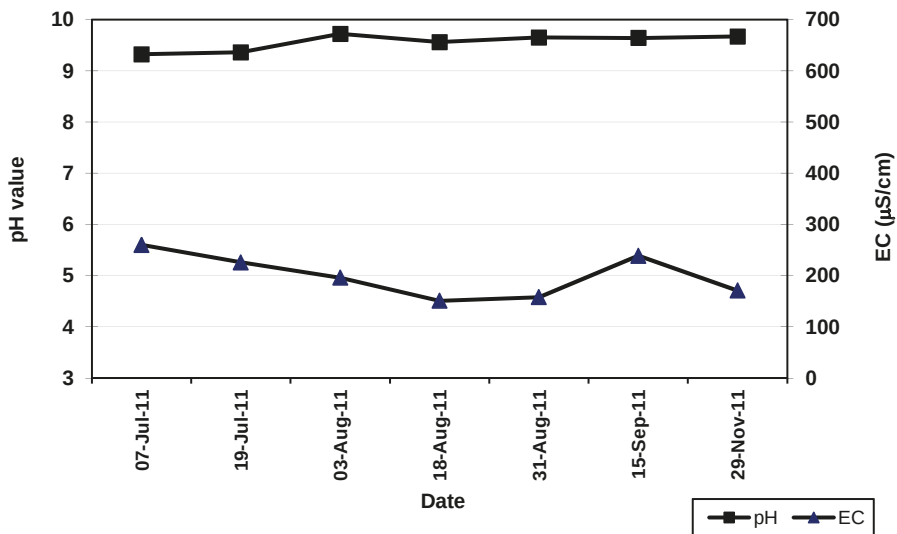
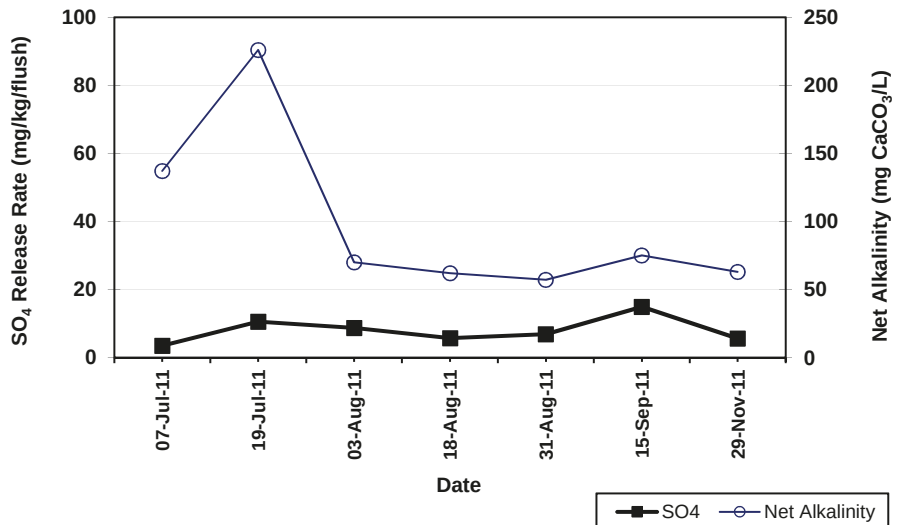


Figure KLC2b: Sulfate Release Rate and Net Alkalinity trends for Overburden 2



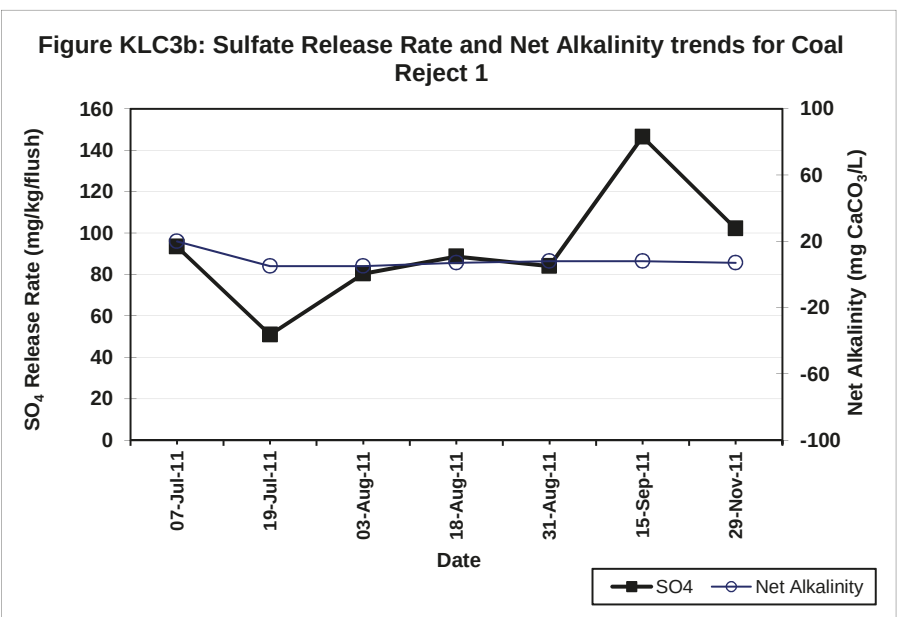
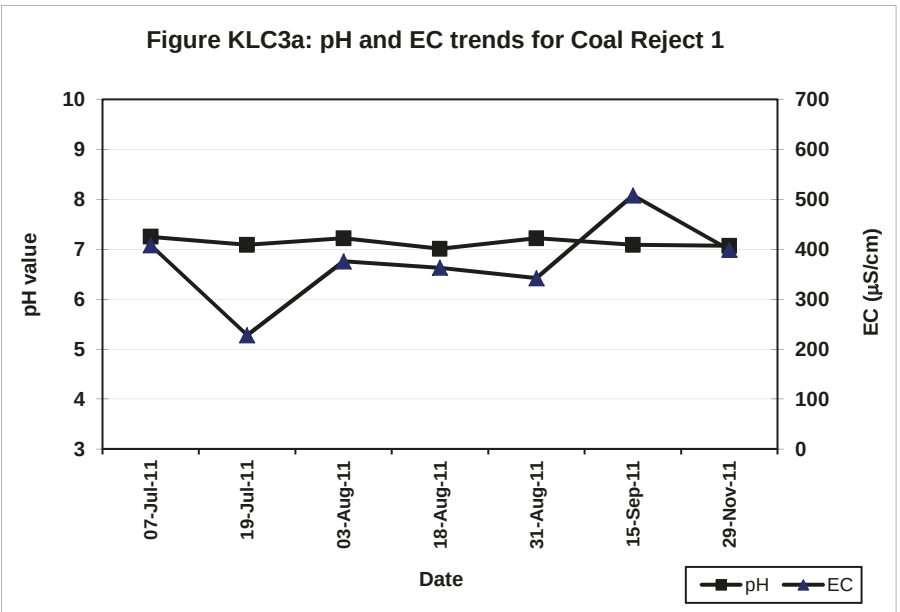
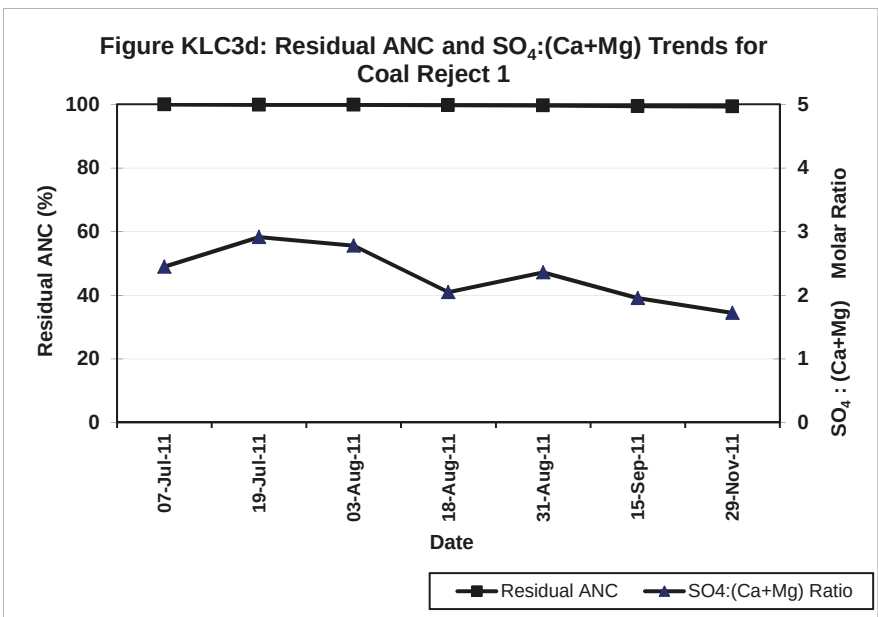
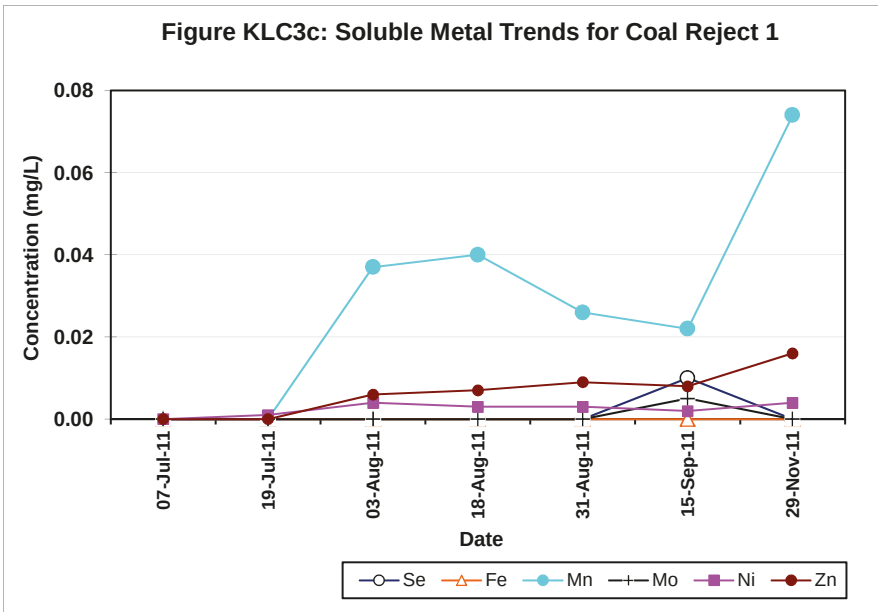


Figure KLC4c: Soluble Metal Trends for Coal Reject 2

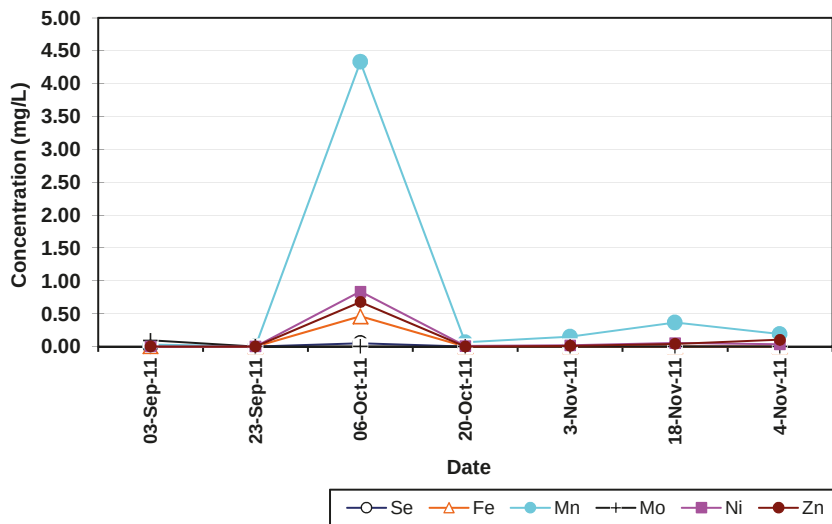


Figure KLC4a: pH and EC trends for Coal Reject 2

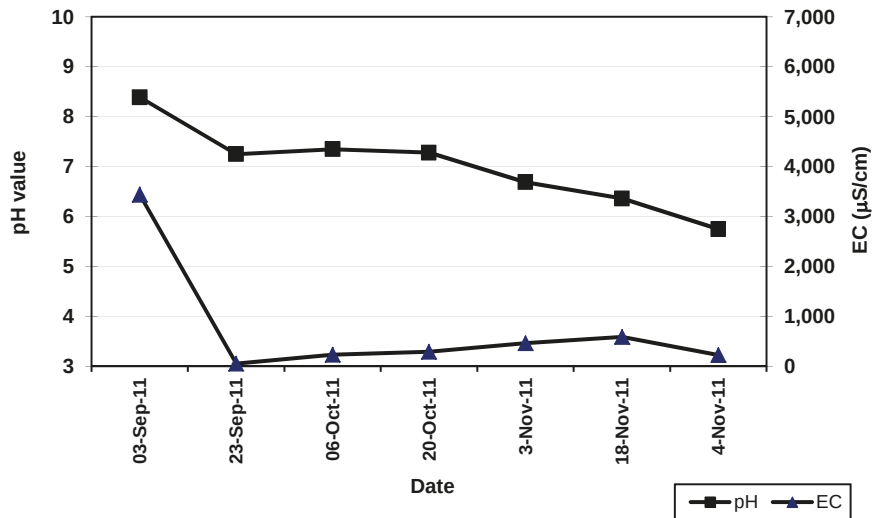


Figure KLC4d: Residual ANC and $\text{SO}_4:(\text{Ca}+\text{Mg})$ Trends for Coal Reject 2

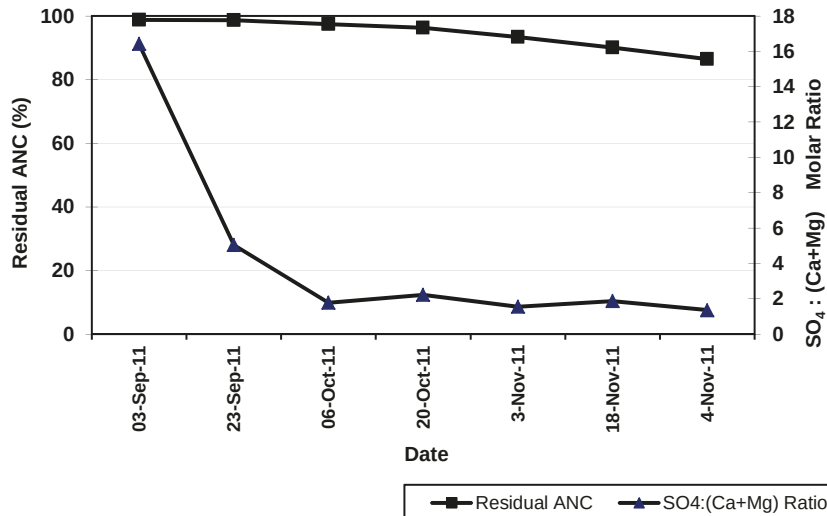


Figure KLC4b: Sulfate Release Rate and Net Alkalinity trends for Coal Reject 2

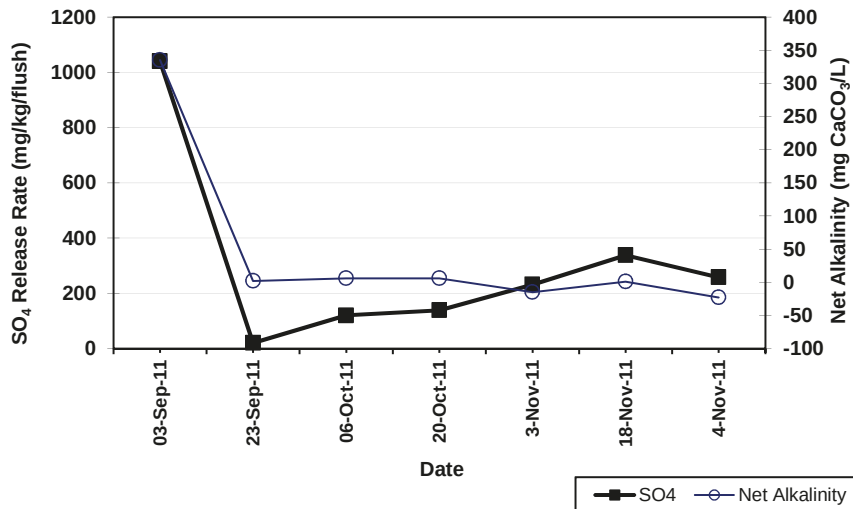


Figure KLC5c: Soluble Metal trends for Coal Reject 3

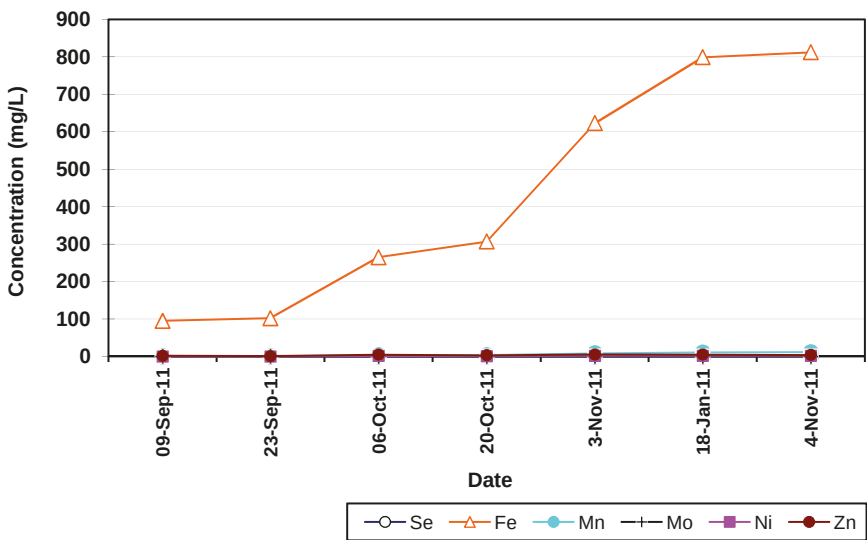


Figure KLC5a: pH and EC trends for Coal Reject 3

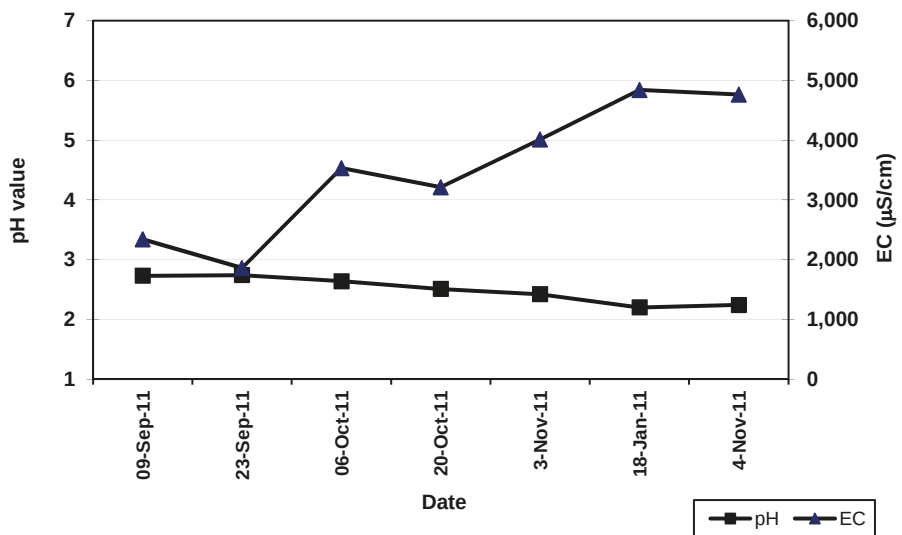


Figure KLC5d: Residual ANC and $\text{SO}_4:(\text{Ca}+\text{Mg})$ trends for Coal Reject 3

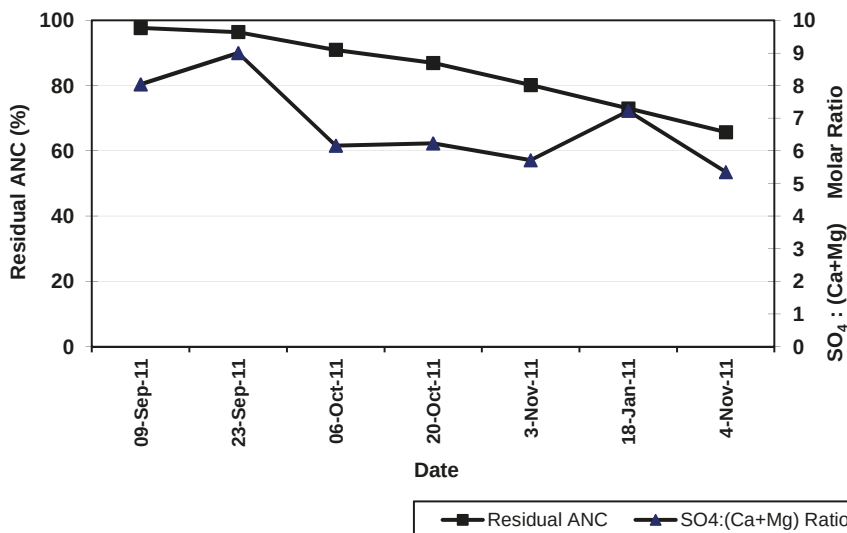


Figure KLC5b: Sulfate Release Rate and Net Alkalinity trends for Coal Reject 3

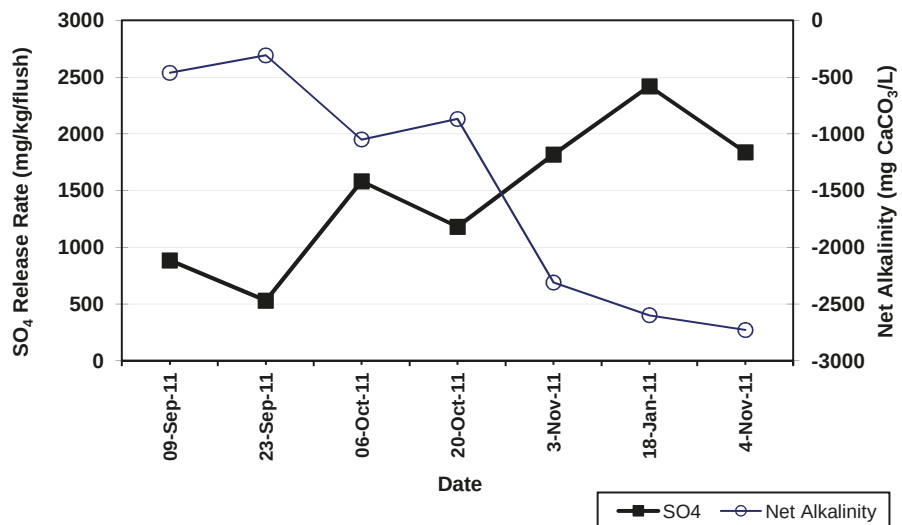


Figure KLC6c: Soluble Metal trends for Coal Reject 4

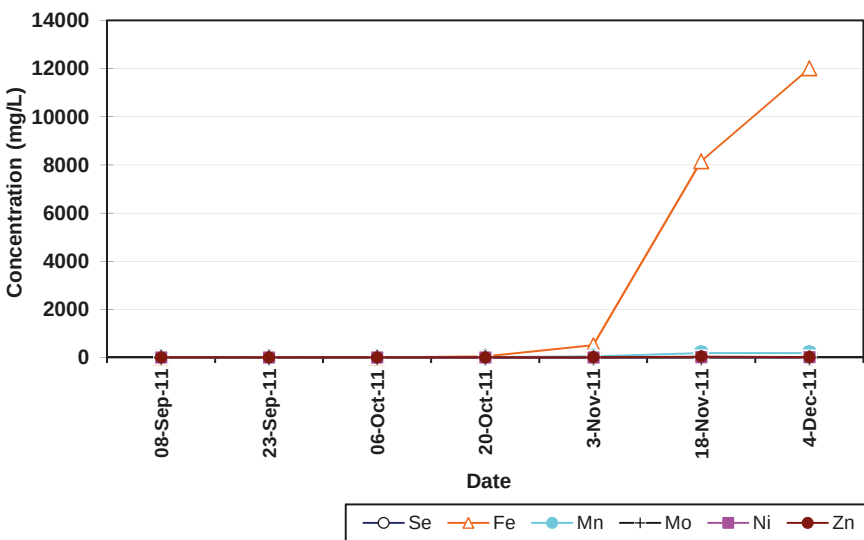


Figure KLC6a: pH and EC trends for Coal Reject 4

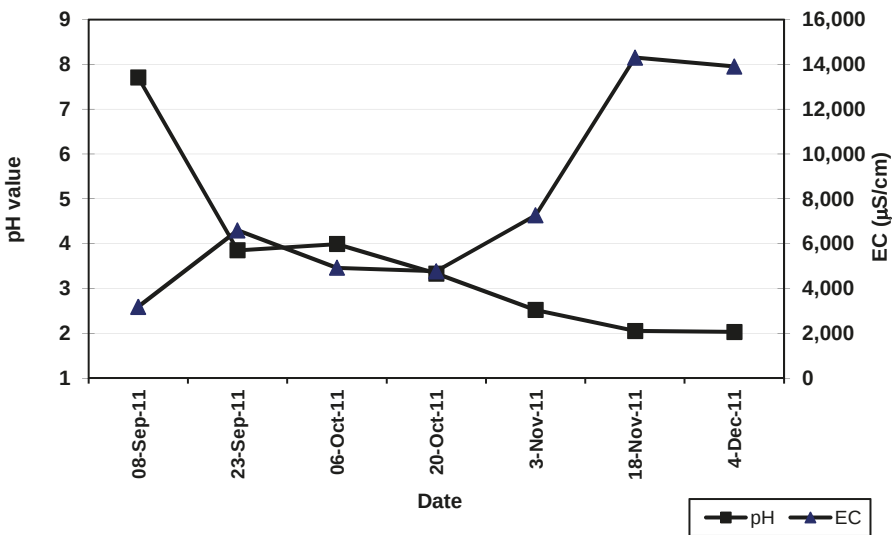


Figure KLC6d: Residual ANC and $\text{SO}_4:(\text{Ca}+\text{Mg})$ trends for Coal Reject 4

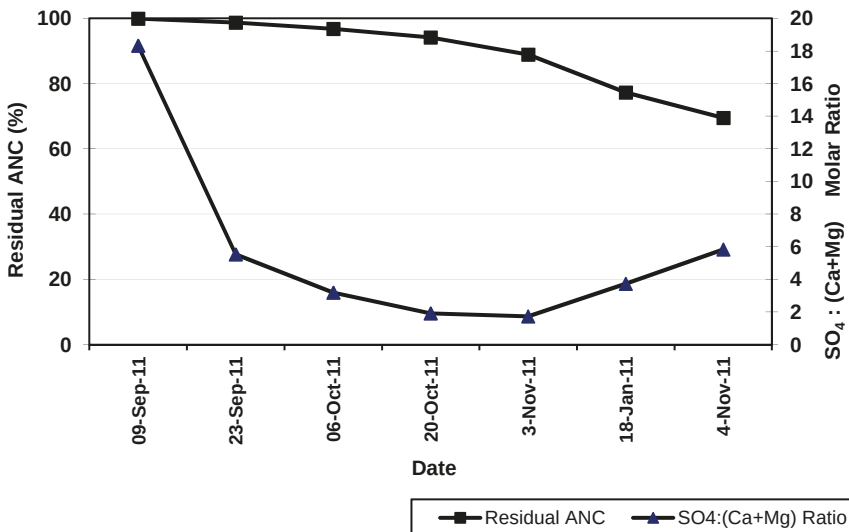


Figure KLC6b: Sulfate Release Rate and Net Alkalinity trends for Coal Reject 4

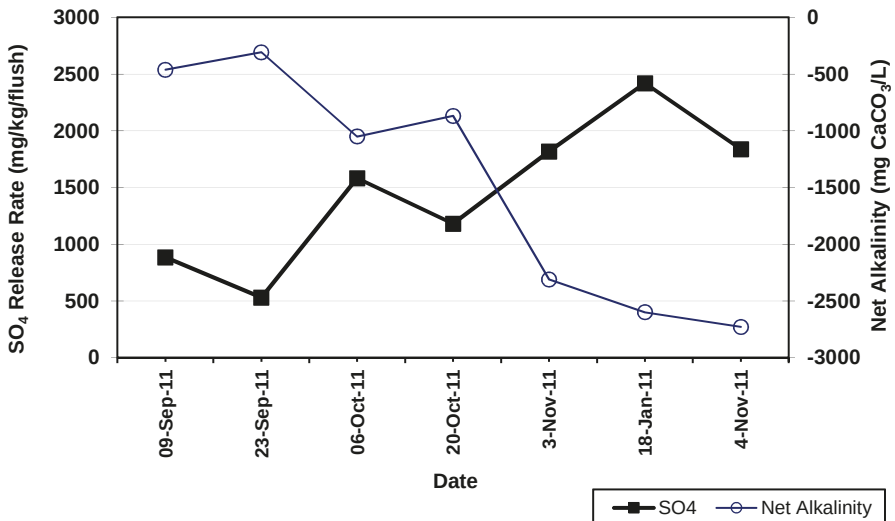


Figure KLC7a: pH and EC trends for Coal Reject 5

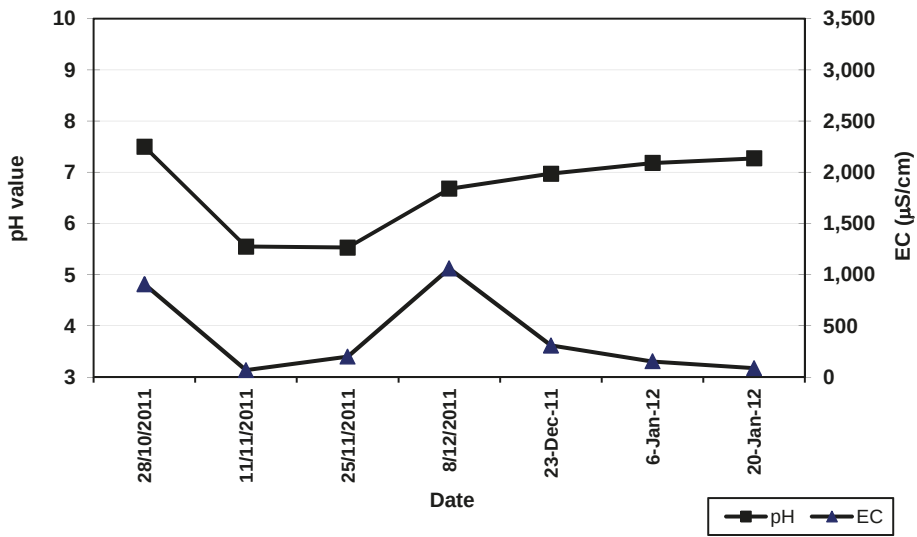


Figure KLC7c: Soluble Metal trends for Coal Reject 5

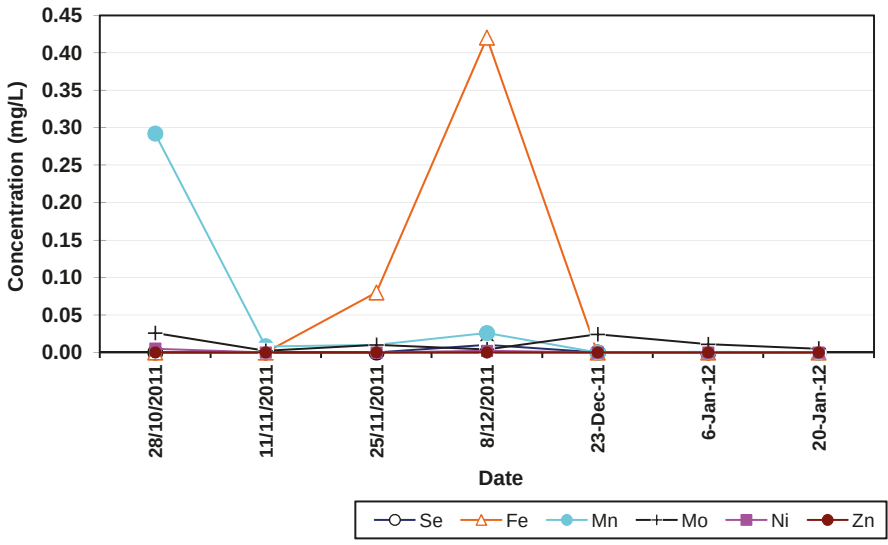


Figure KLC7b: Sulfate Release Rate and Net Alkalinity trends for Coal Reject 5

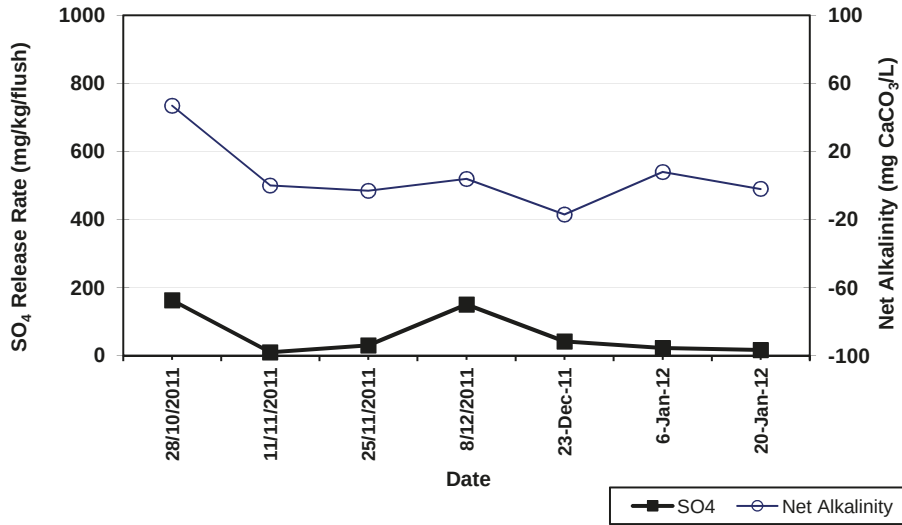


Figure KLC7d: Residual ANC and $\text{SO}_4:(\text{Ca}+\text{Mg})$ trends for Coal Reject 5

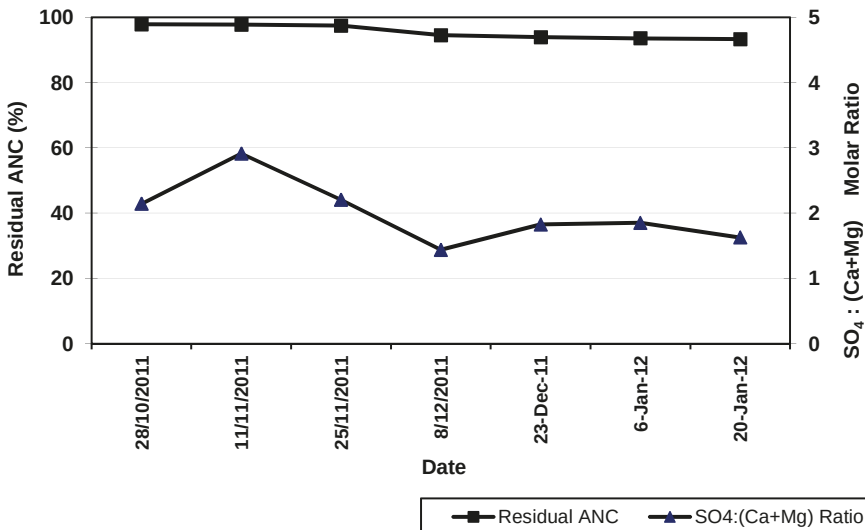


Figure KLC8c: Soluble Metal trends for Coal Reject 6

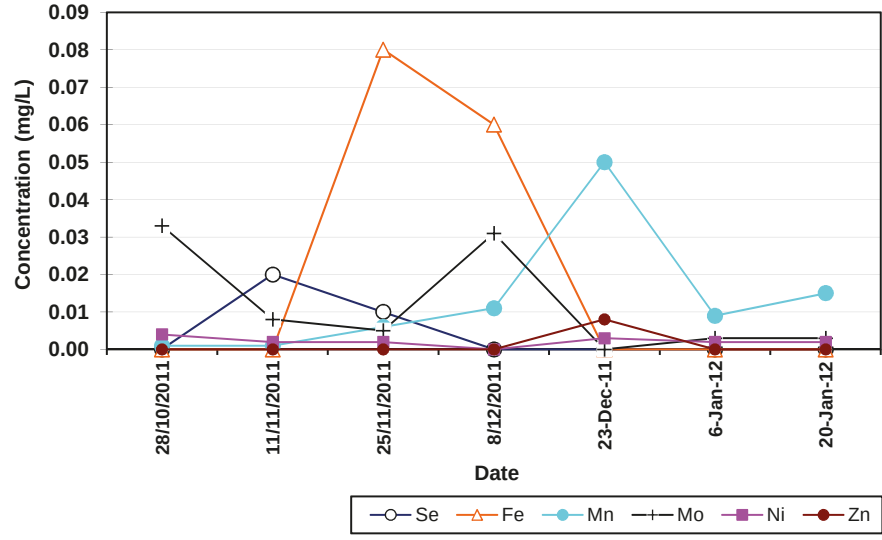


Figure KLC8a: pH and EC trends for Coal Reject 6

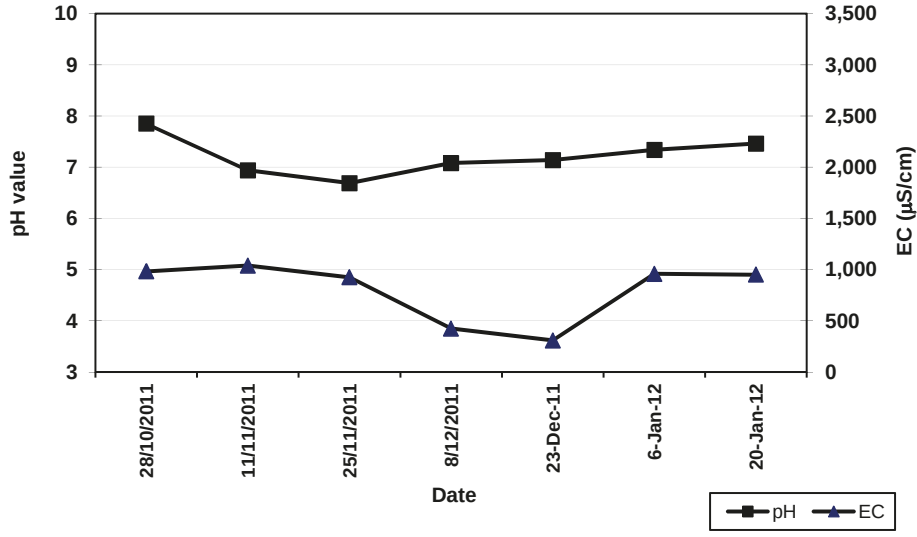


Figure KLC8d: Residual ANC and SO₄:(Ca+Mg) trends for Coal Reject 6

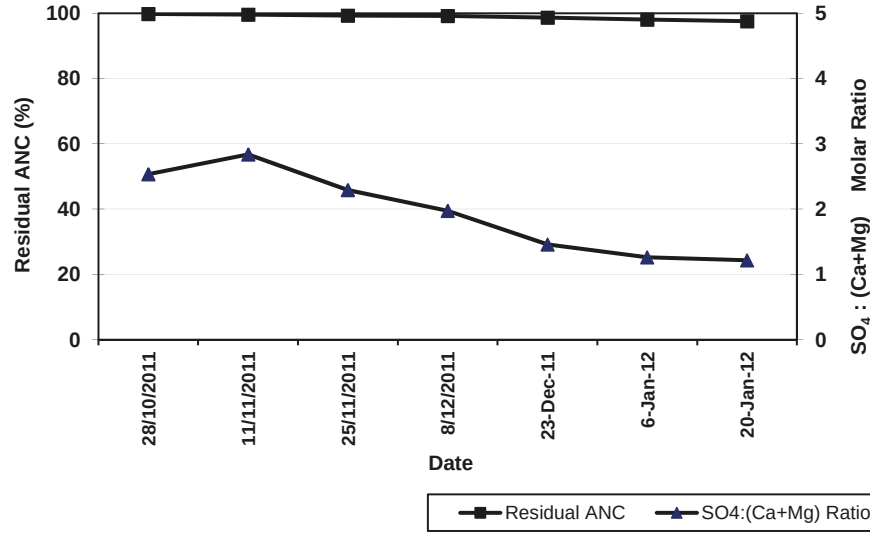
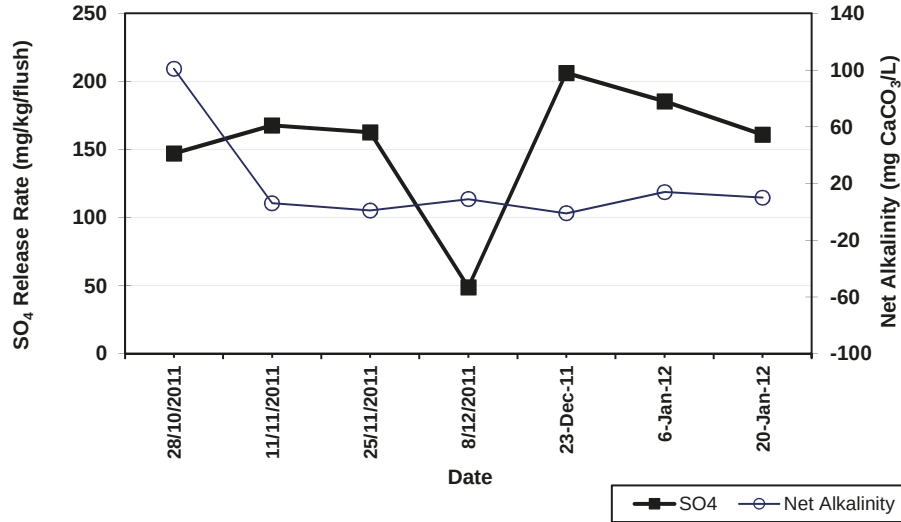


Figure KLC8b: Sulfate Release Rate and Net Alkalinity trends for Coal Reject 6





ATTACHMENT D

ALS Laboratory Results


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1108039	Page	: 1 of 16
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 15-APR-2011
Sampler	: David Tabrett	Issue Date	: 19-MAY-2011
Site	: Bengalla Coal Mine		
Quote number	: BN/567/10	No. of samples received	: 70
		No. of samples analysed	: 70

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
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Page : 2 of 16
Work Order : EB1108039
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



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

- **ANC Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong.**

Page : 3 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4801 27.59-27.94	4802 49.69-50.03	4803 75.24-75.52	4804 84.70-85.11	4805 93.44-93.75
Client sampling date / time					18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-001	EB1108039-002	EB1108039-003	EB1108039-004	EB1108039-005
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		8.9	9.2	9.6	9.6	9.6
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-8.1	-10.8	-48.4	-73.8	-62.4
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		377	437	354	389	399
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		8.9	13.4	49.2	74.2	63.0
^ ANC as CaCO3	----	0.1	% CaCO3		0.9	1.4	5.0	7.6	6.4
Fizz Rating	----	0	Fizz Unit		0	0	2	2	2
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.02	0.08	0.03	0.01	0.02

Page : 4 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL

Client sample ID

				4806 104.17-104.53	4807 131.07-131.30	4808 173.90-174.25	4809 193.94-194.24	4810 204.65-204.95
Client sampling date / time				18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00
Compound	CAS Number	LOR	Unit	EB1108039-006	EB1108039-007	EB1108039-008	EB1108039-009	EB1108039-010
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.8	9.8	9.8	9.6	9.9
EA009: Nett Acid Production Potential								
^ Net Acid Production Potential	----	0.5	kg H2SO4/t	-25.6	-16.4	-44.3	-23.4	-62.5
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	291	369	401	246	411
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	26.2	17.3	44.9	24.3	63.0
^ ANC as CaCO3	----	0.1	% CaCO3	2.7	1.8	4.6	2.5	6.4
Fizz Rating	----	0	Fizz Unit	2	0	2	2	2
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.03	0.02	0.03	0.02

Page : 5 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4811 211.13-211.67	4812 223.55-223.83	4822 17.06-17.33	4823 26.86-27.12	4824 51.67-52.13
Client sampling date / time					18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-011	EB1108039-012	EB1108039-013	EB1108039-014	EB1108039-015
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.8	9.9	9.7	9.2	9.8
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-14.8	-308	-62.5	-30.6	-402
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		353	385	356	302	312
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		15.3	309	63.0	31.8	403
^ ANC as CaCO3	----	0.1	% CaCO3		1.6	31.5	6.4	3.2	41.1
Fizz Rating	----	0	Fizz Unit		0	4	2	2	4
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.02	0.01	0.02	0.04	0.02

Page : 6 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4825 65.86-66.31	4826 74.39-74.64	4827 90.61-91.06	4828 105.85-106.28	4829 112.33-112.69
Client sampling date / time					18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-016	EB1108039-017	EB1108039-018	EB1108039-019	EB1108039-020
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.7	9.8	9.5	9.8	9.4
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		<0.5	-148	-52.1	-163	-34.4
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		339	448	439	488	274
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		<0.5	148	53.0	163	34.9
^ ANC as CaCO3	----	0.1	% CaCO3		<0.1	15.1	5.4	16.6	3.6
Fizz Rating	----	0	Fizz Unit		0	3	2	3	2
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		<0.01	0.02	0.03	0.01	0.02

Page : 7 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4830	4831	4832	4833	4813
					159.60-159.99	174.82-175.22	178.70-178.96	189.89-190.36	46.25-46.72
				Client sampling date / time	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-021	EB1108039-022	EB1108039-023	EB1108039-024	EB1108039-025
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		10.1	10.0	9.7	9.8	9.3
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-309	-127	-62.4	-57.1	-37.2
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		752	530	338	263	157
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		309	128	63.0	58.0	38.0
^ ANC as CaCO3	----	0.1	% CaCO3		31.5	13.0	6.4	5.9	3.9
Fizz Rating	----	0	Fizz Unit		4	3	2	2	2
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		<0.01	0.02	0.02	0.03	0.02

Page : 8 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL

Client sample ID

				4814 52.63-53.00	4815 59.25-59.53	4816 83.41-83.72	4817 119.54-119.89	4818 135.14-135.42
Client sampling date / time				18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00
Compound	CAS Number	LOR	Unit	EB1108039-026	EB1108039-027	EB1108039-028	EB1108039-029	EB1108039-030
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.2	9.8	10.0	9.8	9.6
EA009: Nett Acid Production Potential								
^ Net Acid Production Potential	----	0.5	kg H2SO4/t	-104	-127	-234	-25.3	-37.2
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	247	423	417	286	312
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	106	128	234	26.2	38.0
^ ANC as CaCO3	----	0.1	% CaCO3	10.8	13.0	23.9	2.7	3.9
Fizz Rating	----	0	Fizz Unit	3	3	3	2	2
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.08	0.02	0.02	0.03	0.02

Page : 9 of 16
Work Order : EB1108039
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4819	4820	4821	4858	4859
					162.27-162.65	169.74-169.99	178.63-178.97	24.50-24.80	32.08-32.36
				Client sampling date / time	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-031	EB1108039-032	EB1108039-033	EB1108039-034	EB1108039-035
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.8	9.6	9.8	9.4	9.4
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-49.8	-31.1	-49.5	-60.9	-100
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		381	378	337	295	331
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		50.5	32.4	50.5	62.3	102
^ ANC as CaCO3	----	0.1	% CaCO3		5.2	3.3	5.2	6.4	10.4
Fizz Rating	----	0	Fizz Unit		2	2	2	2	3
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.02	0.04	0.03	0.05	0.04

Page : 10 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4860 59.90-60.25	4870 70.75-71.06	4861 81.92-82.25	4862 91.94-92.19	4863 110.24-110.58
Client sampling date / time					29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-036	EB1108039-037	EB1108039-038	EB1108039-039	EB1108039-040
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.7	9.5	9.3	9.4	9.7
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-91.9	-98.6	-31.6	-37.4	-60.3
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		331	245	326	199	331
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		92.3	99.4	33.7	38.0	61.1
^ ANC as CaCO3	----	0.1	% CaCO3		9.4	10.1	3.4	3.9	6.2
Fizz Rating	----	0	Fizz Unit		2	3	2	2	2
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.01	0.02	0.07	0.02	0.02



Page : 11 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla

Analytical Results

Sub-Matrix: SOIL				Client sample ID	4864	4865	4866	4867	4868
					1274.92-128.16	154.73-155.01	166.14-166.45	180.15-180.45	184.70-185.00
				Client sampling date / time	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-041	EB1108039-042	EB1108039-043	EB1108039-044	EB1108039-045
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.7	9.8	10.0	9.6	9.6
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-161	-24.8	-28.9	-2.9	-53.2
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		547	277	489	402	441
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		161	25.6	29.8	3.5	53.6
^ ANC as CaCO3	----	0.1	% CaCO3		16.5	2.6	3.0	0.4	5.5
Fizz Rating	----	0	Fizz Unit		3	2	2	0	2
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.02	0.02	0.03	0.02	0.01

Page : 12 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4869 195.57-195.52	4834 17.38-17.70	4835 26.84-27.21	4836 33.75-34.05	4837 50.65-50.90
Client sampling date / time					29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-046	EB1108039-047	EB1108039-048	EB1108039-049	EB1108039-050
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.9	8.7	9.2	9.0	9.4
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-17.0	-28.3	-24.8	-26.7	-24.6
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		490	226	185	258	291
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		18.3	28.7	25.6	28.7	26.2
^ ANC as CaCO3	----	0.1	% CaCO3		1.9	2.9	2.6	2.9	2.7
Fizz Rating	----	0	Fizz Unit		0	2	2	2	2
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.04	0.01	0.02	0.06	0.05

Page : 13 of 16
Work Order : EB1108039
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4838	4839	4840	4841	4842
					84.53-84.83	89.90-90.18	114.46-114.84	121.00-121.35	149.75-150.00
Client sampling date / time					29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-051	EB1108039-052	EB1108039-053	EB1108039-054	EB1108039-055
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.5	9.6	9.6	9.7	9.7
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-107	-32.0	-48.6	-63.0	-25.7
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		308	418	324	331	456
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		108	32.4	48.6	63.0	26.2
^ ANC as CaCO3	----	0.1	% CaCO3		11.0	3.3	5.0	6.4	2.7
Fizz Rating	----	0	Fizz Unit		3	2	2	2	2
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.02	0.01	<0.01	<0.01	0.01

Page : 14 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4843	4844	4845	4846	4847
					154.75-155.00	203.57-203.88	211.92-212.27	30.93-31.18	40.82-41.11
Client sampling date / time					29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-056	EB1108039-057	EB1108039-058	EB1108039-059	EB1108039-060
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.8	9.6	9.6	9.2	9.4
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-4.7	-35.5	-29.0	-37.6	-35.3
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		325	330	451	120	231
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		5.5	36.2	29.9	38.0	36.2
^ ANC as CaCO3	----	0.1	% CaCO3		0.6	3.7	3.0	3.9	3.7
Fizz Rating	----	0	Fizz Unit		0	2	2	2	2
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.02	0.02	0.03	0.01	0.03

Page : 15 of 16
Work Order : EB1108039
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	4848 50.52-50.83	4849 74.91-75.13	4850 79.80-75.13	4851 89.72-90.07	4852 109.90-109.33
Client sampling date / time					29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1108039-061	EB1108039-062	EB1108039-063	EB1108039-064	EB1108039-065
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.4	9.9	9.8	9.6	9.6
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-37.0	-310	-104	-48.7	-24.9
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		363	499	606	354	331
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		38.0	310	104	49.2	25.6
^ ANC as CaCO3	----	0.1	% CaCO3		3.9	31.6	10.6	5.0	2.6
Fizz Rating	----	0	Fizz Unit		2	4	3	2	2
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.03	<0.01	0.03	0.02	0.02

Page : 16 of 16
 Work Order : EB1108039
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL

Client sample ID

				4853 120.94-121.25	4854 131.74-132.05	4855 152.73-153.10	4856 189.94-190.14	4857 210.05-210.31
Client sampling date / time				29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00	29-MAR-2011 15:00
Compound	CAS Number	LOR	Unit	EB1108039-066	EB1108039-067	EB1108039-068	EB1108039-069	EB1108039-070
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.7	9.6	9.8	9.3	9.8
EA009: Nett Acid Production Potential								
^ Net Acid Production Potential	----	0.5	kg H2SO4/t	-23.0	-14.9	-17.6	-16.8	-22.0
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	444	235	263	537	429
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	24.2	15.4	18.3	18.6	22.4
^ ANC as CaCO3	----	0.1	% CaCO3	2.5	1.6	1.9	1.9	2.3
Fizz Rating	----	0	Fizz Unit	0	0	0	0	2
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.04	0.02	0.02	0.06	0.02


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1110533	Page	: 1 of 6
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 28-MAY-2011
Sampler	: ----	Issue Date	: 14-JUN-2011
Site	: Bengalla Coal Mine		
Quote number	: BN/057/11 V2	No. of samples received	: 79
		No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

Environmental Division Brisbane
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Page : 2 of 6
Work Order : EB1110533
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



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

- Samples EB1110533-074, 075, 076, 077(ME_ED_comp, ME_MA_comp, ME_PF_comp, ME_VA_comp) were filtered for ED037 (Alkalinity) analysis due to suspended sediments in the samples.

Page : 3 of 6
 Work Order : EB1110533
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	ME_BR_comp	ME_BY_comp	ME_ED_comp	ME_MA_comp	ME_PF_comp
Client sampling date / time					18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1110533-072	EB1110533-073	EB1110533-074	EB1110533-075	EB1110533-076
ED037: Alkalinity									
Total Alkalinity as CaCO ₃	----	1	mg/kg		41700	8470	1300	1560	1470
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/kg		39600	7170	521	652	814
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/kg		2080	1300	782	912	652
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO ₄ 2-	14808-79-8	10	mg/kg		<10	30	10	<10	20
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	10	mg/kg		30	30	30	20	30
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg		<10	<10	<10	<10	<10
Magnesium	7439-95-4	10	mg/kg		<10	<10	<10	<10	<10
Sodium	7440-23-5	10	mg/kg		80	60	60	60	60
Potassium	7440-09-7	10	mg/kg		<10	<10	<10	<10	<10
ED093T: Total Major Cations									
Sodium	7440-23-5	10	mg/kg		3800	5640	3580	15500	6680
Potassium	7440-09-7	10	mg/kg		1340	980	840	580	1080
Calcium	7440-70-2	10	mg/kg		16600	10300	44200	30300	14100
Magnesium	7439-95-4	10	mg/kg		4870	3700	10500	7860	4610
EG005S : Soluble Metals by ICPAES									
Aluminium	7429-90-5	1	mg/kg		1	3	2	6	3
Antimony	7440-36-0	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	7440-38-2	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	0.1
Boron	7440-42-8	1	mg/kg		<1	<1	<1	<1	<1
Cadmium	7440-43-9	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	7440-47-3	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt	7440-48-4	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Copper	7440-50-8	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Iron	7439-89-6	1	mg/kg		<1	<1	<1	<1	<1
Lead	7439-92-1	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Manganese	7439-96-5	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	7439-98-7	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	7440-02-0	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Selenium	7782-49-2	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	7440-66-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		4950	6720	5060	18700	8880
Antimony	7440-36-0	5	mg/kg		<5	<5	<5	<5	<5
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50

Page : 4 of 6
 Work Order : EB1110533
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				ME_BR_comp	ME_BY_comp	ME_ED_comp	ME_MA_comp	ME_PF_comp
				18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00
Compound	CAS Number	LOR	Unit	EB1110533-072	EB1110533-073	EB1110533-074	EB1110533-075	EB1110533-076
EG005T: Total Metals by ICP-AES - Continued								
Cobalt	7440-48-4	2	mg/kg	8	10	5	2	15
Iron	7439-89-6	50	mg/kg	19600	13800	22800	15600	15900
Manganese	7439-96-5	5	mg/kg	313	167	386	263	275
Molybdenum	7439-98-7	2	mg/kg	<2	<2	<2	<2	<2
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	13
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	8	15	12	14	16
Copper	7440-50-8	5	mg/kg	27	9	11	5	18
Lead	7439-92-1	5	mg/kg	11	9	8	24	10
Nickel	7440-02-0	2	mg/kg	11	11	6	4	22
Zinc	7440-66-6	5	mg/kg	73	48	43	50	65

Page : 5 of 6
 Work Order : EB1110533
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	ME_VA_comp	ME_WN_comp	ME_WW_comp		
Client sampling date / time					18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00		
Compound	CAS Number	LOR	Unit	EB1110533-077	EB1110533-078	EB1110533-079			
ED037: Alkalinity									
Total Alkalinity as CaCO ₃	----	1	mg/kg	1300	1630	1550	----		----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/kg	651	1300	1060	----		----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/kg	652	326	489	----		----
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO ₄ 2-	14808-79-8	10	mg/kg	<10	20	10	----		----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	10	mg/kg	40	40	70	----		----
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg	<10	<10	<10	----		----
Magnesium	7439-95-4	10	mg/kg	<10	<10	<10	----		----
Sodium	7440-23-5	10	mg/kg	60	50	40	----		----
Potassium	7440-09-7	10	mg/kg	<10	<10	<10	----		----
ED093T: Total Major Cations									
Sodium	7440-23-5	10	mg/kg	6440	5200	2520	----		----
Potassium	7440-09-7	10	mg/kg	1090	960	1140	----		----
Calcium	7440-70-2	10	mg/kg	8990	3480	11600	----		----
Magnesium	7439-95-4	10	mg/kg	3980	1500	5230	----		----
EG005S : Soluble Metals by ICPAES									
Aluminium	7429-90-5	1	mg/kg	2	2	<1	----		----
Antimony	7440-36-0	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Arsenic	7440-38-2	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Boron	7440-42-8	1	mg/kg	<1	<1	<1	----		----
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Chromium	7440-47-3	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Cobalt	7440-48-4	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Copper	7440-50-8	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Iron	7439-89-6	1	mg/kg	<1	<1	<1	----		----
Lead	7439-92-1	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Manganese	7439-96-5	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Molybdenum	7439-98-7	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Nickel	7440-02-0	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Selenium	7782-49-2	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Zinc	7440-66-6	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg	8510	6460	5270	----		----
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	----		----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----		----

Page : 6 of 6
 Work Order : EB1110533
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	ME_VA_comp	ME_WN_comp	ME_WW_comp	----	----
Client sampling date / time					18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	----	----
Compound	CAS Number	LOR	Unit		EB1110533-077	EB1110533-078	EB1110533-079	----	----
EG005T: Total Metals by ICP-AES - Continued									
Cobalt	7440-48-4	2	mg/kg		7	4	10	----	----
Iron	7439-89-6	50	mg/kg		19100	6880	25700	----	----
Manganese	7439-96-5	5	mg/kg		301	68	474	----	----
Molybdenum	7439-98-7	2	mg/kg		<2	<2	<2	----	----
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	----	----
Arsenic	7440-38-2	5	mg/kg		<5	<5	8	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg		12	27	14	----	----
Copper	7440-50-8	5	mg/kg		18	<5	23	----	----
Lead	7439-92-1	5	mg/kg		9	7	14	----	----
Nickel	7440-02-0	2	mg/kg		9	3	21	----	----
Zinc	7440-66-6	5	mg/kg		63	46	71	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1117331	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 25-AUG-2011
Sampler	: ----	Issue Date	: 05-SEP-2011
Site	: ----		
Quote number	: BN/057/11 V2	No. of samples received	: 8
		No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Greg Vogel	Laboratory Manager	Brisbane Inorganics

Page : 2 of 4
Work Order : EB1117331
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



General Comments

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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



Page : 3 of 4
 Work Order : EB1117331
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla

Analytical Results

Sub-Matrix: SOIL				Client sample ID	ME_BR_comp	ME_BY_comp	ME_ED_comp	ME_MA_comp	ME_PF_comp
Client sampling date / time					18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00
Compound	CAS Number	LOR	Unit		EB1117331-001	EB1117331-002	EB1117331-003	EB1117331-004	EB1117331-005
ED007: Exchangeable Cations									
^ Exchangeable Calcium	----	0.1	meq/100g		16.1	6.5	18.0	18.0	12.9
^ Exchangeable Magnesium	----	0.1	meq/100g		0.6	0.7	0.7	1.0	0.8
^ Exchangeable Potassium	----	0.1	meq/100g		0.8	0.7	0.6	0.4	0.8
^ Exchangeable Sodium	----	0.1	meq/100g		9.0	7.6	4.5	5.5	5.6
^ Cation Exchange Capacity	----	0.1	meq/100g		26.6	15.6	23.8	24.9	20.1
^ Exchangeable Sodium Percent	----	0.1	%		33.9	49.0	18.9	22.0	28.1

Page : 4 of 4
 Work Order : EB1117331
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	ME_VA_comp	ME_WN_comp	ME_WW_comp	----	----
				Client sampling date / time	18-MAR-2011 15:00	18-MAR-2011 15:00	18-MAR-2011 15:00	----	----
Compound	CAS Number	LOR	Unit		EB1117331-006	EB1117331-007	EB1117331-008	----	----
ED007: Exchangeable Cations									
^ Exchangeable Calcium	----	0.1	meq/100g		3.3	3.0	10.6	----	----
^ Exchangeable Magnesium	----	0.1	meq/100g		1.2	1.0	4.5	----	----
^ Exchangeable Potassium	----	0.1	meq/100g		0.8	0.7	0.6	----	----
^ Exchangeable Sodium	----	0.1	meq/100g		6.5	7.1	2.9	----	----
^ Cation Exchange Capacity	----	0.1	meq/100g		11.7	11.8	18.7	----	----
^ Exchangeable Sodium Percent	----	0.1	%		55.2	60.4	15.6	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1115657	Page	: 1 of 9
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 05-AUG-2011
Sampler	: N.Smith	Issue Date	: 26-AUG-2011
Site	: Bengalla Coal Mine		
Quote number	: BN/057/11 V2	No. of samples received	: 35
		No. of samples analysed	: 35

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Greg Vogel	Laboratory Manager	Brisbane Inorganics
Greg Vogel	Laboratory Manager	Stafford Minerals - AY
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Inorganics

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Page : 2 of 9
Work Order : EB1115657
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



General Comments

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

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

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

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

Page : 3 of 9
Work Order : EB1115657
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



Analytical Results

Sub-Matrix: **ROCK**

Client sample ID

Client sampling date / time

				7071 177.15-177.65	7072 177.65-178.65	7073 178.65-179.56	7074 179.56-180.08	7075 183.40-183.93
				25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit	EB1115657-001	EB1115657-002	EB1115657-003	EB1115657-004	EB1115657-005
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	6.1	6.5	5.3	5.8	9.2
EA009: Nett Acid Production Potential								
^ Net Acid Production Potential	----	0.5	kg H2SO4/t	10.5	7.1	38.7	55.6	-7.1
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	1640	1420	1560	1910	230
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	10.0	19.8	9.0	8.7	8.6
^ ANC as CaCO3	----	0.1	% CaCO3	1.0	2.0	0.9	0.9	0.9
Fizz Rating	----	0	Fizz Unit	0	2	0	0	0
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.67	0.88	1.56	2.10	0.05

Page : 4 of 9
 Work Order : EB1115657
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: **ROCK**

Client sample ID

				7076 183.93-184.31	7077 184.31-185.30	7078 185.30-186.20	7079 186.20-187.05	7080 187.05-187.93
Client sampling date / time				25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit	EB1115657-006	EB1115657-007	EB1115657-008	EB1115657-009	EB1115657-010
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.3	9.3	9.8	9.8	9.6
EA009: Nett Acid Production Potential								
^ Net Acid Production Potential	----	0.5	kg H2SO4/t	-9.5	-9.8	-60.8	-31.1	-18.7
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	205	256	588	511	323
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	10.4	10.7	61.7	31.7	19.3
^ ANC as CaCO3	----	0.1	% CaCO3	1.1	1.1	6.3	3.2	2.0
Fizz Rating	----	0	Fizz Unit	0	0	2	2	1
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.03	0.03	0.03	0.02	0.02

Page : 5 of 9
Work Order : EB1115657
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



Analytical Results

Sub-Matrix: ROCK				Client sample ID	7081	7082	7083	7084	7085
					187.93-188.92	188.92-189.83	189.83-190.78	190.78-191.70	191.70-192.48
Client sampling date / time					25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit		EB1115657-011	EB1115657-012	EB1115657-013	EB1115657-014	EB1115657-015
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.6	9.8	9.7	9.9	9.6
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-17.5	-18.2	-18.0	-140	-20.1
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		312	532	260	616	295
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		18.1	20.0	18.6	141	20.7
^ ANC as CaCO3	----	0.1	% CaCO3		1.8	2.0	1.9	14.3	2.1
Fizz Rating	----	0	Fizz Unit		1	1	1	3	1
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.02	0.06	0.02	0.03	0.02

Page : 6 of 9
 Work Order : EB1115657
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: **ROCK**

Client sample ID

				7086 192.48-193.46	7087 193.46-194.39	7088 194.39-194.91	7089 194.91-195.46	7055 187.72-188.22
Client sampling date / time				25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit	EB1115657-016	EB1115657-017	EB1115657-018	EB1115657-019	EB1115657-020
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.9	9.9	9.8	9.8	10.0
EA009: Nett Acid Production Potential								
^ Net Acid Production Potential	----	0.5	kg H2SO4/t	-20.0	-22.0	-17.6	-45.5	-10.2
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	509	471	437	546	424
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	20.6	22.9	18.8	46.1	10.2
^ ANC as CaCO3	----	0.1	% CaCO3	2.1	2.3	1.9	4.7	1.0
Fizz Rating	----	0	Fizz Unit	1	1	1	2	0
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.03	0.04	0.02	<0.01

Page : 7 of 9
Work Order : EB1115657
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



Analytical Results

Sub-Matrix: ROCK				Client sample ID	7056	7057	7058	7059	7060
					188.22-189.23	189.23-190.28	190.28-191.26	191.26-192.22	192.22-192.92
Client sampling date / time					25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit		EB1115657-021	EB1115657-022	EB1115657-023	EB1115657-024	EB1115657-025
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.9	9.9	8.1	8.8	6.7
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-12.4	-39.5	4.2	2.0	39.6
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		454	579	625	605	1880
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		12.7	40.1	8.6	11.1	14.0
^ ANC as CaCO3	----	0.1	% CaCO3		1.3	4.1	0.9	1.1	1.4
Fizz Rating	----	0	Fizz Unit		1	2	1	1	1
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.01	0.02	0.42	0.43	1.75

Page : 8 of 9
 Work Order : EB1115657
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: **ROCK**

Client sample ID

				7061 192.92-193.48	7062 196.89-197.47	7063 197.47-198.42	7064 198.42-199.32	7065 199.32-200.28
Client sampling date / time				25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit	EB1115657-026	EB1115657-027	EB1115657-028	EB1115657-029	EB1115657-030
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	4.8	9.8	9.8	9.9	10.0
EA009: Nett Acid Production Potential								
^ Net Acid Production Potential	----	0.5	kg H2SO4/t	74.6	-31.2	-58.9	-36.8	-50.9
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	1770	474	611	496	606
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	8.0	38.6	61.7	37.7	52.1
^ ANC as CaCO3	----	0.1	% CaCO3	0.8	3.9	6.3	3.8	5.3
Fizz Rating	----	0	Fizz Unit	1	1	2	2	2
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	2.70	0.24	0.09	0.03	0.04

Page : 9 of 9
Work Order : EB1115657
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



Analytical Results

Sub-Matrix: ROCK				Client sample ID	7066	7067	7068	7069	7070
					200.28-201.26	201.26-202.12	202.12-203.01	203.01-203.64	203.64-204.13
				Client sampling date / time	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit		EB1115657-031	EB1115657-032	EB1115657-033	EB1115657-034	EB1115657-035
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		9.8	9.8	9.8	9.9	9.8
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-19.5	-15.6	-4.8	-20.4	-19.2
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		331	330	229	606	398
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		21.0	18.1	7.2	22.9	21.7
^ ANC as CaCO3	----	0.1	% CaCO3		2.1	1.8	0.7	2.3	2.2
Fizz Rating	----	0	Fizz Unit		1	1	1	1	1
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		0.05	0.08	0.08	0.08	0.08



Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EB1117588	Page	: 1 of 8
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla Coal Mine	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 30-AUG-2011
C-O-C number	: ----	Issue Date	: 08-SEP-2011
Sampler	: ----	No. of samples received	: 12
Site	: ----	No. of samples analysed	: 12
Quote number	: BN/057/11 V2		

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Signatories

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<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils

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Page : 2 of 8
Work Order : EB1117588
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla Coal Mine

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^ = This result is computed from individual analyte detections at or above the level of reporting

Page : 3 of 8
 Work Order : EB1117588
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla Coal Mine



Analytical Results

Sub-Matrix: PULP

Client sample ID

Client sampling date / time

				7071	7072	7073	7074	7082
				177.15-177.65	177.65-178.65	178.65-179.56	179.56-180.08	188.92-189.83
				25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit	EB1117588-001	EB1117588-002	EB1117588-003	EB1117588-004	EB1117588-005
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.571	0.791	2.36	2.40	----
ED007: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	4.8	----	----	----	7.2
^ Exchangeable Magnesium	----	0.1	meq/100g	2.8	----	----	----	0.8
^ Exchangeable Potassium	----	0.1	meq/100g	1.0	----	----	----	0.9
^ Exchangeable Sodium	----	0.1	meq/100g	8.5	----	----	----	5.9
^ Cation Exchange Capacity	----	0.1	meq/100g	17.2	----	----	----	15.0
^ Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	<0.1
^ Exchangeable Calcium Percent	----	0.1	%	28.1	----	----	----	48.5
^ Exchangeable Sodium Percent	----	0.1	%	49.8	----	----	----	39.7
^ Exchangeable Magnesium Percent	----	0.1	%	16.2	----	----	----	5.5
^ Exchangeable Potassium Percent	----	0.1	%	6.0	----	----	----	6.3
^ Calcium/Magnesium Ratio	----	0.1	.	1.7	----	----	----	8.8
ED037: Alkalinity								
Total Alkalinity as CaCO3	----	1	mg/kg	118	----	----	----	1380
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	118	----	----	----	339
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	<1	----	----	----	1040
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	3730	----	----	----	110
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	10	mg/kg	30	----	----	----	30
ED093S: Soluble Major Cations								
Calcium	7440-70-2	10	mg/kg	90	----	----	----	<10
Magnesium	7439-95-4	10	mg/kg	40	----	----	----	<10
Sodium	7440-23-5	10	mg/kg	1570	----	----	----	520
Potassium	7440-09-7	10	mg/kg	90	----	----	----	20
ED093T: Total Major Cations								
Sodium	7440-23-5	10	mg/kg	3860	----	----	----	2360
Potassium	7440-09-7	10	mg/kg	1280	----	----	----	1300
Calcium	7440-70-2	10	mg/kg	2020	----	----	----	11300
Magnesium	7439-95-4	10	mg/kg	1980	----	----	----	9520
EG005S : Soluble Metals by ICPAES								
Aluminium	7429-90-5	1	mg/kg	<1	----	----	----	6
Antimony	7440-36-0	0.1	mg/kg	<0.1	----	----	----	<0.1
Arsenic	7440-38-2	0.1	mg/kg	<0.1	----	----	----	0.2
Boron	7440-42-8	1	mg/kg	<1	----	----	----	<1



Page : 4 of 8
 Work Order : EB1117588
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla Coal Mine

Analytical Results

Sub-Matrix: PULP

Client sample ID

Client sampling date / time

				7071 177.15-177.65 25-JUL-2011 15:00	7072 177.65-178.65 25-JUL-2011 15:00	7073 178.65-179.56 25-JUL-2011 15:00	7074 179.56-180.08 25-JUL-2011 15:00	7082 188.92-189.83 25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit	EB1117588-001	EB1117588-002	EB1117588-003	EB1117588-004	EB1117588-005
EG005S : Soluble Metals by ICPAES - Continued								
Cadmium	7440-43-9	0.1	mg/kg	<0.1	----	----	----	<0.1
Chromium	7440-47-3	0.1	mg/kg	<0.1	----	----	----	<0.1
Cobalt	7440-48-4	0.1	mg/kg	1.0	----	----	----	<0.1
Copper	7440-50-8	0.1	mg/kg	<0.1	----	----	----	<0.1
Iron	7439-89-6	1	mg/kg	1	----	----	----	<1
Lead	7439-92-1	0.1	mg/kg	<0.1	----	----	----	<0.1
Manganese	7439-96-5	0.1	mg/kg	3.3	----	----	----	<0.1
Molybdenum	7439-98-7	0.1	mg/kg	<0.1	----	----	----	0.1
Nickel	7440-02-0	0.1	mg/kg	1.2	----	----	----	<0.1
Selenium	7782-49-2	0.1	mg/kg	<0.1	----	----	----	0.2
Zinc	7440-66-6	0.1	mg/kg	0.2	----	----	----	<0.1
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	4990	----	----	----	3640
Antimony	7440-36-0	5	mg/kg	<5	----	----	----	<5
Boron	7440-42-8	50	mg/kg	<50	----	----	----	<50
Cobalt	7440-48-4	2	mg/kg	17	----	----	----	12
Iron	7439-89-6	50	mg/kg	17400	----	----	----	130000
Manganese	7439-96-5	5	mg/kg	130	----	----	----	3110
Molybdenum	7439-98-7	2	mg/kg	<2	----	----	----	<2
Selenium	7782-49-2	5	mg/kg	<5	----	----	----	<5
Arsenic	7440-38-2	5	mg/kg	24	----	----	----	14
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	<1
Chromium	7440-47-3	2	mg/kg	18	----	----	----	6
Copper	7440-50-8	5	mg/kg	12	----	----	----	27
Lead	7439-92-1	5	mg/kg	20	----	----	----	14
Nickel	7440-02-0	2	mg/kg	23	----	----	----	14
Zinc	7440-66-6	5	mg/kg	84	----	----	----	90

Page : 5 of 8
 Work Order : EB1117588
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla Coal Mine



Analytical Results

Sub-Matrix: PULP

Client sample ID

Client sampling date / time

				7056 188.22-189.23	7058 190.28-191.26	7059 191.26-192.22	7060 192.22-192.92	7061 192.92-193.48
				25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00	25-JUL-2011 15:00
Compound	CAS Number	LOR	Unit	EB1117588-006	EB1117588-007	EB1117588-008	EB1117588-009	EB1117588-010
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	----	0.264	0.193	1.47	3.04
ED007: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	3.1	1.1	----	----	5.1
^ Exchangeable Magnesium	----	0.1	meq/100g	0.6	0.5	----	----	1.6
^ Exchangeable Potassium	----	0.1	meq/100g	0.8	0.9	----	----	0.2
^ Exchangeable Sodium	----	0.1	meq/100g	7.0	8.1	----	----	7.0
^ Cation Exchange Capacity	----	0.1	meq/100g	11.6	10.6	----	----	13.8
^ Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	----	----	<0.1
^ Exchangeable Calcium Percent	----	0.1	%	27.2	10.7	----	----	36.7
^ Exchangeable Sodium Percent	----	0.1	%	60.9	76.2	----	----	50.2
^ Exchangeable Magnesium Percent	----	0.1	%	5.5	5.0	----	----	11.4
^ Exchangeable Potassium Percent	----	0.1	%	6.5	8.2	----	----	1.7
^ Calcium/Magnesium Ratio	----	0.1	.	5.0	2.1	----	----	3.2
ED037: Alkalinity								
Total Alkalinity as CaCO3	----	1	mg/kg	1290	118	----	----	52
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	353	118	----	----	52
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	940	<1	----	----	<1
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	110	1400	----	----	4900
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	10	mg/kg	60	40	----	----	40
ED093S: Soluble Major Cations								
Calcium	7440-70-2	10	mg/kg	<10	<10	----	----	420
Magnesium	7439-95-4	10	mg/kg	<10	<10	----	----	100
Sodium	7440-23-5	10	mg/kg	460	670	----	----	1540
Potassium	7440-09-7	10	mg/kg	<10	20	----	----	20
ED093T: Total Major Cations								
Sodium	7440-23-5	10	mg/kg	2880	2780	----	----	3060
Potassium	7440-09-7	10	mg/kg	980	1220	----	----	1140
Calcium	7440-70-2	10	mg/kg	2030	740	----	----	1600
Magnesium	7439-95-4	10	mg/kg	1120	990	----	----	950
EG005S : Soluble Metals by ICPAES								
Aluminium	7429-90-5	1	mg/kg	9	<1	----	----	9
Antimony	7440-36-0	0.1	mg/kg	<0.1	<0.1	----	----	<0.1
Arsenic	7440-38-2	0.1	mg/kg	0.1	<0.1	----	----	<0.1
Boron	7440-42-8	1	mg/kg	<1	<1	----	----	<1



Page : 6 of 8
 Work Order : EB1117588
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla Coal Mine

Analytical Results

Sub-Matrix: PULP

Client sample ID

Client sampling date / time

				7056 188.22-189.23 25-JUL-2011 15:00 EB1117588-006	7058 190.28-191.26 25-JUL-2011 15:00 EB1117588-007	7059 191.26-192.22 25-JUL-2011 15:00 EB1117588-008	7060 192.22-192.92 25-JUL-2011 15:00 EB1117588-009	7061 192.92-193.48 25-JUL-2011 15:00 EB1117588-010
Compound	CAS Number	LOR	Unit					
EG005S : Soluble Metals by ICPAES - Continued								
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	----	----	<0.1
Chromium	7440-47-3	0.1	mg/kg	<0.1	<0.1	----	----	<0.1
Cobalt	7440-48-4	0.1	mg/kg	<0.1	<0.1	----	----	1.8
Copper	7440-50-8	0.1	mg/kg	<0.1	<0.1	----	----	<0.1
Iron	7439-89-6	1	mg/kg	<1	<1	----	----	38
Lead	7439-92-1	0.1	mg/kg	<0.1	<0.1	----	----	<0.1
Manganese	7439-96-5	0.1	mg/kg	<0.1	<0.1	----	----	49.8
Molybdenum	7439-98-7	0.1	mg/kg	0.2	<0.1	----	----	<0.1
Nickel	7440-02-0	0.1	mg/kg	<0.1	<0.1	----	----	2.1
Selenium	7782-49-2	0.1	mg/kg	0.1	0.1	----	----	<0.1
Zinc	7440-66-6	0.1	mg/kg	<0.1	<0.1	----	----	0.8
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	3560	3420	----	----	4090
Antimony	7440-36-0	5	mg/kg	<5	<5	----	----	<5
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	<50
Cobalt	7440-48-4	2	mg/kg	6	19	----	----	13
Iron	7439-89-6	50	mg/kg	6510	11200	----	----	35400
Manganese	7439-96-5	5	mg/kg	73	79	----	----	555
Molybdenum	7439-98-7	2	mg/kg	<2	<2	----	----	6
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	<5
Arsenic	7440-38-2	5	mg/kg	<5	17	----	----	36
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	<1
Chromium	7440-47-3	2	mg/kg	16	9	----	----	16
Copper	7440-50-8	5	mg/kg	<5	17	----	----	10
Lead	7439-92-1	5	mg/kg	10	23	----	----	15
Nickel	7440-02-0	2	mg/kg	4	28	----	----	18
Zinc	7440-66-6	5	mg/kg	60	91	----	----	69

Page : 7 of 8
 Work Order : EB1117588
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla Coal Mine



Analytical Results

Sub-Matrix: PULP

Client sample ID

				7062	7070	----	----	----
				196.89-197.47	203.64-204.13			
Client sampling date / time				25-JUL-2011 15:00	25-JUL-2011 15:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1117588-011	EB1117588-012	----	----	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.076	----	----	----	----
ED007: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	----	2.9	----	----	----
^ Exchangeable Magnesium	----	0.1	meq/100g	----	0.6	----	----	----
^ Exchangeable Potassium	----	0.1	meq/100g	----	0.7	----	----	----
^ Exchangeable Sodium	----	0.1	meq/100g	----	8.2	----	----	----
^ Cation Exchange Capacity	----	0.1	meq/100g	----	12.5	----	----	----
^ Exchangeable Aluminium	----	0.1	meq/100g	----	<0.1	----	----	----
^ Exchangeable Calcium Percent	----	0.1	%	----	23.5	----	----	----
^ Exchangeable Sodium Percent	----	0.1	%	----	65.9	----	----	----
^ Exchangeable Magnesium Percent	----	0.1	%	----	5.2	----	----	----
^ Exchangeable Potassium Percent	----	0.1	%	----	5.6	----	----	----
^ Calcium/Magnesium Ratio	----	0.1	.	----	4.5	----	----	----
ED037: Alkalinity								
Total Alkalinity as CaCO3	----	1	mg/kg	----	1240	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	----	744	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	----	496	----	----	----
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	----	130	----	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	10	mg/kg	----	30	----	----	----
ED093S: Soluble Major Cations								
Calcium	7440-70-2	10	mg/kg	----	<10	----	----	----
Magnesium	7439-95-4	10	mg/kg	----	<10	----	----	----
Sodium	7440-23-5	10	mg/kg	----	440	----	----	----
Potassium	7440-09-7	10	mg/kg	----	<10	----	----	----
ED093T: Total Major Cations								
Sodium	7440-23-5	10	mg/kg	----	5760	----	----	----
Potassium	7440-09-7	10	mg/kg	----	870	----	----	----
Calcium	7440-70-2	10	mg/kg	----	3790	----	----	----
Magnesium	7439-95-4	10	mg/kg	----	3390	----	----	----
EG005S : Soluble Metals by ICPAES								
Aluminium	7429-90-5	1	mg/kg	----	11	----	----	----
Antimony	7440-36-0	0.1	mg/kg	----	<0.1	----	----	----
Arsenic	7440-38-2	0.1	mg/kg	----	0.3	----	----	----
Boron	7440-42-8	1	mg/kg	----	<1	----	----	----



Page : 8 of 8
 Work Order : EB1117588
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla Coal Mine

Analytical Results

Sub-Matrix: PULP				Client sample ID	7062	7070	----	----	----
					196.89-197.47	203.64-204.13			
Client sampling date / time					25-JUL-2011 15:00	25-JUL-2011 15:00	----	----	----
Compound	CAS Number	LOR	Unit		EB1117588-011	EB1117588-012	----	----	----
EG005S : Soluble Metals by ICPAES - Continued									
Cadmium	7440-43-9	0.1	mg/kg		----	<0.1	----	----	----
Chromium	7440-47-3	0.1	mg/kg		----	<0.1	----	----	----
Cobalt	7440-48-4	0.1	mg/kg		----	<0.1	----	----	----
Copper	7440-50-8	0.1	mg/kg		----	<0.1	----	----	----
Iron	7439-89-6	1	mg/kg		----	<1	----	----	----
Lead	7439-92-1	0.1	mg/kg		----	<0.1	----	----	----
Manganese	7439-96-5	0.1	mg/kg		----	<0.1	----	----	----
Molybdenum	7439-98-7	0.1	mg/kg		----	0.2	----	----	----
Nickel	7440-02-0	0.1	mg/kg		----	<0.1	----	----	----
Selenium	7782-49-2	0.1	mg/kg		----	0.2	----	----	----
Zinc	7440-66-6	0.1	mg/kg		----	<0.1	----	----	----
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		----	6280	----	----	----
Antimony	7440-36-0	5	mg/kg		----	<5	----	----	----
Boron	7440-42-8	50	mg/kg		----	<50	----	----	----
Cobalt	7440-48-4	2	mg/kg		----	6	----	----	----
Iron	7439-89-6	50	mg/kg		----	16400	----	----	----
Manganese	7439-96-5	5	mg/kg		----	115	----	----	----
Molybdenum	7439-98-7	2	mg/kg		----	<2	----	----	----
Selenium	7782-49-2	5	mg/kg		----	<5	----	----	----
Arsenic	7440-38-2	5	mg/kg		----	6	----	----	----
Cadmium	7440-43-9	1	mg/kg		----	<1	----	----	----
Chromium	7440-47-3	2	mg/kg		----	9	----	----	----
Copper	7440-50-8	5	mg/kg		----	14	----	----	----
Lead	7439-92-1	5	mg/kg		----	12	----	----	----
Nickel	7440-02-0	2	mg/kg		----	6	----	----	----
Zinc	7440-66-6	5	mg/kg		----	71	----	----	----



Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EB1108821	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 06-MAY-2011
Sampler	: D.Wise	Issue Date	: 24-MAY-2011
Site	: Bengalla Coal Mine		
Quote number	: BN/567/10	No. of samples received	: 1
		No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Inorganics
Myles.Clark	Acid Sulfate Soils Supervisor	Stafford Minerals - AY

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A Campbell Brothers Limited Company



Page : 2 of 3
 Work Order : EB1108821
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla

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

- **ANC Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong.**

Page : 3 of 3
 Work Order : EB1108821
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	BMC_REJECT_BAY2_0 1	----	----	----	----
				Client sampling date / time	23-APR-2011 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1108821-001	----	----	----	----
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		8.0	----	----	----	----
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		-5.8	----	----	----	----
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		408	----	----	----	----
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		43.4	----	----	----	----
^ ANC as CaCO3	----	0.1	% CaCO3		4.4	----	----	----	----
Fizz Rating	----	0	Fizz Unit		2	----	----	----	----
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		1.23	----	----	----	----



Environmental Division



CERTIFICATE OF ANALYSIS

Work Order	: EB1201192	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 17-JAN-2012
Sampler	: ----	Issue Date	: 03-FEB-2012
Site	: Bengalla Coal Mine		
Quote number	: BN/057/11 V2	No. of samples received	: 1
		No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Myles Clark	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

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Page : 2 of 4
Work Order : EB1201192
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



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.

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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

- (ADD METHOD): NATA accreditation does not cover performance of this service.



Page : 3 of 4
 Work Order : EB1201192
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla

Analytical Results

Sub-Matrix: PULP				Client sample ID	BMC_Reject_Bay2_01	----	----	----	----
				Client sampling date / time	02-JUL-2011 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1201192-001	----	----	----	----	----
EA026 : Chromium Reducible Sulfur									
Chromium Reducible Sulphur	----	0.005	%	0.187	----	----	----	----	----
ED037: Alkalinity									
Total Alkalinity as CaCO3	----	1	mg/kg	480	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	480	----	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	<1	----	----	----	----	----
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg	1720	----	----	----	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	10	mg/kg	30	----	----	----	----	----
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg	260	----	----	----	----	----
Magnesium	7439-95-4	10	mg/kg	220	----	----	----	----	----
Sodium	7440-23-5	10	mg/kg	380	----	----	----	----	----
Potassium	7440-09-7	10	mg/kg	30	----	----	----	----	----
EG005S : Soluble Metals by ICPAES									
Aluminium	7429-90-5	1	mg/kg	<1	----	----	----	----	----
Antimony	7440-36-0	0.1	mg/kg	<0.1	----	----	----	----	----
Arsenic	7440-38-2	0.1	mg/kg	<0.1	----	----	----	----	----
Boron	7440-42-8	1	mg/kg	<1	----	----	----	----	----
Cadmium	7440-43-9	0.1	mg/kg	<0.1	----	----	----	----	----
Chromium	7440-47-3	0.1	mg/kg	<0.1	----	----	----	----	----
Cobalt	7440-48-4	0.1	mg/kg	<0.1	----	----	----	----	----
Copper	7440-50-8	0.1	mg/kg	<0.1	----	----	----	----	----
Iron	7439-89-6	1	mg/kg	<1	----	----	----	----	----
Lead	7439-92-1	0.1	mg/kg	<0.1	----	----	----	----	----
Manganese	7439-96-5	0.1	mg/kg	0.6	----	----	----	----	----
Molybdenum	7439-98-7	0.1	mg/kg	<0.1	----	----	----	----	----
Nickel	7440-02-0	0.1	mg/kg	<0.1	----	----	----	----	----
Selenium	7782-49-2	0.1	mg/kg	0.1	----	----	----	----	----
Zinc	7440-66-6	0.1	mg/kg	<0.1	----	----	----	----	----
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg	4330	----	----	----	----	----
Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----	----
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----	----
Boron	7440-42-8	50	mg/kg	<50	----	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----	----

Page : 4 of 4
 Work Order : EB1201192
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: PULP

Client sample ID

Client sampling date / time

				BMC_Reject_Bay2_01	----	----	----	----
				02-JUL-2011 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1201192-001	----	----	----	----
EG005T: Total Metals by ICP-AES - Continued								
Chromium	7440-47-3	2	mg/kg	5	----	----	----	----
Cobalt	7440-48-4	2	mg/kg	2	----	----	----	----
Copper	7440-50-8	5	mg/kg	16	----	----	----	----
Iron	7439-89-6	50	mg/kg	28100	----	----	----	----
Lead	7439-92-1	5	mg/kg	15	----	----	----	----
Manganese	7439-96-5	5	mg/kg	705	----	----	----	----
Molybdenum	7439-98-7	2	mg/kg	<2	----	----	----	----
Nickel	7440-02-0	2	mg/kg	4	----	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
Zinc	7440-66-6	5	mg/kg	56	----	----	----	----
Calcium	7440-70-2	50	mg/kg	4290	----	----	----	----
Magnesium	7439-95-4	50	mg/kg	2350	----	----	----	----
Sodium	7440-23-5	50	mg/kg	490	----	----	----	----
Potassium	7440-09-7	50	mg/kg	730	----	----	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1115900	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
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Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 09-AUG-2011
Sampler	: D. Wise	Issue Date	: 25-AUG-2011
Site	: Bengalla Coal Mine		
Quote number	: BN/567/10	No. of samples received	: 6
		No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



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ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Inorganics
Myles.Clark	Acid Sulfate Soils Supervisor	Stafford Minerals - AY

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Page : 2 of 4
Work Order : EB1115900
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



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

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

Page : 3 of 4
Work Order : EB1115900
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



Analytical Results

Sub-Matrix: COAL				Client sample ID	SC503	Bolt Press Filter Cake TH70	SC702	Bolt Press filter Cake TH70	SC403
Client sampling date / time					28-JUL-2011 07:30	28-JUL-2011 07:30	28-JUL-2011 15:00	28-JUL-2011 15:00	28-JUL-2011 07:30
Compound	CAS Number	LOR	Unit		EB1115900-001	EB1115900-002	EB1115900-003	EB1115900-004	EB1115900-005
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		4.7	7.2	7.8	7.6	5.1
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		178	40.7	197	47.3	120
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		623	719	434	711	486
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		5.4	4.9	23.1	5.9	4.2
^ ANC as CaCO3	----	0.1	% CaCO3		0.6	0.5	2.4	0.6	0.4
Fizz Rating	----	0	Fizz Unit		0	0	1	0	0
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		5.99	1.49	7.20	1.74	4.05

Page : 4 of 4
 Work Order : EB1115900
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: COAL				Client sample ID	SC701	----	----	----	----
				Client sampling date / time	28-JUL-2011 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1115900-006	----	----	----	----
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		8.2	----	----	----	----
EA009: Nett Acid Production Potential									
^ Net Acid Production Potential	----	0.5	kg H2SO4/t		226	----	----	----	----
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		424	----	----	----	----
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		20.8	----	----	----	----
^ ANC as CaCO3	----	0.1	% CaCO3		2.1	----	----	----	----
Fizz Rating	----	0	Fizz Unit		1	----	----	----	----
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		8.07	----	----	----	----

ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EB1117339	Page	: 1 of 6
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 09-AUG-2011
Sampler	: ----	Issue Date	: 06-SEP-2011
Site	: ----		
Quote number	: BN/567/10	No. of samples received	: 9
		No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



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Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils

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Page : 2 of 6
Work Order : EB1117339
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



General Comments

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- **EG005T (Total Metals): Sample EB1117339-008 (Comp2) shows poor matrix recovery due to sample matrix interference. Confirmed by visual confirmation.**



Page : 3 of 6
 Work Order : EB1117339
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla

Analytical Results

Sub-Matrix: COMPOSITE				Client sample ID	Comp1	Comp2	Comp3		
Client sampling date / time					26-AUG-2011 15:00	26-AUG-2011 15:00	26-AUG-2011 15:00		
Compound	CAS Number	LOR	Unit	EB1117339-007	EB1117339-008	EB1117339-009			
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%	51.4	5.3	22.7	----		----
ED037: Alkalinity									
Total Alkalinity as CaCO3	----	1	mg/kg	444	287	405	----		----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	444	287	405	----		----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	<1	<1	<1	----		----
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg	1880	1200	680	----		----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	10	mg/kg	560	40	130	----		----
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg	<10	<10	<10	----		----
Magnesium	7439-95-4	10	mg/kg	<10	<10	<10	----		----
Sodium	7440-23-5	10	mg/kg	1700	700	640	----		----
Potassium	7440-09-7	10	mg/kg	10	<10	<10	----		----
ED093T: Total Major Cations									
Sodium	7440-23-5	10	mg/kg	2710	2580	1890	----		----
Potassium	7440-09-7	10	mg/kg	670	440	420	----		----
Calcium	7440-70-2	10	mg/kg	1740	26400	5320	----		----
Magnesium	7439-95-4	10	mg/kg	980	520	2020	----		----
EG005S : Soluble Metals by ICPAES									
Aluminium	7429-90-5	1	mg/kg	<1	<1	<1	----		----
Antimony	7440-36-0	0.1	mg/kg	0.1	<0.1	<0.1	----		----
Arsenic	7440-38-2	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Boron	7440-42-8	1	mg/kg	<1	<1	<1	----		----
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Chromium	7440-47-3	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Cobalt	7440-48-4	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Copper	7440-50-8	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Iron	7439-89-6	1	mg/kg	<1	<1	<1	----		----
Lead	7439-92-1	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Manganese	7439-96-5	0.1	mg/kg	<0.1	<0.1	0.1	----		----
Molybdenum	7439-98-7	0.1	mg/kg	0.2	<0.1	<0.1	----		----
Nickel	7440-02-0	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
Selenium	7782-49-2	0.1	mg/kg	0.1	<0.1	<0.1	----		----
Zinc	7440-66-6	0.1	mg/kg	<0.1	<0.1	<0.1	----		----
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg	2120	2470	1870	----		----

Page : 4 of 6
 Work Order : EB1117339
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: **COMPOSITE**

Client sample ID

Client sampling date / time

				Comp1	Comp2	Comp3	----	----
				26-AUG-2011 15:00	26-AUG-2011 15:00	26-AUG-2011 15:00	----	----
Compound	CAS Number	LOR	Unit	EB1117339-007	EB1117339-008	EB1117339-009	----	----
EG005T: Total Metals by ICP-AES - Continued								
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	----
Cobalt	7440-48-4	2	mg/kg	6	10	16	----	----
Iron	7439-89-6	50	mg/kg	10300	14700	77400	----	----
Manganese	7439-96-5	5	mg/kg	58	42	323	----	----
Molybdenum	7439-98-7	2	mg/kg	<2	<2	3	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	----	----
Arsenic	7440-38-2	5	mg/kg	6	6	18	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	2	<2	<2	----	----
Copper	7440-50-8	5	mg/kg	29	43	57	----	----
Lead	7439-92-1	5	mg/kg	11	17	15	----	----
Nickel	7440-02-0	2	mg/kg	9	12	24	----	----
Zinc	7440-66-6	5	mg/kg	46	35	53	----	----



Page : 5 of 6
 Work Order : EB1117339
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla

Analytical Results

Sub-Matrix: SOIL				Client sample ID	Bolt Press Filter Cake TH70	Bolt Press filter Cake T H70	SC403	SC503	SC702
Client sampling date / time					28-JUL-2011 15:00	28-JUL-2011 15:00	28-JUL-2011 15:00	28-JUL-2011 15:00	28-JUL-2011 15:00
Compound	CAS Number	LOR	Unit		EB1117339-001	EB1117339-002	EB1117339-003	EB1117339-004	EB1117339-005
EA026 : Chromium Reducible Sulfur									
Chromium Reducible Sulphur	----	0.005	%		0.640	0.628	3.15	4.15	6.40

Page : 6 of 6
Work Order : EB1117339
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID	SC701	----	----	----	----
				Client sampling date / time	28-JUL-2011 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1117339-006	----	----	----	----	----
EA026 : Chromium Reducible Sulfur									
Chromium Reducible Sulphur	----	0.005	%	8.14	----	----	----	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1122094	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 21-OCT-2011
Sampler	: Nathan Smith	Issue Date	: 08-NOV-2011
Site	: Bengalla Coal Mine		
Quote number	: BN/567/10	No. of samples received	: 2
		No. of samples analysed	: 2

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Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils

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Page : 2 of 3
Work Order : EB1122094
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla



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

Page : 3 of 3
 Work Order : EB1122094
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: SOIL				Client sample ID				
				Client sampling date / time				
Compound	CAS Number	LOR	Unit	PF2	VA 1/2			
				13-OCT-2011 15:00	14-OCT-2011 15:00			
				EB1122094-001	EB1122094-002			
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.9	8.8	----	----	----
EA009: Nett Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	5.5	-7.4	----	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	484	381	----	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	3.7	27.0	----	----	----
ANC as CaCO3	----	0.1	% CaCO3	0.4	2.8	----	----	----
Fizz Rating	----	0	Fizz Unit	0	1	----	----	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.30	0.64	----	----	----



Environmental Division



CERTIFICATE OF ANALYSIS

Work Order	: EB1124058	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 14-NOV-2011
Sampler	: ALAN ROBERTSON	Issue Date	: 25-NOV-2011
Site	: Bengalla Coal Mine		
Quote number	: BN/057/11 V2	No. of samples received	: 2
		No. of samples analysed	: 2

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Signatories

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Signatories	Position	Accreditation Category
Myles.Clark	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

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Page : 2 of 3
Work Order : EB1124058
Client : RGS ENVIRONMENTAL PTY LTD
Project : Bengalla

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- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5

Page : 3 of 3
 Work Order : EB1124058
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : Bengalla



Analytical Results

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

				PF2	VA1/2			
				14-NOV-2011 12:00	14-NOV-2011 12:00			
Compound	CAS Number	LOR	Unit	EB1124058-001	EB1124058-002			
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.044	0.495	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	29.5	26.3	----	----	----
ED093T: Total Major Cations								
Sodium	7440-23-5	10	mg/kg	1340	350	----	----	----
Potassium	7440-09-7	10	mg/kg	840	860	----	----	----
Calcium	7440-70-2	10	mg/kg	860	11300	----	----	----
Magnesium	7439-95-4	10	mg/kg	940	4410	----	----	----
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	2060	2250	----	----	----
Antimony	7440-36-0	5	mg/kg	<5	<5	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cobalt	7440-48-4	2	mg/kg	5	8	----	----	----
Iron	7439-89-6	50	mg/kg	5640	32100	----	----	----
Manganese	7439-96-5	5	mg/kg	45	308	----	----	----
Molybdenum	7439-98-7	2	mg/kg	<2	<2	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	2	2	----	----	----
Copper	7440-50-8	5	mg/kg	17	36	----	----	----
Lead	7439-92-1	5	mg/kg	8	12	----	----	----
Nickel	7440-02-0	2	mg/kg	5	10	----	----	----
Zinc	7440-66-6	5	mg/kg	22	51	----	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1113862	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 15-JUL-2011
Sampler	: A. Roberson	Issue Date	: 22-JUL-2011
Site	: Bengalla		
Quote number	: BN/567/10	No. of samples received	: 3
		No. of samples analysed	: 3

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



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Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics

Environmental Division Brisbane
Part of the **ALS Laboratory Group**
32 Shand Street Stafford QLD Australia 4053
Tel. +61-7-3243 7222 Fax. +61-7-3243 7218 www.alsglobal.com
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Page : 2 of 4
Work Order : EB1113862
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



General Comments

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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.

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting



Page : 3 of 4
 Work Order : EB1113862
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla

Analytical Results

Sub-Matrix: WATER				Client sample ID	Bengalla OB1 KLC1	Bengalla OB2 KLC2	Bengalla rejects1 KLC3	----	----
Client sampling date / time					07-JUL-2011 15:00	07-JUL-2011 15:00	07-JUL-2011 15:00	----	----
Compound	CAS Number	LOR	Unit		EB1113862-001	EB1113862-002	EB1113862-003	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		9.27	9.32	7.25	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		267	260	408	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		22	84	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		87	53	20	----	----
Total Alkalinity as CaCO3	----	1	mg/L		109	137	20	----	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		<1	<1	<1	----	----
ED040F: Dissolved Major Anions									
Sulfate as SO4 2-	14808-79-8	1	mg/L		15	10	136	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		13	8	8	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		4	6	10	----	----
Magnesium	7439-95-4	1	mg/L		4	6	8	----	----
Sodium	7440-23-5	1	mg/L		50	48	51	----	----
Potassium	7440-09-7	1	mg/L		2	5	<1	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		2.45	1.92	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L		0.023	0.011	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		0.002	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	----	----
Manganese	7439-96-5	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L		0.013	0.004	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	----	----
Iron	7439-89-6	0.05	mg/L		0.08	<0.05	<0.05	----	----
EN055: Ionic Balance									

Page : 4 of 4
 Work Order : EB1113862
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: WATER				Client sample ID	Bengalla OB1 KLC1	Bengalla OB2 KLC2	Bengalla rejects1 KLC3	----	----
				Client sampling date / time	07-JUL-2011 15:00	07-JUL-2011 15:00	07-JUL-2011 15:00	----	----
Compound	CAS Number	LOR	Unit		EB1113862-001	EB1113862-002	EB1113862-003	----	----
EN055: Ionic Balance - Continued									
^ Total Anions	----	0.01	meq/L		2.86	3.17	3.46	----	----
^ Total Cations	----	0.01	meq/L		2.75	3.01	3.38	----	----
^ Ionic Balance	----	0.01	%		----	2.67	----	----	----
Ionic Balance	----	0.01	%		----	----	1.22	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1114257	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 21-JUL-2011
Sampler	: A Robertson	Issue Date	: 01-AUG-2011
Site	: ----		
Quote number	: BN/567/10	No. of samples received	: 3
		No. of samples analysed	: 3

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Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics

Environmental Division Brisbane
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Page : 2 of 3
Work Order : EB1114257
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Page : 3 of 3
Work Order : EB1114257
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



Analytical Results

Sub-Matrix: WATER				Client sample ID	Bengalla OB1 KLC1	Bengalla OB2 KLC2	Bengalla rejects1 KLC3	----	----
Client sampling date / time					19-JUL-2011 15:00	19-JUL-2011 15:00	19-JUL-2011 15:00	----	----
Compound	CAS Number	LOR	Unit		EB1114257-001	EB1114257-002	EB1114257-003	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		9.23	9.36	7.09	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		226	226	228	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		14	21	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		50	69	7	----	----
Total Alkalinity as CaCO3	----	1	mg/L		65	90	7	----	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		<1	<1	2	----	----
ED040F: Dissolved Major Anions									
Sulfate as SO4 2-	14808-79-8	1	mg/L		34	26	88	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		16	11	5	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		<1	1	6	----	----
Magnesium	7439-95-4	1	mg/L		<1	<1	4	----	----
Sodium	7440-23-5	1	mg/L		48	48	36	----	----
Potassium	7440-09-7	1	mg/L		2	3	<1	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		2.40	1.88	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L		0.020	0.014	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		0.004	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	0.001	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	----	----
Manganese	7439-96-5	0.001	mg/L		<0.001	<0.001	0.015	----	----
Molybdenum	7439-98-7	0.001	mg/L		0.046	0.018	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		0.01	0.01	<0.01	----	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	----	----
Iron	7439-89-6	0.05	mg/L		0.10	<0.05	<0.05	----	----



Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EB1115390	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 03-AUG-2011
Sampler	: A Robertson/ R Rait	Issue Date	: 15-AUG-2011
Site	: ----		
Quote number	: BN/567/10	No. of samples received	: 3
		No. of samples analysed	: 3

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<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics

Environmental Division Brisbane
Part of the **ALS Laboratory Group**

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Page : 2 of 3
Work Order : EB1115390
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla

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

Page : 3 of 3
 Work Order : EB1115390
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: LEACHATE				Client sample ID	Bengalla OB1 KLC1	Bengalla OB2 KLC2	Bengalla rejects1 KLC3	----	----
Client sampling date / time					03-AUG-2011 15:00	03-AUG-2011 15:00	03-AUG-2011 15:00	----	----
Compound	CAS Number	LOR	Unit		EB1115390-001	EB1115390-002	EB1115390-003	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		9.79	9.72	7.22	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		189	196	376	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		23	31	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		26	39	7	----	----
Total Alkalinity as CaCO3	----	1	mg/L		48	70	7	----	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		<1	<1	2	----	----
ED040F: Dissolved Major Anions									
Sulfate as SO4 2-	14808-79-8	1	mg/L		26	21	152	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		8	7	2	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		<1	1	8	----	----
Magnesium	7439-95-4	1	mg/L		<1	<1	9	----	----
Sodium	7440-23-5	1	mg/L		38	39	51	----	----
Potassium	7440-09-7	1	mg/L		2	2	<1	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		1.80	2.16	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L		0.016	0.014	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		0.002	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	0.002	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	0.004	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	0.006	----	----
Manganese	7439-96-5	0.001	mg/L		<0.001	<0.001	0.037	----	----
Molybdenum	7439-98-7	0.001	mg/L		0.030	0.016	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	----	----
Iron	7439-89-6	0.05	mg/L		0.11	<0.05	<0.05	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1116606	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 18-AUG-2011
Sampler	: A ROBERTSON	Issue Date	: 30-AUG-2011
Site	: ----		
Quote number	: BN/567/10	No. of samples received	: 3
		No. of samples analysed	: 3

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- Analytical Results



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Signatories

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Signatories	Position	Accreditation Category
Greg Vogel	Laboratory Manager	Brisbane Inorganics
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics

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Page : 2 of 3
Work Order : EB1116606
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



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Page : 3 of 3
Work Order : EB1116606
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



Analytical Results

Sub-Matrix: LEACHATE				Client sample ID	Bengalla OB1 KLC1	Bengalla OB2 KLC2	Bengalla rejects1 KLC3	----	----
Client sampling date / time					18-AUG-2011 11:00	18-AUG-2011 11:00	18-AUG-2011 11:00	----	----
Compound	CAS Number	LOR	Unit		EB1116606-001	EB1116606-002	EB1116606-003	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		9.51	9.56	7.01	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		166	151	363	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		18	24	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		30	38	9	----	----
Total Alkalinity as CaCO3	----	1	mg/L		48	62	9	----	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		<1	<1	2	----	----
ED040F: Dissolved Major Anions									
Sulfate as SO4 2-	14808-79-8	1	mg/L		21	13	156	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		8	6	3	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		<1	3	12	----	----
Magnesium	7439-95-4	1	mg/L		<1	3	12	----	----
Sodium	7440-23-5	1	mg/L		35	33	45	----	----
Potassium	7440-09-7	1	mg/L		2	15	1	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		134	50.9	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L		0.002	0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L		0.025	0.029	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		0.0003	0.0003	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		0.109	0.111	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		0.023	0.025	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L		0.023	0.023	0.002	----	----
Nickel	7440-02-0	0.001	mg/L		0.042	0.037	0.003	----	----
Lead	7439-92-1	0.001	mg/L		0.030	0.033	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L		0.097	0.096	0.007	----	----
Manganese	7439-96-5	0.001	mg/L		0.052	0.102	0.040	----	----
Molybdenum	7439-98-7	0.001	mg/L		0.030	0.015	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Boron	7440-42-8	0.05	mg/L		0.09	0.09	<0.05	----	----
Iron	7439-89-6	0.05	mg/L		13.5	11.3	<0.05	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1117693	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 31-AUG-2011
Sampler	: A Robertson	Issue Date	: 12-SEP-2011
Site	: Bengalla		
Quote number	: BN/567/10	No. of samples received	: 3
		No. of samples analysed	: 3

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



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This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics

Environmental Division Brisbane
Part of the **ALS Laboratory Group**

32 Shand Street Stafford QLD Australia 4053
Tel. +61-7-3243 7222 Fax. +61-7-3243 7218 www.alsglobal.com
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Page : 2 of 3
Work Order : EB1117693
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla

General Comments

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Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Page : 3 of 3
 Work Order : EB1117693
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: WATER

Client sample ID

				Bengalla OB1 KLC1	Bengalla OB2 KLC2	Bengalla rejects1 KLC3	----	----
Client sampling date / time				31-AUG-2011 15:00	31-AUG-2011 15:00	31-AUG-2011 15:00	----	----
Compound	CAS Number	LOR	Unit	EB1117693-001	EB1117693-002	EB1117693-003	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	9.61	9.65	7.22	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	193	158	342	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	25	26	<1	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	27	31	10	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	53	57	10	----	----
ED038A: Acidity								
Acidity as CaCO ₃	----	1	mg/L	<1	<1	2	----	----
ED040F: Dissolved Major Anions								
Sulfate as SO ₄ 2-	14808-79-8	1	mg/L	24	15	146	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	10	6	3	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	1	11	----	----
Magnesium	7439-95-4	1	mg/L	<1	<1	9	----	----
Sodium	7440-23-5	1	mg/L	39	31	45	----	----
Potassium	7440-09-7	1	mg/L	2	2	<1	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	3.23	2.54	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	0.017	0.010	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	0.003	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.002	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.003	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.009	----	----
Manganese	7439-96-5	0.001	mg/L	0.001	0.001	0.026	----	----
Molybdenum	7439-98-7	0.001	mg/L	0.036	0.015	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----
Iron	7439-89-6	0.05	mg/L	0.28	0.08	<0.05	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1118811	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 14-SEP-2011
Sampler	: A.Robertson	Issue Date	: 27-SEP-2011
Site	: ----		
Quote number	: BN/567/10	No. of samples received	: 6
		No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

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- General Comments
- Analytical Results



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Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics

Environmental Division Brisbane
 Part of the **ALS Laboratory Group**
 32 Shand Street Stafford QLD Australia 4053
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Page : 2 of 4
Work Order : EB1118811
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



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

Page : 3 of 4
 Work Order : EB1118811
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: **WATER**

Client sample ID

				Bengalla OB1 KLC1	Bengalla OB2 KLC2	Bengalla rejects1 KLC3	Bengalla rejects KLC4	Bengalla rejects KLC5
Client sampling date / time				14-SEP-2011 15:00	14-SEP-2011 15:00	14-SEP-2011 15:00	08-SEP-2011 15:00	08-SEP-2011 15:00
Compound	CAS Number	LOR	Unit	EB1118811-001	EB1118811-002	EB1118811-003	EB1118811-004	EB1118811-005
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	9.66	9.64	7.09	8.39	2.73
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	169	239	508	3440	2340
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	20	34	<1	12	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	23	41	12	323	<1
Total Alkalinity as CaCO ₃	----	1	mg/L	43	75	12	335	<1
ED038A: Acidity								
Acidity as CaCO ₃	----	1	mg/L	<1	<1	4	<1	461
ED040F: Dissolved Major Anions								
Sulfate as SO ₄ 2-	14808-79-8	1	mg/L	24	32	225	862	1100
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	6	8	3	370	2
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	15	12	34
Magnesium	7439-95-4	1	mg/L	<1	<1	20	6	14
Sodium	7440-23-5	1	mg/L	35	50	56	768	288
Potassium	7440-09-7	1	mg/L	1	1	1	5	1
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	3.30	3.29	<0.01	0.04	3.72
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.015	0.017	<0.001	0.003	0.007
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0155
Chromium	7440-47-3	0.001	mg/L	0.003	<0.001	<0.001	0.002	0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.792
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.001	0.001	0.422
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.002	<0.001	0.358
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.025
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.008	<0.005	1.59
Manganese	7439-96-5	0.001	mg/L	0.001	0.001	0.022	0.029	0.671
Molybdenum	7439-98-7	0.001	mg/L	0.028	0.030	0.005	0.092	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	0.01	0.01	<0.01	<0.01
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	0.18	<0.05
Iron	7439-89-6	0.05	mg/L	0.25	0.06	<0.05	<0.05	95.4

Page : 4 of 4
 Work Order : EB1118811
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: **WATER**

Client sample ID

Bengalla rejects KLC6

Client sampling date / time

08-SEP-2011 15:00

Compound	CAS Number	LOR	Unit	EB1118811-006				
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.71	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	3180	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	240	----	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	240	----	----	----	----
ED038A: Acidity								
Acidity as CaCO ₃	----	1	mg/L	10	----	----	----	----
ED040F: Dissolved Major Anions								
Sulfate as SO ₄ 2-	14808-79-8	1	mg/L	933	----	----	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	281	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	13	----	----	----	----
Magnesium	7439-95-4	1	mg/L	5	----	----	----	----
Sodium	7440-23-5	1	mg/L	751	----	----	----	----
Potassium	7440-09-7	1	mg/L	4	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	0.002	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	0.006	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.006	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	0.022	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	0.031	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Boron	7440-42-8	0.05	mg/L	0.11	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1120549	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 04-OCT-2011
Sampler	: A.ROBERTSON	Issue Date	: 13-OCT-2011
Site	: ----		
Quote number	: BN/567/10	No. of samples received	: 6
		No. of samples analysed	: 6

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Signatories

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<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

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 Part of the **ALS Laboratory Group**
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Page : 2 of 4
Work Order : EB1120549
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115



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^ = This result is computed from individual analyte detections at or above the level of reporting

Page : 3 of 4
 Work Order : EB1120549
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115



Analytical Results

Sub-Matrix: LEACHATE				Client sample ID	Bengalla 1	Bengalla 2	Bengalla 3	Bengalla 4	Bengalla 5
Client sampling date / time					30-SEP-2011 15:00	30-SEP-2011 15:00	30-SEP-2011 15:00	23-SEP-2011 15:00	23-SEP-2011 15:00
Compound	CAS Number	LOR	Unit		EB1120549-001	EB1120549-002	EB1120549-003	EB1120549-004	EB1120549-005
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		9.63	9.67	7.07	7.25	2.74
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		145	171	399	53	1860
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		20	27	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		22	37	8	4	<1
Total Alkalinity as CaCO ₃	----	1	mg/L		42	63	8	4	<1
ED038A: Acidity									
Acidity as CaCO ₃	----	1	mg/L		<1	<1	1	2	307
ED040F: Dissolved Major Anions									
Sulfate as SO ₄ 2-	14808-79-8	1	mg/L		15	12	168	16	758
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		5	4	2	1	<1
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		<1	<1	16	<1	17
Magnesium	7439-95-4	1	mg/L		<1	<1	15	<1	11
Sodium	7440-23-5	1	mg/L		28	33	36	8	169
Potassium	7440-09-7	1	mg/L		<1	1	1	<1	<1
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		2.39	2.96	<0.01	0.06	2.20
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.008	0.007	<0.001	<0.001	0.012
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	0.0002	0.0001	<0.0001	0.0086
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	0.002
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	0.452
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	0.003	<0.001	0.277
Nickel	7440-02-0	0.001	mg/L		<0.001	0.004	0.004	<0.001	0.266
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	0.002
Zinc	7440-66-6	0.005	mg/L		<0.005	0.007	0.016	<0.005	0.942
Manganese	7439-96-5	0.001	mg/L		<0.001	0.001	0.074	0.003	0.616
Molybdenum	7439-98-7	0.001	mg/L		0.018	0.013	<0.001	<0.001	0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L		0.08	<0.05	<0.05	<0.05	102

Page : 4 of 4
Work Order : EB1120549
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115



Analytical Results

Sub-Matrix: **LEACHATE**

Client sample ID

Client sampling date / time

				Bengalla 6	----	----	----	----
				23-SEP-2011 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1120549-006	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	3.85	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	6590	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	<1	----	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	<1	----	----	----	----
ED038A: Acidity								
Acidity as CaCO ₃	----	1	mg/L	34	----	----	----	----
ED040F: Dissolved Major Anions								
Sulfate as SO ₄ 2-	14808-79-8	1	mg/L	3710	----	----	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	35	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	141	----	----	----	----
Magnesium	7439-95-4	1	mg/L	84	----	----	----	----
Sodium	7440-23-5	1	mg/L	1440	----	----	----	----
Potassium	7440-09-7	1	mg/L	15	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	1.08	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0214	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.206	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	1.18	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.884	----	----	----	----
Lead	7439-92-1	0.001	mg/L	0.009	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	1.62	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	3.09	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	0.11	----	----	----	----
Boron	7440-42-8	0.05	mg/L	0.28	----	----	----	----
Iron	7439-89-6	0.05	mg/L	20.1	----	----	----	----


Environmental Division
CERTIFICATE OF ANALYSIS

Work Order	: EB1120962	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 10-OCT-2011
Sampler	: A Robertson	Issue Date	: 19-OCT-2011
Site	: ----		
Quote number	: BN/057/11 V2	No. of samples received	: 3
		No. of samples analysed	: 3

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



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Accredited for compliance with
ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

Environmental Division Brisbane
 Part of the **ALS Laboratory Group**
 32 Shand Street Stafford QLD Australia 4053
 Tel. +61-7-3243 7222 Fax. +61-7-3243 7218 www.alsglobal.com
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Page : 2 of 3
Work Order : EB1120962
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



General Comments

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Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Page : 3 of 3
 Work Order : EB1120962
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: LEACHATE				Client sample ID	Bengalla 4	Bengalla 5	Bengalla 6	----	----
				Client sampling date / time	06-OCT-2011 15:00	06-OCT-2011 15:00	06-OCT-2011 15:00	----	----
Compound	CAS Number	LOR	Unit		EB1120962-001	EB1120962-002	EB1120962-003	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.35	2.64	3.99	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		234	3530	4920	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		9	<1	<1	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		9	<1	<1	----	----
ED038A: Acidity									
Acidity as CaCO ₃	----	1	mg/L		3	1050	28	----	----
ED040F: Dissolved Major Anions									
Sulfate as SO ₄ 2-	14808-79-8	1	mg/L		96	2060	2860	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		1	<1	4	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		16	29	193	----	----
Magnesium	7439-95-4	1	mg/L		4	67	110	----	----
Sodium	7440-23-5	1	mg/L		28	437	930	----	----
Potassium	7440-09-7	1	mg/L		<1	<1	12	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.42	19.8	0.40	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L		0.001	0.022	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		0.0194	0.0419	0.0190	----	----
Chromium	7440-47-3	0.001	mg/L		0.002	0.007	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		0.073	2.62	0.089	----	----
Cobalt	7440-48-4	0.001	mg/L		1.08	1.63	1.09	----	----
Nickel	7440-02-0	0.001	mg/L		0.834	1.34	0.831	----	----
Lead	7439-92-1	0.001	mg/L		0.003	<0.001	0.003	----	----
Zinc	7440-66-6	0.005	mg/L		0.678	4.98	0.673	----	----
Manganese	7439-96-5	0.001	mg/L		4.33	3.59	4.30	----	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		0.05	0.01	0.04	----	----
Boron	7440-42-8	0.05	mg/L		0.21	<0.05	0.20	----	----
Iron	7439-89-6	0.05	mg/L		0.46	265	0.45	----	----



Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EB1122738	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 31-OCT-2011
Sampler	: A.Robertson	Issue Date	: 10-NOV-2011
Site	: ----		
Quote number	: BN/057/11 V2	No. of samples received	: 5
		No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

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Signatories

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Signatories	Position	Accreditation Category
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

Environmental Division Brisbane
Part of the **ALS Laboratory Group**

32 Shand Street Stafford QLD Australia 4053
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Page : 2 of 3
 Work Order : EB1122738
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla

General Comments

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LOR = Limit of reporting

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- **EG020-F (Dissolved Metals): EB1122569-002 shows poor matrix spike recovery due to matrix interference. This was confirmed by re-extraction and re-analysis.**

Page : 3 of 3
 Work Order : EB1122738
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: LIQUID

Client sample ID

Client sampling date / time

				Bengalla 4	Bengalla 5	Bengalla 6	Bengalla 7	Bengalla 8
				20-OCT-2011 15:00	20-OCT-2011 15:00	20-OCT-2011 15:00	28-OCT-2011 15:00	28-OCT-2011 15:00
Compound	CAS Number	LOR	Unit	EB1122738-001	EB1122738-002	EB1122738-003	EB1122738-004	EB1122738-005
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.28	2.51	3.33	7.50	7.85
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	290	3210	4770	907	983
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	9	<1	<1	50	106
Total Alkalinity as CaCO ₃	----	1	mg/L	9	<1	<1	50	106
ED038A: Acidity								
Acidity as CaCO ₃	----	1	mg/L	3	869	180	3	5
ED040F: Dissolved Major Anions								
Sulfate as SO ₄ 2-	14808-79-8	1	mg/L	115	1650	3030	260	233
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	<1	<1	1	83	94
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	15	28	244	16	12
Magnesium	7439-95-4	1	mg/L	4	50	254	21	16
Sodium	7440-23-5	1	mg/L	29	219	604	136	169
Potassium	7440-09-7	1	mg/L	5	4	26	6	6
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	19.5	1.95	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.112	0.002	0.002	0.002
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0296	0.0404	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	0.008	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	1.96	0.415	0.004	0.002
Cobalt	7440-48-4	0.001	mg/L	0.007	1.00	1.74	0.006	<0.001
Nickel	7440-02-0	0.001	mg/L	0.009	0.979	1.46	0.005	0.004
Lead	7439-92-1	0.001	mg/L	<0.001	0.002	0.024	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	3.00	1.90	<0.005	<0.005
Manganese	7439-96-5	0.001	mg/L	0.063	3.72	13.5	0.292	0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.005	<0.001	0.026	0.033
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.05	<0.01	<0.01
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.06	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L	<0.05	307	39.4	<0.05	<0.05



Environmental Division



CERTIFICATE OF ANALYSIS

Work Order	: EB1124028	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 14-NOV-2011
Sampler	: A Robertson	Issue Date	: 25-NOV-2011
Site	: ----		
Quote number	: BN/057/11 V2	No. of samples received	: 5
		No. of samples analysed	: 5

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Signatories

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Signatories	Position	Accreditation Category
Greg Vogel	Laboratory Manager	Brisbane Inorganics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

Address 32 Shand Street Stafford QLD Australia 4053 | PHONE +61-7-3243 7222 | Facsimile +61-7-3243 7218
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Page : 2 of 3
Work Order : EB1124028
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



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^ = This result is computed from individual analyte detections at or above the level of reporting

Page : 3 of 3
Work Order : EB1124028
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla

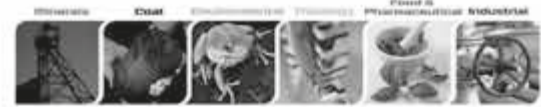


Analytical Results

Sub-Matrix: WATER				Client sample ID	Bengalla 4	Bengalla 5	Bengalla 6	Bengalla 7	Bengalla 8
Client sampling date / time					03-NOV-2011 15:00	03-NOV-2011 15:00	03-NOV-2011 15:00	11-NOV-2011 15:00	11-NOV-2011 15:00
Compound	CAS Number	LOR	Unit		EB1124028-001	EB1124028-002	EB1124028-003	EB1124028-004	EB1124028-005
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.69	2.42	2.52	5.55	6.94
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		462	4010	7270	68	1040
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		6	<1	<1	1	13
Total Alkalinity as CaCO ₃	----	1	mg/L		6	<1	<1	1	13
ED038A: Acidity									
Acidity as CaCO ₃	----	1	mg/L		21	2310	2000	1	7
ED040F: Dissolved Major Anions									
Sulfate as SO ₄ 2-	14808-79-8	1	mg/L		200	2580	5790	15	369
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		1	<1	<1	5	51
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		39	30	282	<1	18
Magnesium	7439-95-4	1	mg/L		9	96	672	1	22
Sodium	7440-23-5	1	mg/L		30	178	418	8	153
Potassium	7440-09-7	1	mg/L		1	<1	21	<1	4
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	58.1	7.92	0.02	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	0.222	0.019	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		0.0002	0.0523	0.123	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	0.015	0.009	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	4.20	2.44	0.005	<0.001
Cobalt	7440-48-4	0.001	mg/L		0.016	2.00	4.14	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		0.017	1.88	3.86	<0.001	0.002
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	0.121	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		0.010	5.39	7.50	<0.005	<0.005
Manganese	7439-96-5	0.001	mg/L		0.148	8.46	43.0	0.008	0.001
Molybdenum	7439-98-7	0.001	mg/L		<0.001	0.006	<0.001	0.002	0.008
Selenium	7782-49-2	0.01	mg/L		<0.01	0.02	0.06	<0.01	0.02
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L		<0.05	623	508	<0.05	<0.05



Environmental Division



CERTIFICATE OF ANALYSIS

Work Order	: EB1125310	Page	: 1 of 3
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 28-NOV-2011
Sampler	: A Robertson	Issue Date	: 12-DEC-2011
Site	: ----		
Quote number	: BN/057/11 V2	No. of samples received	: 5
		No. of samples analysed	: 5

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- Analytical Results



NATA Accredited Laboratory 825

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Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

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Environmental Division Brisbane ABN 84 009 936 029 Part of the ALS Group A Campbell Brothers Limited Company

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Page : 2 of 3
 Work Order : EB1125310
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla

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.

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

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^ = This result is computed from individual analyte detections at or above the level of reporting

- **ED045G (Chloride) : The LOR for Bengalla 6 has been raised due to matrix interference.**
- **EG020A F (Dissolved Metals): Particular sample EB1125310-003 (Bengalla 6) required dilution prior to extraction due to matrix interferences. LOR values have been adjusted accordingly.**
- **The presence of high SO4 may bias the EC low.**

Page : 3 of 3
 Work Order : EB1125310
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: **WATER**

				Client sample ID	Bengalla 4	Bengalla 5	Bengalla 6	Bengalla 7	Bengalla 8
				Client sampling date / time	18-NOV-2011 15:00	18-NOV-2011 15:00	18-NOV-2011 15:00	25-NOV-2011 15:00	25-NOV-2011 15:00
Compound	CAS Number	LOR	Unit		EB1125310-001	EB1125310-002	EB1125310-003	EB1125310-004	EB1125310-005
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.36	2.20	2.05	5.53	6.69
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		588	4840	14300	199	925
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		5	<1	<1	3	8
Total Alkalinity as CaCO ₃	----	1	mg/L		5	<1	<1	3	8
ED038A: Acidity									
Acidity as CaCO ₃	----	1	mg/L		4	2600	18500	6	7
ED040F: Dissolved Major Anions									
Sulfate as SO ₄ 2-	14808-79-8	1	mg/L		272	3290	24800	56	362
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		3	<1	<5	12	32
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		31	35	326	4	23
Magnesium	7439-95-4	1	mg/L		18	94	1480	4	26
Sodium	7440-23-5	1	mg/L		54	139	122	23	117
Potassium	7440-09-7	1	mg/L		2	<1	<1	<1	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	75.1	213	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.010	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	0.392	1.07	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		0.0009	0.0462	0.338	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	0.015	0.165	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	4.60	18.6	<0.001	0.002
Cobalt	7440-48-4	0.001	mg/L		0.049	1.85	14.1	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		0.054	1.93	17.0	<0.001	0.002
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	0.029	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		0.040	4.97	33.6	<0.005	<0.005
Manganese	7439-96-5	0.001	mg/L		0.364	10.4	175	0.010	0.006
Molybdenum	7439-98-7	0.001	mg/L		<0.001	0.012	<0.010	0.010	0.005
Selenium	7782-49-2	0.01	mg/L		<0.01	0.02	0.21	<0.01	0.01
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.10	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L		<0.05	799	8150	0.08	0.08



CERTIFICATE OF ANALYSIS

Work Order	: EB1126527	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 09-DEC-2011
Sampler	: A Robertson	Issue Date	: 20-DEC-2011
Site	: ----		
Quote number	: BN/057/11 V2	No. of samples received	: 5
		No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



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Signatories

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Signatories	Position	Accreditation Category
Jonathon Angell	Inorganic Coordinator	Brisbane Inorganics
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

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Page : 2 of 4
Work Order : EB1126527
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



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^ = This result is computed from individual analyte detections at or above the level of reporting

- **Ionic Balance out of acceptable limits for sample Bengalla 7 due to analytes not quantified in this report.**
- **The presence of high SO₄ may bias the EC low.**



Analytical Results

Sub-Matrix: LIQUID				Client sample ID	Bengalla 4	Bengalla 5	Bengalla 6	Bengalla 7	Bengalla 8
				Client sampling date / time	04-DEC-2011 15:00	04-DEC-2011 15:00	04-DEC-2011 15:00	09-DEC-2011 09:45	09-DEC-2011 09:45
Compound	CAS Number	LOR	Unit	EB1126527-001	EB1126527-002	EB1126527-003	EB1126527-004	EB1126527-005	
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	5.75	2.24	2.03	6.68	7.08	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	223	4760	13900	1060	424	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	4	<1	<1	8	9	
Total Alkalinity as CaCO3	----	1	mg/L	4	<1	<1	8	9	
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L	27	2730	38300	4	<1	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	208	2660	27500	330	105	
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L	2	<1	<1	32	29	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	31	36	254	33	9	
Magnesium	7439-95-4	1	mg/L	20	104	1040	38	8	
Sodium	7440-23-5	1	mg/L	32	85	2	105	45	
Potassium	7440-09-7	1	mg/L	2	<1	<1	3	2	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	0.02	80.6	258	0.01	0.01	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.010	<0.010	<0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.358	1.66	0.001	<0.001	
Cadmium	7440-43-9	0.0001	mg/L	0.0011	0.0421	0.182	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	0.026	0.172	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	0.009	4.30	16.1	0.002	0.001	
Cobalt	7440-48-4	0.001	mg/L	0.029	1.50	6.88	0.002	<0.001	
Nickel	7440-02-0	0.001	mg/L	0.034	1.65	9.74	0.002	<0.001	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.010	<0.010	<0.001	<0.001	
Zinc	7440-66-6	0.005	mg/L	0.103	3.96	16.5	<0.005	<0.005	
Manganese	7439-96-5	0.001	mg/L	0.190	11.3	182	0.026	0.011	
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.010	0.013	0.004	0.031	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.10	0.22	0.01	<0.01	
Boron	7440-42-8	0.05	mg/L	<0.05	<0.10	<0.10	<0.05	<0.05	
Iron	7439-89-6	0.05	mg/L	<0.05	812	12000	0.42	0.06	
EN055: Ionic Balance									

Page : 4 of 4
 Work Order : EB1126527
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: LIQUID

				Client sample ID	Bengalla 4	Bengalla 5	Bengalla 6	Bengalla 7	Bengalla 8
				Client sampling date / time	04-DEC-2011 15:00	04-DEC-2011 15:00	04-DEC-2011 15:00	09-DEC-2011 09:45	09-DEC-2011 09:45
Compound	CAS Number	LOR	Unit		EB1126527-001	EB1126527-002	EB1126527-003	EB1126527-004	EB1126527-005
EN055: Ionic Balance - Continued									
Total Anions	----	0.01	meq/L		4.47	55.4	572	7.93	3.18
Total Cations	----	0.01	meq/L		4.64	----	----	9.42	3.12
Total Cations	----	0.01	meq/L		----	52.8	564	----	----
Ionic Balance	----	0.01	%		1.85	----	----	8.54	1.10
Ionic Balance	----	0.01	%		----	2.49	0.71	----	----



CERTIFICATE OF ANALYSIS

Work Order	: EB1200456	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 09-JAN-2012
Sampler	: A Robertson	Issue Date	: 16-JAN-2012
Site	: Bengalla		
Quote number	: BN/057/11 V2	No. of samples received	: 4
		No. of samples analysed	: 2

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Jonathon Angell	Inorganic Coordinator	Brisbane Inorganics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

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Page : 2 of 4
Work Order : EB1200456
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115



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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting



Analytical Results

Sub-Matrix: WATER				Client sample ID	Bengalla 7	Bengalla 8			
				Client sampling date / time	06-JAN-2012 15:00	06-JAN-2012 15:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1200456-001	EB1200456-002	----	----	----	
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	7.18	7.34	----	----	----	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	153	960	----	----	----	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	9	17	----	----	----	
Total Alkalinity as CaCO3	----	1	mg/L	9	17	----	----	----	
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L	1	3	----	----	----	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	47	435	----	----	----	
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L	11	18	----	----	----	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	4	53	----	----	----	
Magnesium	7439-95-4	1	mg/L	4	55	----	----	----	
Sodium	7440-23-5	1	mg/L	20	68	----	----	----	
Potassium	7440-09-7	1	mg/L	<1	7	----	----	----	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	----	----	----	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	----	----	----	
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----	
Copper	7440-50-8	0.001	mg/L	<0.001	0.002	----	----	----	
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----	
Nickel	7440-02-0	0.001	mg/L	<0.001	0.002	----	----	----	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----	
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----	
Manganese	7439-96-5	0.001	mg/L	0.001	0.009	----	----	----	
Molybdenum	7439-98-7	0.001	mg/L	0.011	0.003	----	----	----	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----	
Boron	7440-42-8	0.05	mg/L	<0.05	0.05	----	----	----	
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----	
EN055: Ionic Balance									

Page : 4 of 4
Work Order : EB1200456
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115



Analytical Results

Sub-Matrix: WATER				Client sample ID	Bengalla 7	Bengalla 8	----	----	----
				Client sampling date / time	06-JAN-2012 15:00	06-JAN-2012 15:00	----	----	----
Compound	CAS Number	LOR	Unit		EB1200456-001	EB1200456-002	----	----	----
EN055: Ionic Balance - Continued									
Total Anions	----	0.01	meq/L		1.47	9.90	----	----	----
Total Cations	----	0.01	meq/L		1.40	10.3	----	----	----
Ionic Balance	----	0.01	%		2.46	1.99	----	----	----



Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EB1201200	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 17-JAN-2012
Sampler	: A Robertson	Issue Date	: 25-JAN-2012
Site	: Bengalla		
Quote number	: BN/057/11 V2	No. of samples received	: 2
		No. of samples analysed	: 2

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Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics

Environmental Division Brisbane
Part of the **ALS Laboratory Group**

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Page : 2 of 4
Work Order : EB1201200
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115



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Page : 3 of 4
 Work Order : EB1201200
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115

Analytical Results

Sub-Matrix: WATER				Client sample ID	Bengalla 7	Bengalla 8			
				Client sampling date / time	23-DEC-2011 15:00	23-DEC-2011 15:00			
Compound	CAS Number	LOR	Unit		EB1201200-001	EB1201200-002			
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.97	7.14	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		308	1150	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		12	16	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		12	16	----	----	----
ED038A: Acidity									
Acidity as CaCO ₃	----	1	mg/L		29	17	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		84	535	----	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		18	19	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		6	56	----	----	----
Magnesium	7439-95-4	1	mg/L		8	59	----	----	----
Sodium	7440-23-5	1	mg/L		38	101	----	----	----
Potassium	7440-09-7	1	mg/L		1	8	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.50	mg/L		<0.50	<0.50	----	----	----
Antimony	7440-36-0	0.010	mg/L		<0.010	<0.010	----	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	----	----	----
Cobalt	7440-48-4	0.010	mg/L		<0.010	<0.010	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	0.003	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	0.008	----	----	----
Manganese	7439-96-5	0.010	mg/L		<0.010	0.050	----	----	----
Molybdenum	7439-98-7	0.010	mg/L		0.024	<0.010	----	----	----
Selenium	7782-49-2	0.10	mg/L		<0.10	<0.10	----	----	----
Boron	7440-42-8	0.50	mg/L		<0.50	<0.50	----	----	----
Iron	7439-89-6	0.50	mg/L		<0.50	<0.50	----	----	----
EN055: Ionic Balance									
^ Total Anions	----	0.01	meq/L		2.50	12.0	----	----	----

Page : 4 of 4
Work Order : EB1201200
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115



Analytical Results

Sub-Matrix: WATER				Client sample ID	Bengalla 7	Bengalla 8	----	----	----
				Client sampling date / time	23-DEC-2011 15:00	23-DEC-2011 15:00	----	----	----
Compound	CAS Number	LOR	Unit		EB1201200-001	EB1201200-002	----	----	----
EN055: Ionic Balance - Continued									
^ Total Cations	----	0.01	meq/L		2.64	12.2	----	----	----
^ Ionic Balance	----	0.01	%		----	1.03	----	----	----



CERTIFICATE OF ANALYSIS

Work Order	: EB1201775	Page	: 1 of 4
Client	: RGS ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ALAN ROBERTSON	Contact	: Customer Services
Address	: 18 INGLIS STREET GRANGE QLD, AUSTRALIA 4051	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alan@rgsenv.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3856 5591	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3856 5591	Facsimile	: +61 7 3243 7218
Project	: 101115 Bengalla	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 23-JAN-2012
Sampler	: A Robertson	Issue Date	: 31-JAN-2012
Site	: ----		
Quote number	: BN/057/11 V2	No. of samples received	: 2
		No. of samples analysed	: 2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics

Page : 2 of 4
Work Order : EB1201775
Client : RGS ENVIRONMENTAL PTY LTD
Project : 101115 Bengalla



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



Page : 3 of 4
 Work Order : EB1201775
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla

Analytical Results

Sub-Matrix: LIQUID				Client sample ID	Bengalla 7	Bengalla 8			
				Client sampling date / time	20-JAN-2012 15:00	20-JAN-2012 15:00			
Compound	CAS Number	LOR	Unit		EB1201775-001	EB1201775-002			
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.27	7.46			
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		88	951			
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1			
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1			
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		6	14			
Total Alkalinity as CaCO3	----	1	mg/L		6	14			
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		8	4			
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		31	458			
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		5	8			
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		3	58			
Magnesium	7439-95-4	1	mg/L		3	60			
Sodium	7440-23-5	1	mg/L		11	50			
Potassium	7440-09-7	1	mg/L		<1	6			
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.02	<0.01			
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001			
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001			
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001			
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001			
Copper	7440-50-8	0.001	mg/L		<0.001	0.001			
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001			
Nickel	7440-02-0	0.001	mg/L		<0.001	0.002			
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001			
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005			
Manganese	7439-96-5	0.001	mg/L		<0.001	0.015			
Molybdenum	7439-98-7	0.001	mg/L		0.005	0.003			
Selenium	7782-49-2	0.01	mg/L		<0.01	0.01			
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05			
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05			
EN055: Ionic Balance									

Page : 4 of 4
 Work Order : EB1201775
 Client : RGS ENVIRONMENTAL PTY LTD
 Project : 101115 Bengalla



Analytical Results

Sub-Matrix: LIQUID				Client sample ID	Bengalla 7	Bengalla 8	----	----	----
				Client sampling date / time	20-JAN-2012 15:00	20-JAN-2012 15:00	----	----	----
Compound	CAS Number	LOR	Unit		EB1201775-001	EB1201775-002	----	----	----
EN055: Ionic Balance - Continued									
Total Anions	----	0.01	meq/L		0.91	10.0	----	----	----
Total Cations	----	0.01	meq/L		0.88	10.2	----	----	----
Ionic Balance	----	0.01	%		----	0.59	----	----	----