APPENDIX 19

Geochemical Assessment

Prepared by:

ENVIRONMENTAL GEOCHEMISTRY INTERNATIONAL PTY LTD

81A College Street, Balmain, NSW 2041 Australia

Telephone: (61-2) 9810 8100 Facsimile: (61-2) 9810 5542

Email: egi@geochemistry.com.au

ACN 600 298 271 ABN 48 600 298 271

For:

UMWELT (AUSTRALIA) PTY LIMITED

ON BEHALF OF GLENDELL TENEMENTS PTY LIMITED

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Geochemical Assessment of the Glendell Continued Operations Project

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List of Abbreviations

Abbreviations Used in Geochemical Assessment

ARD	Acid Rock Drainage
AMD	Acid, Metalliferous and Saline Drainage
NMD	Neutral and Metalliferous Drainage
ABA	Acid Base Account
$pH_{1:2}$	pH of a sample slurry with a solid to water ratio of 1:2 (by weight)
$EC_{1:2}$	Electrical Conductivity of a sample slurry with a solid to water ratio of 1:2 (by weight)
ESP	Exchangeable Sodium Percentage
ECEC	Effective Cation Exchange Capacity
S	Sulphur
CRS	Chromium Reducible Sulphur
KCl	Potassium Chloride
H_2SO_4	Sulphuric Acid
SO_4	Sulphate
$CaCO_3$	Calcium Carbonate
ANC	Acid Neutralising Capacity in kg H_2SO_4/t
ANC_{ABCC}	Acid Neutralising Capacity in kg H2SO4/t estimated from ABCC testing
CNV	Carbonate Neutralising Value in kg H2SO4/t
MPA	Maximum Potential Acidity, calculated from total S in kg H_2SO_4/t
NAPP	Net Acid Producing Potential, calculated from ANC and total S (or MPA) in kg H_2SO_4/t.
NAG	Net Acid Generation (test)
NAGpH	pH of NAG solution before titration
$NAG_{(pH4.5)}$	NAG acidity titrated to pH 4.5 in kg H_2SO_4/t
$NAG_{(pH7.0)}$	NAG acidity titrated to pH 7.0 in kg H_2SO_4/t
ABCC	Acid Buffering Characteristic Curve
GAI	Geochemical Abundance Index based on multi-elements of solids
PAF	Potentially Acid Forming
PAF-LC	Potentially Acid Forming - Low Capacity
NAF	Non Acid Forming
UC	Uncertain
AC	Acid Consuming

Units of Measurement

%	Percentage
°C	Degrees Celsius
dS	Deci Siemen
μm	Micrometre
mm	Millimetre
m	Metre
mg	Milligram
g	Gram
kg	Kilogram
t	Tonne
L	Litre
ml	Millilitre

Other Abbreviations

ALS	Australian Laboratory Services
EGi	Environmental Geochemistry International Pty Ltd
Project	Glendell Continued Operations Project
ROM	Run-of-Mine

Executive Summary

Environmental Geochemistry International Pty Ltd (EGi) was commissioned by Umwelt (Australia) Pty Limited on behalf of Glendell Tenements Pty Limited (the Proponent) to carry out a geochemical assessment of the Glendell Continued Operations Project (the Project), located 20 km northwest of Singleton in NSW. This assessment follows on from previous geochemical investigations associated with potential mining areas at the Mount Owen Complex carried out by EGi in 2013, 2014 and 2018.This report will contribute to an Environmental Impact Statement (EIS) for the Project.

The objectives of the work were to assess the acid rock drainage (ARD), salinity, metal/metalloid leaching (including neutral mine drainage (NMD)) of the proposed mine materials, identify any geochemical issues, and provide recommendations for materials management and any follow up test work required.

The Project involves mining of a stratigraphic sequence currently being mined at Glendell Mine (Glendell Pit, also known as Barrett Pit) and the Mount Owen Mine (North Pit), and results of previous geochemical assessments for the Mount Owen Complex were used in conjunction with the current visual assessment and Project specific data to assess the geochemical implications for the Project. Note that no new testing was carried out for the Project, as it was determined that there was sufficient information already generated with the addition of visual core inspection. The following previous geochemical testing was considered relevant to the Project:

- Geochemical characterisation of 807 overburden/interburden and coal samples as part of 2013 and 2018 EGi studies;
- Leach column testing of eight representative interburden/overburden materials as part of the 2014 EGi study; and
- Geochemical characterisation of 181 coarse and fine rejects samples as part of the 2013 EGi study.

Results indicate that the vast bulk (over 95%) of overburden/interburden materials represented by the samples tested are likely to be Non Acid Forming (NAF), with a significant excess of acid neutralising capacity (ANC) and low leachable salinity. Occasional thin (generally less than 0.3 m) zones of elevated S were identified close to coal seams, but dilution and mixing during mining should be sufficient to mitigate any ARD generation.

Fresh overburden/interburden had a median ANC of 25 kg H_2SO_4/t, providing a potential source of buffering to help mitigate any ARD from Potentially Acid Forming (PAF) materials. Fresh sandstone tended to have higher ANC than other lithologies, having a median of 35 kg H_2SO_4/t, and is also the most common lithology. Given the expected high proportions of NAF relative to PAF (less than 3%), operational blending of NAF and PAF overburden/interburden together with the excess alkaline leachate from NAF materials is expected to be a robust approach to controlling ARD from PAF materials.

The Project will involve development to the base of the Hebden Seam, but with a stepped pit floor, so that the final pit floor will consist of two different seam floors: the floor of the Barrett 1 Seam; and floor of the Hebden Seam H2. All of the samples representing the floors of the Barrett and Hebden

Seam series were classified NAF, suggesting that any final pit floor below these seams are likely to be NAF.

The coal materials represented by the samples tested appear to be mainly NAF, but may include PAF and PAF Low Capacity (PAF-LC) portions. Some occurrences of coal horizons generating ARD were observed in the current pit walls, but the vast majority of the pit walls showed no evidence of ARD, supporting the isolated nature of these pyritic horizons.

Results of coarse rejects and tailings testing carried out as part of the 2013 EGi Study of the Mount Owen Complex are expected to be applicable to the Project, which indicate these are likely to be mainly NAF. However, rejects from Lemington, Pikes Gully, Liddell and Hebden Seam Groups may have a greater ARD hazard.

Kinetic Net Acid Generation (NAG) and leach column testing indicated that PAF materials are reactive and can rapidly generate ARD within weeks to a couple of months after exposure to atmospheric oxidation conditions. Constituents associated with ARD are likely to include Al, As, Co, Cu, Fe, Mn, Ni and Zn, and slightly elevated Cd and Cr. However, leach column results also show that thorough blending with NAF materials is likely to be an effective strategy in controlling ARD from PAF materials for at least 12 months.

Water extraction and leach column testing of NAF overburden/interburden and rejects indicated that these materials have low salinity potential and are unlikely to release significant metal/metalloid concentrations.

Overall, the geochemical characteristics of coal, overburden/interburden, coarse rejects and fine tailings material associated with the Project are expected to be consistent with those of existing operations at the Mount Owen Complex:

- The vast majority of overburden/interburden, coal and washery wastes for the Project are expected to be NAF with excess ANC and are not expected to require special handling. Dilution and mixing during mining are expected to be sufficient to mitigate ARD from any occasional thin zones of pyrite that may be present in pit walls and pit backfill, and prevent any significant impacts on downstream water quality.
- Although the PAF mine materials do not appear to represent a concern in terms of downstream water quality impacts, placement of PAF materials close to final surfaces could cause local effects on rehabilitation success through upward migration of acid and salinity into the growth horizon. The thorough intermingling of coarse rejects and overburden observed on site (Section 2), and the excess ANC in the overburden suggests, that these bulk fill zones are unlikely to result in any significant effects on rehabilitation.
- With regard to tailings disposal, fine rejects (tailings) are not mixed with neutralising overburden materials, and spigotting fine rejects can result in preferential deposition and concentration of pyritic materials, potentially resulting in PAF zones. These aspects need to be considered in the detailed final rehabilitation design of the tailings storage facilities (TSFs).
- Weathered Permian materials are likely to be NAF, but the 2013 EGi Study for the Mount Owen Complex indicated these materials were sodic and dispersive, and may require treatment with gypsum or lime if used as a plant growing horizon, exposed on dump surfaces

or used in engineered structures. Finer grained fresh Permian materials may also be partly sodic and require treatment.

- The low salinity potential of NAF overburden/interburden, and the expected relatively minor PAF overburden/interburden, washery waste and pit wall materials indicate that the Project is not likely to have a significant impact on pit water quality, or require modification of the current saline water management. More detailed assessment and modelling of surface and groundwater salinity balance and impacts are provided in separate surface water impact (GHD, 2019) and groundwater impact (AGE, 2019) assessments for the Project.

The following recommendations were made as part of the Geochemical Assessment for the Mount Owen Continued Operations Modification 2 and remain relevant to the Project:

- Carry out visual inspection of any further core drilling in the Project mine area for evidence of pyrite occurrence to confirm the strong dominance of NAF overburden/interburden across the deposit.
- The potential impacts of fine rejects on final rehabilitation of the TSFs are uncertain, and it should be demonstrated that either the TSF will not contain zones of PAF materials close to surface, or that the final TSF capping design will be effective in controlling upward flux of any potential ARD products. This will need to be considered in the detailed final rehabilitation design of the TSFs.
- The Mount Owen Complex Surface Water Management and Monitoring Plan (SWMMP) includes water quality monitoring provisions to monitor for ARD effects (Glencore, 2019). Some modifications are recommended, consistent with recommendations for the Mount Owen Continued Operations Modification 2:
    - The monitoring points should be expanded to include key pit dewatering points.
    - The parameters listed in the SWMMP should include the following relevant to ARD: pH, EC, SO_4, Ca, Mg, K, Na, Cl, Al, As, Co, Cu, Fe, Mn, Ni and Zn.
    - Alkalinity should also be monitored at the same frequency as pH and EC for all sites.
    - pH, EC, alkalinity SO_4, Ca, Mg, K, Na and Cl be determined monthly at water quality monitoring sites ECD2, W10, West Pit dewatering, North Pit dewatering and Glendell Pit dewatering for 12 months and reviewed.

1.0 Introduction

Environmental Geochemistry International Pty Ltd (EGi) was commissioned by Umwelt (Australia) Pty Limited on behalf of Glendell Tenements Pty Limited (the Proponent) to carry out a geochemical assessment of the Glendell Continued Operations Project (the Project), located 20 km northwest of Singleton in NSW. The objectives of the work are to assess the acid rock drainage (ARD), salinity, metal/metalloid leaching (including neutral mine drainage, NMD) of the proposed mine materials, identify any geochemical issues, and provide recommendations for materials management and any follow up test work required. This assessment follows on from previous geochemical investigations carried out by EGi on the Mount Owen Optimisation Project (2013 EGi Study) (EGi, 2013), which included the Mount Owen Continued Operations Project and the proposed mining area of the Project, follow on leach column testing by EGi for 52 weeks in 2013/2014 (2014 EGi Study) (EGI, 2014), and the Mount Owen Continued Operations Modification 2 (2018 EGi Study) (EGi, 2018). This report will contribute to an Environmental Impact Statement (EIS) for the Project.

The objectives of the work were to assess the acid rock drainage (ARD), salinity, metal/metalloid leaching (including neutral mine drainage, NMD) of the proposed mine materials, identify any geochemical issues, and provide recommendations for materials management and any follow up test work required.

The scope of work involved:

- compilation of background project data, including previous work, water quality data, coal quality data, geological information and project descriptions;
- site visits in June and September 2018 to examine representative core through the proposed mine stratigraphic sequence and inspect pits and operations;
- review and assessment of previous data in the context of the materials to be mined and processed as part of the Project;
- comparison of drill core visual inspection findings with previous test results to confirm the assumed continuity of geochemical properties of materials tested at Mount Owen and Glendell as part of previous geochemical investigations; and
- reporting.

The following compiles sampling, test methodology and test results of the previous EGi studies that relate to the Project. More detail can be found in the original reports. Note that no new testing was carried out for the Project, as it was determined that there was sufficient information already generated with the addition of visual core inspection detailed in Section 2.

2.0 Background and Geology

The Mount Owen Complex, which includes the Project Area, is located within the Hunter Coalfields in the Upper Hunter Valley of NSW.

The Project will involve further mining of the stratigraphic sequence currently being mined in the Glendell Mine, with an expansion of the Glendell Pit to the north (Glendell Pit Extension) and the mining of the Hebden Seam. This sequence is also mined In the Mount Owen North Pit. The coal deposit is a Permian aged multi-seamed resource hosted within the Wittingham Coal Measures, which is in turn part of the Singleton Super-Group. The Project will enable access to approximately 135 million tonnes (Mt) of additional run-of-mine (ROM) coal from the Glendell Pit. Recovery of the additional coal reserves will result in approximately 750 hectares (ha) of additional (to that currently approved) disturbance (Additional Disturbance Area) (Figure 1), and require an increased depth in the Glendell Pit to provide for mining down to the Hebden Seam. The change to the Glendell Pit mine plan will require the extension of the mine life through to 2044 (an additional 20 years beyond the current approved mining period).

Figure 2 is a typical stratigraphic section for the Singleton Super-Group in the Glendell Pit. The current operations target from the Pikes Gully to Barrett Seam series, with the approved Life of Mine Plan including from the Lemington B to Barrett Seam series. The target seams for the Project slightly extend the stratigraphic range with inclusion of the Lemington C Seam to Hebden Seam series. The Camberwell Anticline separates the Project Area into two parts, with structural differences but similar stratigraphy as follows:

East of the Camberwell Anticline

- Lemington A - C (3 seams)
- Pikes Gully
- Arties
- Liddell
- Barrett
- Hebden

West of the Camberwell Anticline

- Lemington A - B (2 seams)
- Pikes Gully
- Arties
- Liddell
- Barrett
- Hebden

Key non-coal sedimentary materials for the Project are predominantly (in decreasing order of abundance) sandstone, conglomerate, claystone, siltstone, carbonaceous claystone/siltstone and tuff. The Lemington Coal Measures were deposited under a marginal marine environment, and show elevated S in some coal plies as a result. The lower coal plies are more dominated by a freshwater depositional environment.

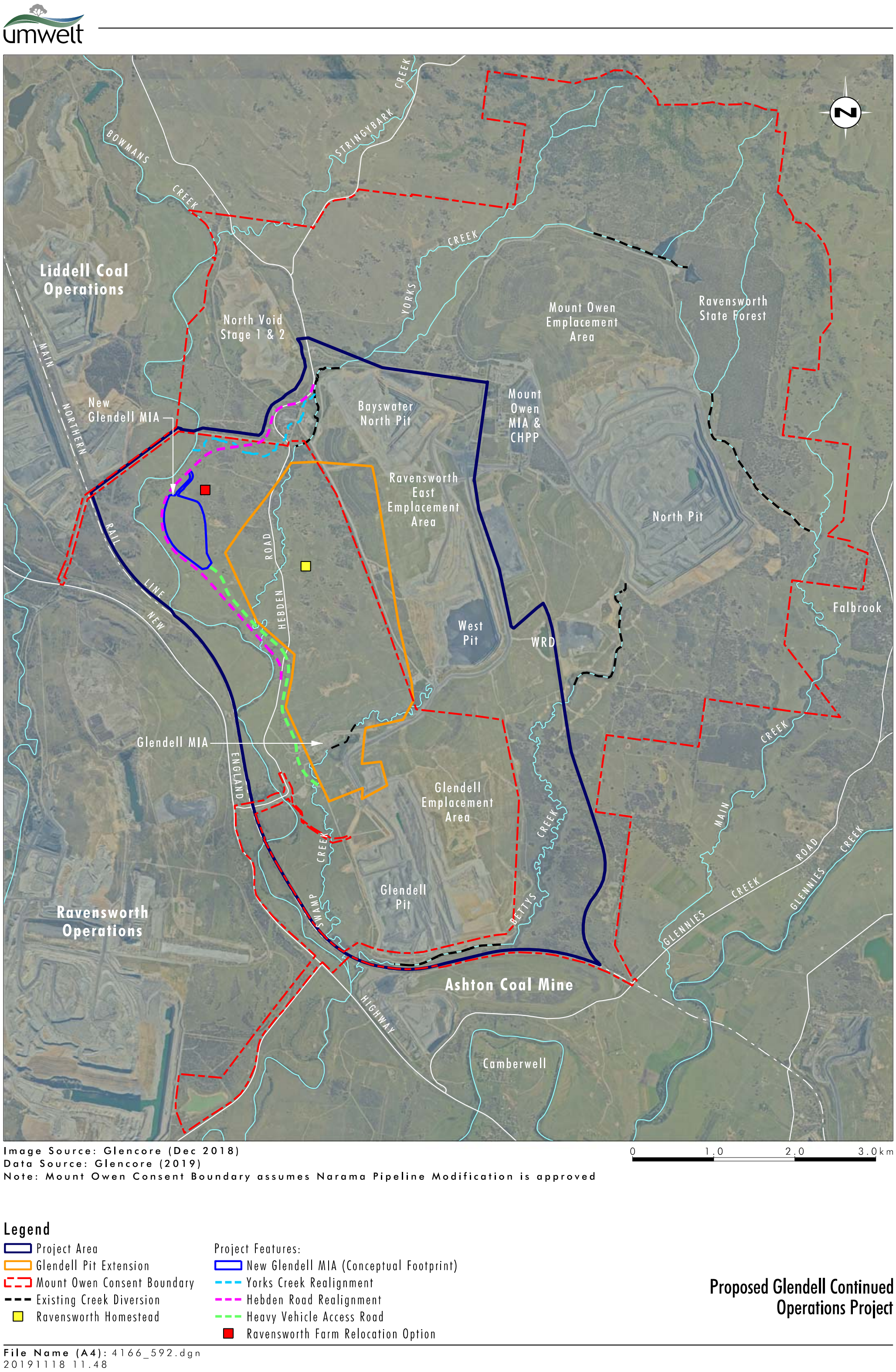
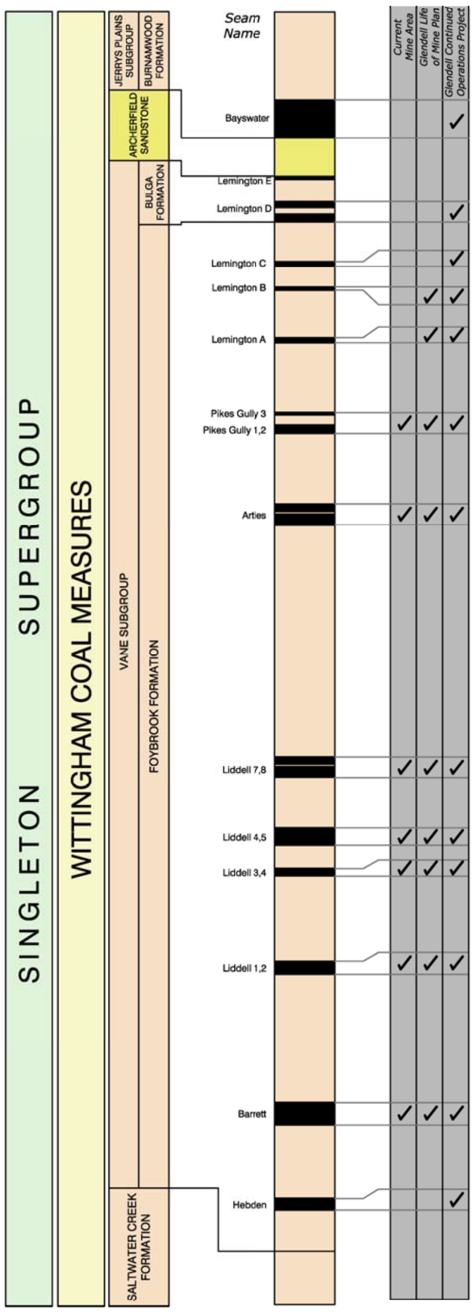


Figure 1 – Overview of the Project showing the Glendell Pit Extension.



Target Stratigraphy at Mount Owen Complex

Image Source: Glencore (April 2018)

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Figure 2 – Typical stratigraphic section of the Glendell Pit, showing the target seams for the Project.

The Project involves mining of a stratigraphic sequence currently being mined at Glendell Pit and the North Pit (Mount Owen Mine). Results of previous geochemical assessments for the Mount Owen Complex, including the 2013 EGi Study, 2014 EGi Study and 2018 EGi Study, can be used in conjunction with the current visual assessment and Project specific data to assess the geochemical implications for the Project.

Mining would involve continuation of truck and excavator methods currently being used, and reach a final pit depth of approximately 250 m from surface. Overburden and interburden would be progressively backfilled into the existing pits, with some out of pit dumping as required.

All coal is washed at the existing Mount Owen Coal Handling and Preparation Plant (CHPP) to produce mainly thermal coal and around 24% semi-soft coking coal, and coarse and fine rejects streams. Product coal is transported to the Port of Newcastle via the existing Mount Owen rail spur and the Main Northern Rail Line. Coarse rejects are placed in pit with the overburden/interburden, and fine tailings rejects thickened and deposited within the West Pit, in-pit tailings cells in North Pit/Bayswater North Pit, and/or transferred as part of the Greater Ravensworth Area Water and Tailings Scheme (GRAWTS).

Cored holes GNC007, GNC010 and GNC011 were examined during the September 2018 site visit as examples of interburden and overburden through the proposed mine stratigraphy. These holes were drilled in 2011 and 2012. In addition, hole GNC002 was examined during an EGi site visit in June 2011 as part of the previous geochemical test work conducted for the 2013 EGi Study. The focus of the core inspection was to identify any pyrite and neutralising carbonate occurrence, and check for continuity with previous observations during assessment of the Mount Owen Complex as part of the 2013 EGi Study and 2018 EGi Study. The stratigraphy intersected by each of these holes is shown below:

GNC002 – Lemington LCF to Hebden H4

GNC007 – Pikes Gully PG3 to Hebden H4

GNC010 – Lemington LBD to Hebden H2

GNC011 – Lemington LBF to Hebden LHB

Previous inspection of core and geochemical test work suggested that the pyrite was fast reacting and thus reaction products would be readily apparent through the presence of iron staining, and secondary salts associated with pyrite oxidation reactions, even in relatively fresh core. Hole GNC002 was inspected in 2011 only two months after drilling, and partial pyrite oxidation effects were already apparent. Exposure of the core from GNC007, GNC010 and GNC011 for several years before inspection in 2018 would allow partial oxidation of any pyrite and clearly highlight any pyritic zones. Note that coal seam intervals and immediate roof and floor materials had already been removed from the core examined, and no visual assessment could be made on pyrite occurrence in these materials.

As with previous observations for the Mount Owen Complex in the 2013 EGi Study and 2018 EGi Study, the vast majority of the core showed no evidence of pyrite occurrence (Plate 1). Pyrite occurrence was generally very minor throughout the stratigraphy, occurring mainly as traces and as thin veneers on bedding surfaces associated with carbonaceous partings (Plate 2 and 3), pyrite containing lensoids and conglomerate clasts (Plate 4 and 5), carbonaceous wisps in sandstone

(Plate 6), fractures (Plate 7), and more rarely as isolated small pyritic zones (Plate 8) and small lenses and bands (Plate 9). The more pyritic zones were generally within a one to two meters of coal seams and associated carbonaceous horizons mainly within the Lemington Seam series and occasional small zones associated with the Pikes Gully Seam series. Previous work and current observations show that those overburden/interburden zones with no visible evidence of pyrite can be assumed to be NAF.

Plate 1 – Typical benign sandstone, and interbedded siltstone/sandstone/conglomerate overburden/interburden. Holes GNC011 depth 106.5 to 110.52 m (top), GNC010, depth 51.55 to 55.05 m (bottom).

Plate 2 – Iron staining and sulphate salts due to partial oxidation of a pyrite coating parallel to bedding. Hole GNC010 68.30 m.

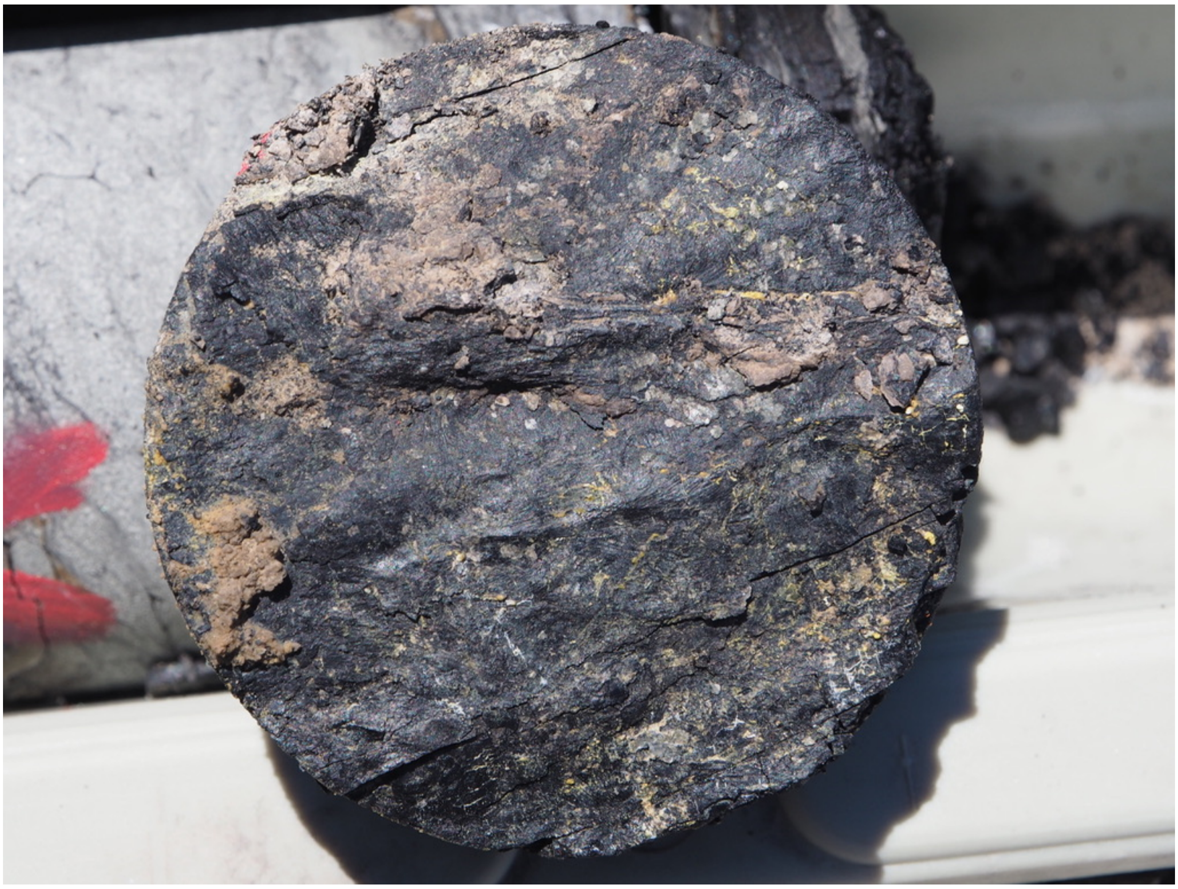

Plate 3 – Iron staining and sulphate salts due to partial oxidation of a pyrite coating parallel to bedding on a thin coal layer. Hole GNC010, depth 35.80 m.

Plate 4 – Iron staining and sulphate salts due to partial oxidation of a pyrite containing lensoid in sandstone. Hole GNC010, depth 24.65 m.

Plate 5 – Iron staining and sulphate salts due to partial oxidation of pyrite in a conglomerate clast. Hole GNC007, depth 103.00 m.

Plate 6 – Iron staining and sulphate salts due to partial oxidation of a pyrite associated with a carbonaceous wisp. Hole GNC010, depth 87.70 m.

Plate 7 – Iron staining and sulphate salts due to partial oxidation of pyrite in a fracture. Hole GNC007, depth 45.4 m.

Plate 8 – Iron staining and sulphate salts due to partial oxidation of a pyritic zone. Hole GNC010, depth 22.00 to 22.45 m.

Plate 9 – Pyrite band (partly oxidised) parallel to bedding. Hole GNC007, depth 43.5 m.

During inspection of the core, 12% HCl was applied to the core to provide an indication of the presence of reactive carbonate such as calcite and dolomite. Results showed common faint fizzing throughout the core, with intermittent zones of strong fizzing indicting the presence of calcitic carbonate. The calcitic carbonate occurred in the matrix and as veins in sandstone horizons (Plates 10 and 11) and in some siltstone and conglomerate, as veins in coal, as veinlets and in matrix associated with siderite lenses (Plate 12), and in a few instances as calcitic/sideritic layers with cone-in-cone textures (Plate 13). Sideritic zones and sandstones with reactive carbonate were observed throughout the holes inspected, indicating an excess of neutralising carbonate in overburden materials.

Plate 10 – Typical sandstone with calcitic carbonate in the matrix (shows reddish tinge). Hole GNC010, depth 168.35 to 177.25 m.

Plate 11 – Sandstone with calcitic carbonate in the matrix and veins. Hole GNC007, depth 67.8 m.

Plate 12 – Common siderite and calcitic lenses. Hole GNC010, depth 217.87 to 225.27 m.

Plate 13 – Calcitic bands with cone-in-cone texture within a sideritic layer. Hole GNC010, depth 223.70 m.

The existing pit and overburden/interburden materials and management were inspected during the EGi site visit. Overburden/interburden materials are generally end tipped in 30 m lifts (Plates 14), and examination of dumped overburden/interburden indicated a general lack of pyritic materials, consistent with core observations.

All coal from Glendell Mine is processed at the Mount Owen Coal Handling and Preparation Plant (CHPP), and rejects are disposed of as part of the Mount Owen operations as follows:

- Coarse rejects are dumped amongst the overburden/interburden in intermingled end tips, and paddock dumps in blocks as part of dump construction (Plate 15).
- Fine rejects (tailings) are spigotted into disused pit voids as per the GRAWTS.

Coal transport to Mount Owen CHPP and fine tailings rejects disposal will continue as per above for the Project. Coarse rejects from the Mount Owen CHPP will be emplaced either in-pit in the Mt Owen North Pit emplacement area, the Bayswater North Pit void or the proposed Glendell Pit Extension in-pit emplacement area.

Thin horizons of pyritic materials were observed in the southern pit walls of the Glendell Pit in two locations (Plates 16 to 17). These were readily apparent due to development of distinct yellow salts and iron staining after pyrite oxidation, and the lack of these products in the vast majority of the pit walls supports the isolated nature of these pyritic horizons.

Plate 14 – Backfill of the existing Glendell Pit.

Plate 15 – End tipping of overburden/interburden and paddock dumping of coarse rejects in the Mount Owen North Pit.

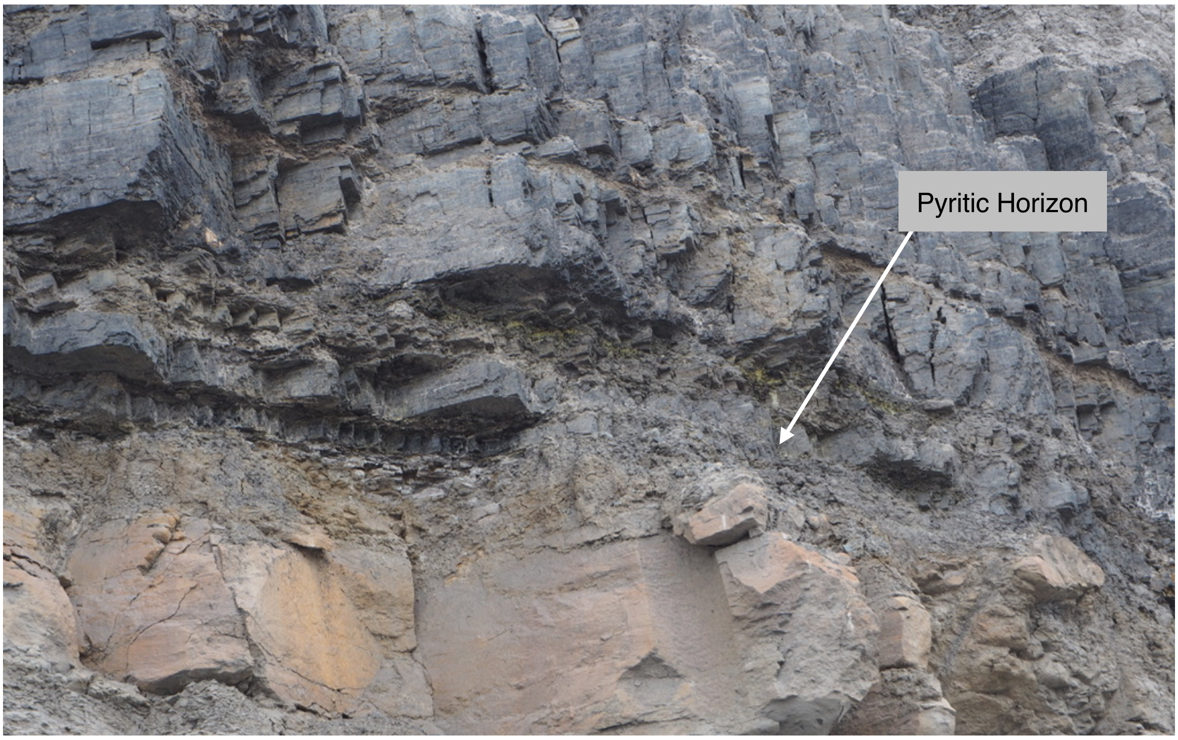

Plate 16 – Thin pyritic horizon on the Glendell Pit south wall, showing distinct yellow salts and iron staining due to pyrite oxidation.

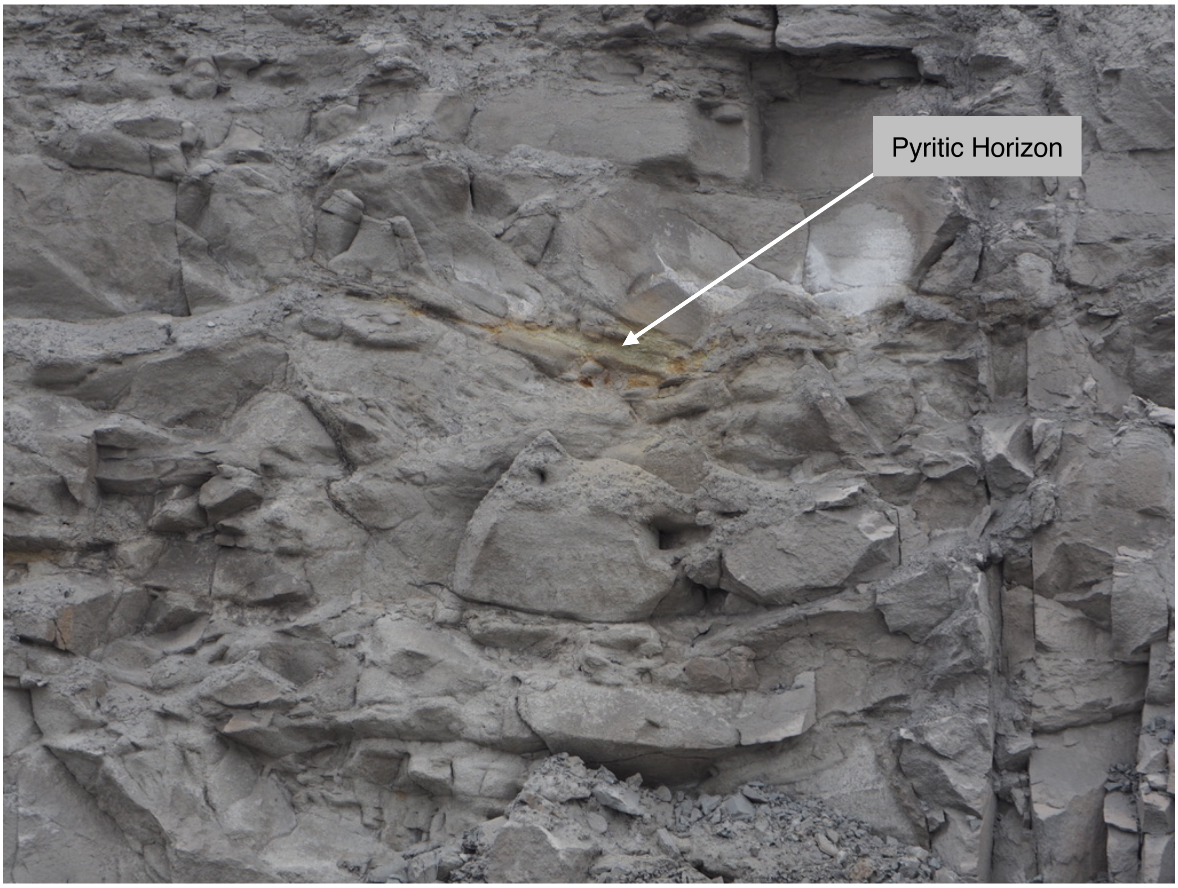

Plate 17 – Thin pyritic horizon in interburden on the Glendell Pit south wall, showing distinct yellow salts and iron staining due to pyrite oxidation.

Inspection of core holes GNC002, GNC007, GNC010 and GNC011, and the existing Glendell Pit and overburden/interburden dumps supports previous findings that the vast majority of overburden/interburden from Glendell is likely to be benign, with some higher ARD potential associated with carbonaceous materials and coal seams. This is consistent with inspection of core through the same stratigraphy at Mount Owen for both the 2013 EGi Study and 2018 EGi Study, indicating continuity of these trends across the Mount Owen Complex.

3.0 Sample Selection

The original depositional environment largely controls the distribution and abundance of pyrite in coal bearing sedimentary sequences, with influences such as seawater incursions and presence of organic matter key to pyrite formation. As a result of these controls, pyrite is usually preferentially distributed in particular lithologies (such as carbonaceous mudstones) and stratigraphic horizons. Coal sequences usually have high lithological variation in the vertical sense, but tend to show lateral continuity, and hence sampling for ARD assessment needs to take this into account by obtaining detailed continuous samples in individual holes spaced at wide intervals. This was the approach taken for the 2013 EGi Study and 2018 EGi Study, with the aim of screening the entire mine stratigraphy for acid potential to identify horizons of concern, and rely on geological controls to help predict the distribution of potentially acid forming (PAF) and non-acid forming (NAF) rock types across the Mount Owen Complex. This approach resulted in a better representation of mine materials in coal deposits than purely lithological based sampling.

The 2013 EGi Study for the Mount Owen Complex included six holes that intersected the same target stratigraphy to be developed as part of the Project, comprising SMC006, SMC009, GNC004, GNC006, GNC008 and GNC010. The following holes were continuously sampled between the stratigraphy indicated, representing the full overburden/interburden sequence to be mined as part of the project:

SMC006 – Lemington LCJ to Hebden HEB

SMC009 – Lemington LDK to Lemington LCE

GNC004 – Lemington LCB to Hebden LHB

In addition, the upper portion of holes GNC006, GNC008 and GNC010 were tested to represent the weathered portion of the sequence at Glendell Mine. A total of 559 overburden/interburden samples tested as part of the 2013 EGi study were relevant to the Project.

For the 2018 EGi Study, a total of 147 overburden/interburden core samples were selected for assessment from holes SMC028 and SMC032 from the Mount Owen North Pit expansion area, and these holes again covered the target stratigraphy. Sampling was restricted to intervals where pyrite occurrence was observed, carbonaceous materials, and intervals either side of coal seams. The remaining overburden/interburden intervals could be reliably assumed to be NAF based on observation and previous results. Intervals were selected by site geologists in conjunction with EGi to match geological boundaries, with intervals ranging from less than 0.1 m to 4.7 m. Site personnel collected all samples. In addition, 101 selected coal quality samples were also provided by Glencore for geochemical testing to allow more complete representation of the coal, roof and floor materials. Samples were collected from the base of Lemington Seam series to the base of the Hebden Seam series as follows:

SMC028 – Lemington LAE Seam to Hebden H1/H2 Seam

SMC032 – Lemington LAD Seam to Hebden LHB Seam

Locations of drill holes inspected as described in Section 2 and sampled for geochemical testing are shown in Figure 3. Holes prefixed by GN were drilled in the Glendell Pit Extension area, and those prefixed by SM were drilled in the Mount Owen Mine North Pit area.

In addition to the overburden/interburden and coal samples described above, Glencore personnel arranged intermittent collection of coarse rejects and tailings discharged from the CHPP as part of the 2013 EGi Study. A total of 181 reject samples were collected from the same target stratigraphy as the Project, of which 46 samples were selected for further geochemical characterisation by EGi.

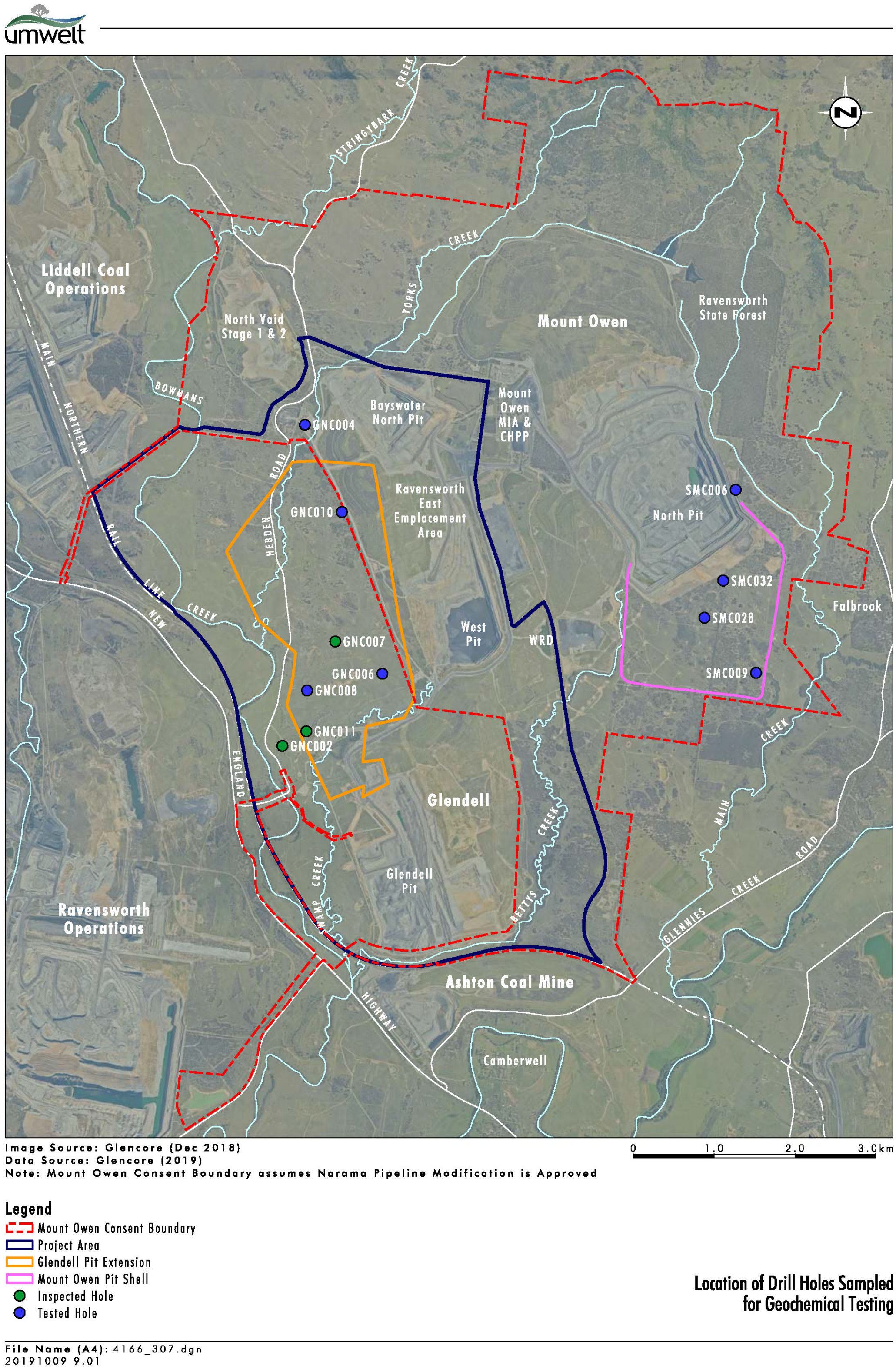

Figure 3 – Location of drillholes sampled for geochemical testing and inspection.

4.0 Methodology

4.1 Geochemical Characterisation of Overburden/Interburden and Coal Samples

A total of 807 overburden/interburden and coal samples relevant to the Project were tested from the 2013 and 2018 EGi Studies. Sample preparation of core was arranged by Glencore with advice from EGi, and carried out by Coal Seam Gas (CSG) Services (Brisbane) for the 2013 EGi Study, and International Resource Laboratories (IRL) (Brisbane) for the 2018 EGi Study. Preparation involved drying (as required), crushing to a nominal -4 mm, splitting, pulverising a 500 g split to -212 μm, and dispatch of 500 g of -212μm pulverised samples and 500 g of -4 mm crushed samples to EGi.

The coal quality samples were supplied as pulverised samples.

All samples were analysed for Leco total sulphur (S). Total S results for coal quality samples were provided by Glencore personnel.

The following was carried out on a subset of the overburden/interburden and coal quality samples:

- pH and electrical conductivity (EC) of deionised water extracts at a ratio of 1 part solid to 2 parts water ($pH_{1:2}$ and $EC_{1:2}$) - 226 samples;
- acid neutralising capacity (ANC) - 461 samples;
- net acid producing potential (NAPP) - calculated from total S and ANC - 461 samples; and
- single addition net acid generation (NAG) test - 298 samples.

Further testing was carried out on selected samples from the full Mount Owen Complex to help resolve uncertainties in the above test results. These specialised tests were not necessarily carried out on samples from the exact target stratigraphy within the Glendell Pit Extension, but were representative of typical materials from the general stratigraphic sequence:

- extended boil and calculated NAG testing to account for high organic carbon contents - 34 samples;
- kinetic NAG testing of higher S samples to check pyrite reactivity and to indicate lag times - 8 samples;
- sulphur speciation to obtain a guide to the proportion of pyritic S - 24 samples; and
- acid buffering characteristic curve (ABCC) testing to define the relative availability of the ANC measured - 37 samples.

Selected samples were also assayed for the following to identify any potential elemental concerns and to provide initial elemental solubility data:

- multi-element testing of solids - 36 samples; and
- multi-element testing of deionised water extracts at a ratio of 1 part solid to 2 parts water - 36 samples.

A general description of ARD test methods and calculations used is provided in Appendix A.

Water extractions for $pH_{1:2}$ and $EC_{1:2}$ and multi-element testing were carried out on -4 mm crushed samples. Pulverised samples were used for all other tests.

The sulphur speciation procedure involved Leco total S, chromium reducible sulphur (CRS) and KCl digestion to help differentiate pyritic S, acid forming sulphate, non-acid forming sulphate and other S forms (including organic S, jarosite S and elemental S).

Total sulphur assays were carried out by CSG Services (Brisbane) and IRL (Brisbane). CRS analyses of sample solids were carried out by ALS Laboratory Group (Brisbane). Multi-element testing of solids were carried out by IRL (Brisbane), ALS Laboratory Group (Maitland), and ALS Laboratory Group (Brisbane). Multi-element analyses of water extracts were carried out by ALS Laboratory Group (Sydney). Analyses of NAG solutions and S analysis of KCl digest solutions were carried out by Levay & Co. Environmental Services (Adelaide). All other analyses were carried out by EGi.

4.2 Leach Column Testing

Eight samples representative of interburden/overburden materials underwent leach column testing by EGi for 52 weeks in 2013/2014[Error! Bookmark not defined.] (EGi, 2014). The objective of the work was to provide information on leaching characteristics and lag times of key waste rock types for use in water quality predictions and to help refine materials management options. The columns were commissioned to represent individual major overburden and interburden sedimentary units, plus two blended columns.

Column samples were composited from individual samples tested by EGi as part of the geochemical characterisation.

Individual crushed -4mm samples were combined and mixed at EGi. A representative 300 to 500g split was collected from each composite and dispatched to Sydney Environmental and Soil Laboratory (SESL) for pulverising to -75μm for geochemical characterisation.

Pulverised splits of all 8 column composites were subjected to the following static geochemical characterisation tests:

- total S (Leco equivalent);
- ANC;
- NAPP calculated from total S and ANC;
- single addition NAG test; and
- multi-element testing of solids.

Further testing was carried out on selected samples to help resolve uncertainties in the above test results, as follows:

- ABCC testing; and
- kinetic NAG testing to check pyrite reactivity and to indicate lag times.

All 8 of the crushed -4mm composite samples were subjected to standard free draining column testing, which involved loading columns with approximately 2 kg of sample and carrying out weekly wet-dry cycles and monthly leaching cycles. The samples were wetted by applying deionised water to the surface, and the resulting leachates were collected through the funnel at the base. An initial (week 0) leachate sample was collected from each column by flushing at a rate of 400 ml/kg. Thereafter, water was added to the columns once per week in four-weekly cycles. In the first three weeks of each cycle, water was added at a rate of 100 ml/kg. In the fourth week of each cycle, water was added at a rate of 400 ml/kg to flush the oxidation products into the leachate collection vessels. Heat lamps were used to dry the samples between water additions to promote oxidation throughout the samples.

Leachates were analysed for pH, electrical conductivity (EC), acidity/alkalinity and a suite of 32 elements as follows:

> Ag, Al, As, B, Ba, Be, Ca, Cd, Cl, Co, Cr, Cu, F, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, P, Pb, S (as SO_4), Sb, Se, Si, Sn, Sr, Th, U and Zn

Total S assays were carried out by SESL. Multi-element analyses of sample solids were carried out by ALS Laboratory Group (Brisbane). Column leachates were analysed by ALS Laboratory Group (Sydney). All other analyses were carried out by EGi.

4.3 Geochemical Characterisation of Washery Rejects

The 2013 EGi Study for the Mount Owen Complex also included testing of washery rejects samples discharged from the CHPP. Samples were sent to ALS Laboratory Group (Muswellbrook) for preparation, which involved drying (as required), crushing to a nominal -4 mm, splitting, pulverising a 500 g split to -212 μm, and dispatch of 500 g of -212 μm pulverised samples and 500 g of -4 mm crushed samples to EGi. EGi were provided with pulverised (-212 μm) material for all samples and crushed material for selected samples.

The 2013 work included the following ARD testing of samples from within the same target stratigraphy as the Glendell Pit Extension proposed as part of the Project:

- $pH_{1:2}$ and $EC_{1:2}$ - 31 samples;
- Total S - 181 samples;
- ANC - 46 samples;
- NAPP (calculated from total S and ANC) - 46 samples; and
- single addition NAG testing - 46 samples.
- extended boil and calculated NAG testing - 4 samples;
- sulphur speciation - 11 samples;
- kinetic NAG testing - 4 samples;
- ABCC testing - 12 samples;
- multi-element testing of solids - 12 samples; and
- multi-element testing of deionised water extracts at a ratio of 1 part solid to 2 parts water - 12 samples.

Water extractions for $pH_{1:2}$ and $EC_{1:2}$ and multi-element testing were carried out on as received coarse and fine reject samples. Pulverised samples were used for all other tests.

Total sulphur assays and multi-element testing of solids were carried out by ALS Laboratory Group (Muswellbrook). CRS analyses of sample solids were carried out by ALS Laboratory Group (Brisbane). Multi-element analyses of water extracts were carried out by ALS Laboratory Group (Sydney). Analyses of NAG solutions and S analysis of KCl digest solutions were carried out by Levay & Co. Environmental Services (Adelaide). All other analyses were carried out by EGi.

5.0 Geochemical Characteristics of Overburden/Interburden and Coal Samples

Table B1 in Appendix B shows acid forming characteristics of 559 overburden/interburden and coal samples tested as part of the 2013 EGi Study that represent the same target stratigraphy as the Project, comprising pH and EC of water extracts, total S, maximum potential acidity (MPA), ANC, NAPP, ANC/MPA ratio and single addition NAG. Acid forming characteristics of 248 samples tested from holes SMC028 and SMC032 as part of the 2018 EGi Study are presented in Table B1, Appendix B. Discussions and figures below incorporate both sets of results.

Specialised testing comprising extended boil and calculated NAG, S speciation, kinetic NAG, ABCC, multi-element testing of solids, and multi-element testing of water extracts were carried out on selected samples as part of the 2013 EGi Study and 2018 EGi Study. Results have been combined, and findings are discussed together in the relevant subsections. Specialised testing was used to help resolve uncertainties in standard geochemical testing, and better define total acid generating capacities, relative reactivities of sulphides and neutralising components, and multi-element compositions and mobility.

5.1 pH and EC

The $pH_{1:2}$ and $EC_{1:2}$ results were determined by equilibrating the sample in deionised water for approximately 16 hours at a solid to water ratio of 1:2 (w/w). This gives an indication of the inherent acidity and salinity of the waste material when initially exposed in a waste emplacement area. A total of 226 samples were tested for $pH_{1:2}$ and $EC_{1:2}$.

The $pH_{1:2}$ values ranged from 4.1 to 9.6, with the vast majority (95%) of samples having a pH greater than 6 and showing no inherent acidity. Only six of the samples tested had a slightly acidic pH of less than 6.0. Four of these samples were non-coal lithologies (samples 3954, 4080, 12041 and 12136) and two were coal samples (samples 5313 and 3996).

$EC_{1:2}$ values ranged from 0.02 to 2.1 dS/m, with the vast majority (95%) falling within the non-saline to slightly range with an EC of 0.8 dS/m or less. Seven samples were moderately saline at 0.8 to 1.6 dS/m (samples 3913, 3930, 3954, 3996, 4078, 12041 and 12136), and one was saline with an EC of 2.11 dS/cm (sample 4080).

Figure 4 is a plot of $pH_{1:2}$ and $EC_{1:2}$ versus total S for all sample tested. The plot shows that acidic $pH_{1:2}$ values (< pH 6) and moderately saline $EC_{1:2}$ values (>0.8 dS/m) are associated with higher S (approximately >0.25 %S) samples. This indicates that lower $pH_{1:2}$ and higher $EC_{1:2}$ values are primarily the result of partial pyrite oxidation occurring between sample collection and sample testing.

Results suggest low leachable acidity and salinity in overburden/interburden materials represented by these samples except where pyrite is present and it has partially oxidised.

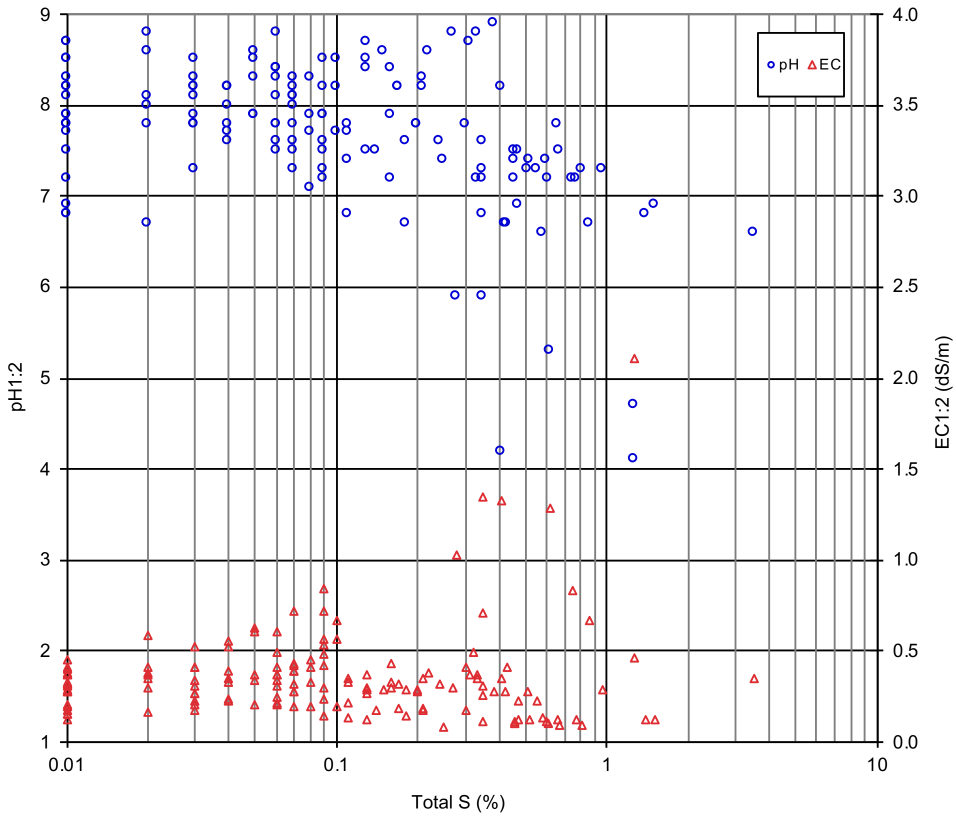

Figure 4 – Plot showing $pH_{1:2}$ and $EC_{1:2}$ versus total S for overburden/interburden and coal samples.

5.2 Acid Base (NAPP) Results

S data were available for 807 samples. S values ranged from below detection to 4.2%S, with the majority of samples (60%) having low S values of less than 0.1%S.

Figure 5 is a box plot of the distribution of S, split by lithology for the samples tested. The plot highlights the lack of S in most lithologies, with the exception of coal (median S of 0.6%) and carbonaceous mudstone (median S of 0.2%). All other non-coal lithologies have low sulphur content with median S of less than 0.1%S. Coal materials have a distinctly higher S distribution, with approximately 15% of the samples having S concentrations greater than 1%S.

ANC was tested on 461 coal and interburden/overburden samples sourced from lithologies occurring within the coal seams to be targeted by the Project. The ANC was low to moderate ranging up to 200 kg H_2SO_4/t, and with a median ANC of 25 kg H_2SO_4/t. Figure 6 is a box plot of the distribution of ANC, split by lithology. Weathered zone, siltstone, mudstone, carbonaceous siltstone, carbonaceous mudstone and coal materials have a low median ANC between 10 to 20 kg H_2SO_4/t. The median ANC values of conglomerate, sandstone and tuff are slightly higher ranging from 30 to 40 kg H_2SO_4/t.

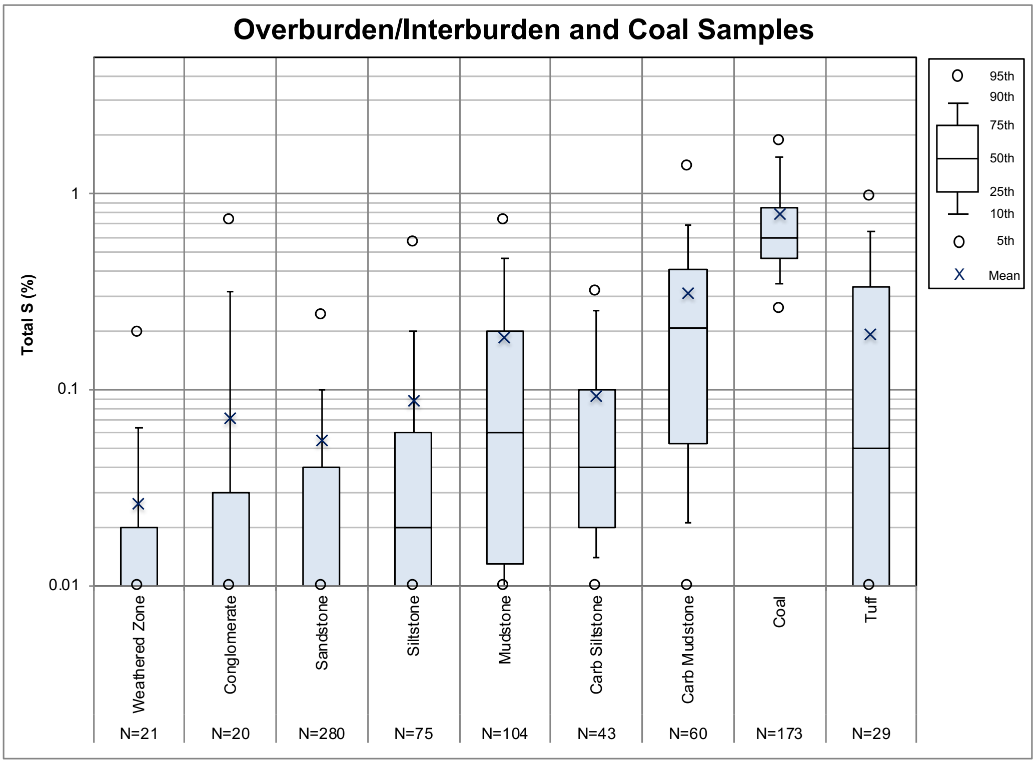

Figure 5 – Box plot showing the distribution of S split by lithology for overburden/interburden and coal samples. Box plots show 5th, 10th, 25th, 50th (median), 75th, 90th and 95th percentiles and means.

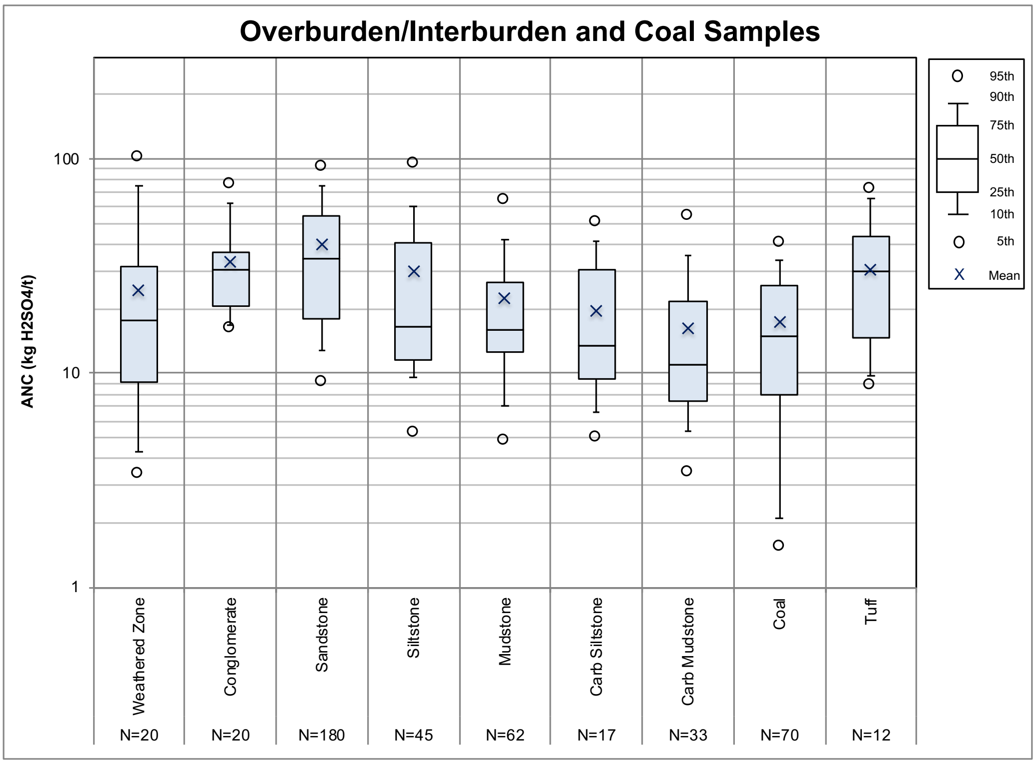

Figure 6 – Box plot showing the distribution of ANC split by lithology for overburden/interburden and coal samples. Box plots show 5th, 10th, 25th, 50th (median), 75th, 90th and 95th percentiles and means.

The NAPP value is an acid-base account calculation using measured total S and ANC values. It represents the balance between the MPA and ANC. A negative NAPP value indicates that the sample may have sufficient ANC to prevent acid generation. Conversely, a positive NAPP value indicates that the material may be acid generating.

Figure 7 is an acid-base account plot of ANC versus total S as split by material type. The NAPP zero line is shown which defines the NAPP positive and NAPP negative domains, and the line representing an ANC/MPA value of 2 is also plotted. Note that the NAPP = 0 line is equivalent to an ANC/MPA of 1. The ANC/MPA value is used as an indication of the relative factor of safety within the NAPP negative domain. Usually a ratio of 2 or more signifies a high probability that the material will remain circum-neutral in pH and thereby should not be problematic with respect to ARD.

NAPP values were calculated for 461 samples. The results show that 80% of samples tested plot in the NAPP negative domain, with 75% also having ANC/MPA ratios of 2 or more, indicating a high factor of safety. Fifteen percent of samples plot in the NAPP positive domain, of which half are coal.

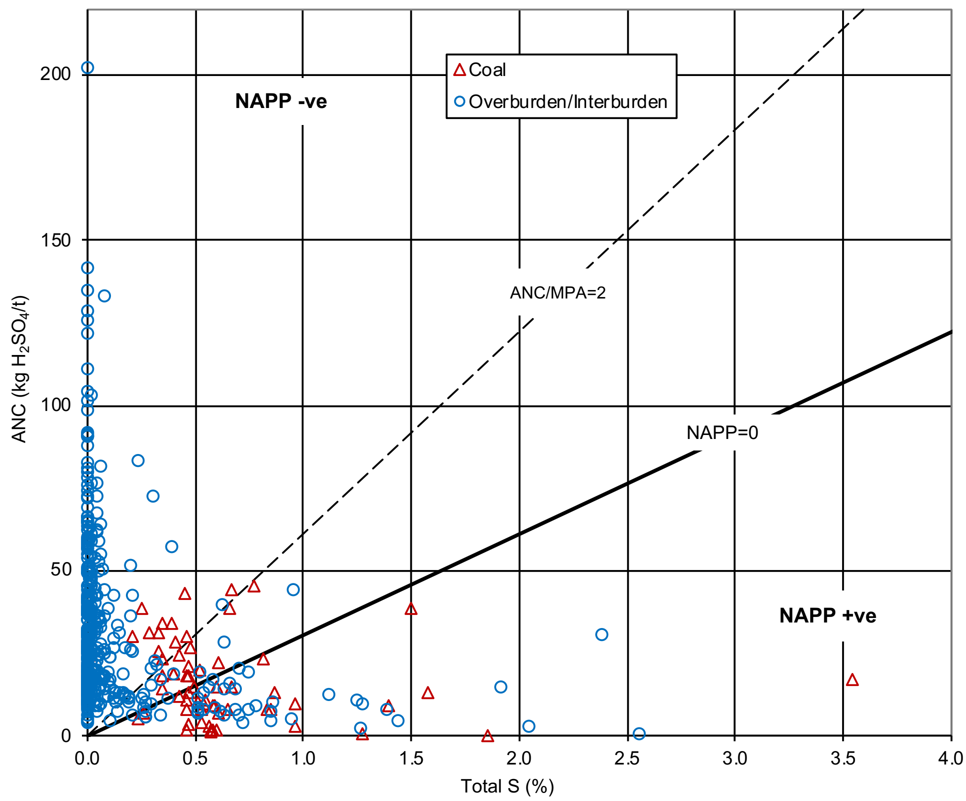

Figure 7 – Acid base account (ABA) plot showing ANC versus total S split by overburden/interburden and coal samples.

5.3 Single Addition NAG Results

Generally a NAGpH value less than 4.5 indicates a sample may be acid forming. However, samples with high organic carbon contents (such as coal and carbonaceous sedimentary materials) can cause interference with standard NAG tests due to partial oxidation of carbonaceous materials. This can lead to low NAGpH values and high acidities in standard single addition NAG tests unrelated to acid generation from sulphides.

NAG testing was conducted on 298 samples. Of these 70% had NAGpH values of 4.5 and greater, indicating they are likely to be non-acid forming (NAF). The remaining 30% had NAGpH values less than 4.5, but many of these were associated with carbonaceous horizons and coal seams, and results are inconclusive in isolation due to potential organic acid effects that may contribute acidity to the sample liquor in addition to that released from sulphide oxidation.

NAG test results are used in conjunction with NAPP values to classify samples according to acid forming potential. Figure 8 is an ARD classification plot showing NAGpH versus NAPP value. Potentially acid forming (PAF), NAF and uncertain (UC) classification domains are indicated. A sample is classified PAF when it has a positive NAPP and NAGpH < 4.5, and NAF when it has a negative NAPP and NAGpH ≥ 4.5. Samples are classified uncertain when there is an apparent conflict between the NAPP and NAG results, i.e. when the NAPP is positive and NAGpH ≥ 4.5, or when the NAPP is negative and NAGpH < 4.5.

The plot shows that most samples (65%) plot in the NAF domain, with 40 samples plotting in the PAF domain, 11 samples plotting in the lower left uncertain domain and 11 samples plotting in the upper right uncertain domain.

A total of 107 samples plot in the NAF domain, with 101 samples or 95% having a relatively low total S of 0.5%S or less. Samples 5300, 6824, 5303, 5304, 5305 and 4079 had higher total S values of 0.52%S to 0.96%S and moderate to high ANC values of 20 to 44 kg H_2SO_4/t, and further testing was carried out to confirm that buffering was sufficient to account for acid generated from these samples.

Of the 40 samples plotting in the PAF domain, 75% are coal or carbonaceous sediments. Of these, 17 samples showed organic acid effects in the NAG test indicated by a large difference between the $NAG_{(pH4.5)}$ and $NAG_{(pH7.0)}$ values, and/or $NAG_{(pH4.5)}$ values very close to or exceeding that of MPA. In these samples the NAG results overestimate the acid potential. Samples showing organic acid effects are highlighted yellow in Table B1 and Table B2 (Appendix B). The remaining samples are expected to be PAF, with 11 samples likely to have a low acid generating capacity of less than 5 kg H_2SO_4/t. Specialised testing was carried out to help define the geochemical properties of the PAF samples and resolve uncertainties in the classification.

Six of the 11 samples plotting in the lower left uncertain domain showed organic acid effects in the NAG test, with one sample sourced from coal and five from carbonaceous sedimentary samples. Follow up tests to check for organic acid effects and availability and nature of the acid neutralising capacity were carried out to resolve the classification of these samples.

The 11 samples plotting in the upper right uncertain domain have moderate total S of 0.4 to 1.5%S, low to moderate ANC values of 7 to 39 kg H_2SO_4/t, and NAGpH values greater than 4.5. The NAG test would normally account for most of the pyritic S in these samples and they are expected to be NAF. ABCC and S speciation testing was carried out to confirm the NAF classification.

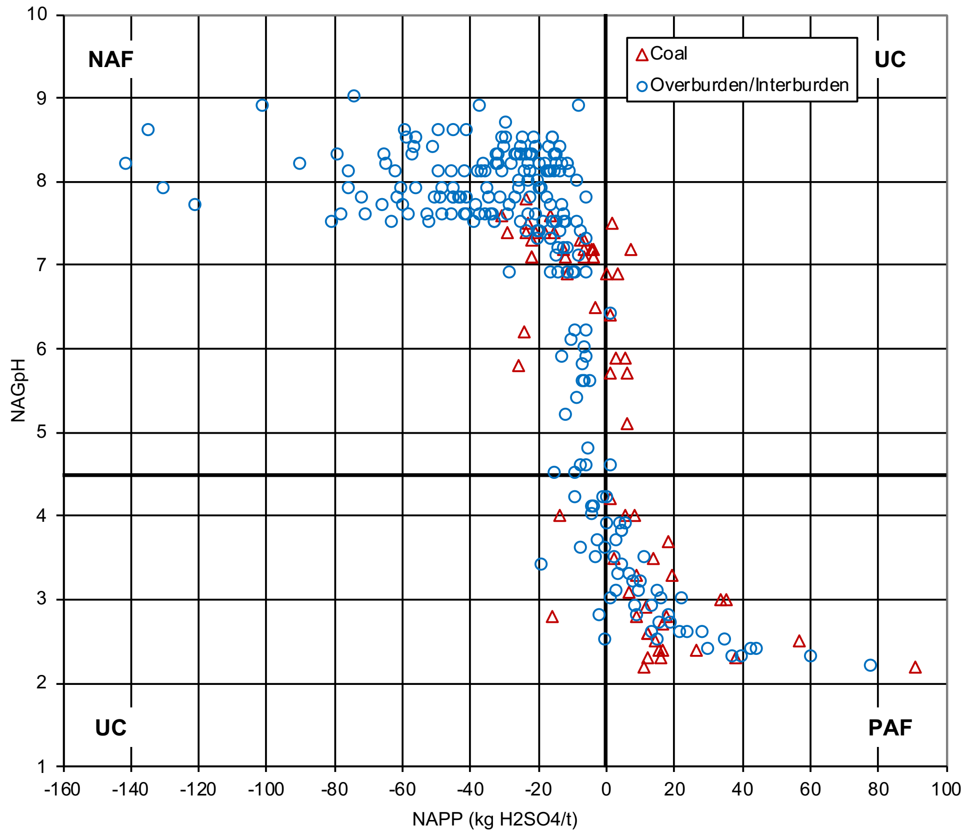

Figure 8 – ARD classification plot showing NAGpH versus NAPP split by material type (i.e. overburden/interburden, coal) samples, with ARD classification domains included for reference.

5.4 Extended Boil and Calculated NAG Results

Extended boil and calculated NAG testing were carried out on 34 selected samples to help resolve uncertainties in ARD classification based on standard NAG test results, as discussed in the previous section. Results are shown in Table B3, Appendix B.

Results show that the NAGpH value for most samples increases 2 to 4 pH units after the extended boiling step. The increase in NAGpH confirms the effects of organic acids. The extended boil NAGpH of nine samples (5333, 3954, 5298, 3996, 4078, 4080, 11676, 11723 and 11729), remained less than 4.5, indicating these samples are likely to be acid producing.

Note that the extended boil NAGpH value can be used to confirm samples are PAF, but an extended boil NAGpH value greater than 4.5 does not necessarily mean that samples are NAF, due to some loss of free acid during the extended boiling procedure. To address this issue, a calculated NAG value is determined from assays of anions and cations released to the NAG solution. A calculated NAG value of less than or equal to 0 kg H_2SO_4/t indicates the sample is likely to be NAF, and a value of more than 0 kg H_2SO_4/t indicates the sample may be PAF.

The calculated NAG values for 10 of the samples (3813, 5290, 5324, 5338, 4056, 12069, 11695, 12097, 12105 and 11716) were negative or equal to zero, indicating that all acid generated in the standard NAG test for these samples was organic, and that materials represented by these samples are unlikely to be acid producing under field conditions.

The remaining 24 samples had positive calculated NAG values, indicating these samples are likely to be acid producing. Samples 5291, 5292, 5330, 3882, 5336, 3907, 3996, 12136, 11739 and 11745 had acid potentials of 5 kg H_2SO_4/t or less, and are classified as PAF with a low capacity (PAF-LC).

Data suggest that in non-coal materials with S <0.3%S, organic acid effects dominate NAG testwork acidities, and that these materials are likely to be NAF. Most coal materials (80%, with S ranging from 0.41 to 1.6%S) were characterised as PAF by the calculated NAG test, suggesting that although organic acids affected the NAG results, a significant portion of the acidity was still associated with sulphide oxidation.

5.5 Acid Buffering Characteristic Curve (ABCC) Testing

Acid buffering characteristic curve (ABCC) testing was carried out on 37 selected samples to evaluate the availability of the ANC measured. The ABCC test involves slow titration of a sample with acid while measuring the solution pH. The acid buffering of a sample to pH 4 can be used as an estimate of the proportion of readily available ANC. Results are presented in Figures C1 to C19, Appendix C, with calcite, dolomite, ferroan dolomite and siderite standard curves as reference. Calcite and dolomite readily dissolve in acid and exhibit strongly buffered pH curves in the ABCC test, rapidly dropping once the ANC value is reached. The siderite standard provides very poor acid buffering, exhibiting a very steep pH curve in the ABCC test. Ferroan dolomite is between siderite and dolomite in acid buffering availability.

Samples 12137 (Figure C2), 3804 (Figure C2) and 11697 (Figure C5) have profiles that plot between the siderite and ferroan dolomite standard curves indicating slow reactivity and with only 35-50% of the total ANC likely to be effective.

Samples 5242 (Figure C1), 11716 (Figure C1), 11723 (Figure C1), 5225 (Figure C3) and 12054 (Figure C7) have profiles that plot close to the ferroan dolomite standard curves. Results indicate slow reactivity with an effective ANC of around 40-75% of the total ANC. Samples 5242 and 5225 show initial strong buffering, indicating a portion of the ANC is in calcitic/dolomitic form.

Six samples, 3880 (Figure C2), 12055 (Figure C3), 4057 (Figure C4), 4480 (Figure C4), 12063 (Figure C11) and 3850 (Figure C13), have profiles that plot between the dolomite and ferroan dolomite standard curves. The readily available ANC portion for these samples ranges from 45% to 95% of the total ANC, with reaction rates likely to be slower than dolomite.

The ABCC profiles for the remaining 23 samples show strong buffering, with profiles plotting close to or between those of calcite and dolomite standard curves. For these samples the proportion of readily available ANC is elevated, ranging from 70% to 100% of the ANC.

Overall, ABCC results suggest that most of the ANC measured for Mount Owen Complex mine materials are likely to be fast reacting and effective. Some slower reacting materials were identified, which are likely to include a high proportion of iron carbonate and which will be partly ineffective. Results also show that the ANC is readily available in elevated S (>0.5%S) samples plotting in the NAF domain, confirming the NAF classification.

5.6 Kinetic NAG Testing

Kinetic NAG tests provide an indication of the kinetics of sulphide oxidation and acid generation for a sample. Kinetic NAG testing was carried out on eight selected samples. Results are presented in Figures C16 to C23.

Typically, there will be a distinct temperature peak of 50°C or more in the kinetic NAG profile for samples with pyritic S greater than 0.7%S and low ANC. The kinetic NAG temperature profiles for samples 5290 (Figure C16), 5330 (Figure C17), 5298 (Figure C20), and 4025 (Figure C21) do not have distinct temperature peaks, and sample 5333 (Figure C18) has a subdued temperature peak, indicating that these samples have pyritic S contents of less than 0.7%S and a significant proportion of non acid generating S forms.

Samples 5314 (Figure C19) and 4080 (Figure C23) showed distinct temperature peaks, typical of pyritic samples. Note that sample 4079 (Figure C22) has a moderate and reactive ANC of 44 kg H_2SO_4/t, which results in reduced oxidation rates and only partial pyrite oxidation in the NAG test. Hence for this sample the temperature profile is not a valid indicator of pyritic S content.

The time to pH 4 in the kinetic NAG test can be used to estimate the lag time before acid conditions develop in a sample under atmospheric oxidation conditions.

Sample 4079 was expected to be NAF, and kinetic NAG testing was carried out to check if rates of acid buffering would match rates of acid generation in higher S samples. The pH profile (Figure C22) remained above 4.5 for the duration of the test, confirming matching rates of buffering and acid generation and the NAF classification.

Samples 5290 and 5330 did not produce acid in the time of the NAG test (Figures C16 and C17), indicating lag times of many years if they are acid forming. Calculated NAG testing (see Section 5.4) suggests sample 5290 is NAF and 5330 only marginally acid producing.

Sample 4025 shows a significant delay of 150 minutes before dropping below pH 4 (Figure C21), indicating a lag time of 1 to 2 years before onset of acid conditions after exposure to atmospheric conditions.

The remaining four samples 5333, 5314, 5298 and 4080 (Figures C18, C19, C20 and C23) show relatively fast reaction rates, dropping below pH 4 in 9 minutes or less, and indicating lag times of one month or less.

Overall, results indicate that PAF materials with pyritic S of 0.7%S or greater are likely to have short lags of a month or less before onset of acid conditions after exposure to atmospheric conditions.

5.7 Sulphur Speciation

Sulphur speciation testing was carried out on 24 selected samples representative of overburden/interburden and coal materials. Results are shown in Table B4, Appendix B. Note that the pyritic S value should only be treated as a guide to the pyrite content in the sample due to issues with repeatability in the chromium reducible sulphur (CRS) method (EGi et al., 2008).

Results are available for 12 coal samples. Data suggest that for all coal samples but three (3883, 5333 and 11697) pyritic S accounts for only 40% or less of the total S, indicating most of the S is in non-pyritic forms and most likely occurs as organic S. NAPP estimates based on total S may overestimate the acid forming potential of these samples. Coal samples 3883, 5333 and 11697 have mainly pyritic S, accounting for over 60% of the total S.

ABCC testwork conducted on eight coal samples indicates in seven samples the ANC is associated with calcite/dolomite which is nearly 100% readily available. In sample 11716, ferroan dolomite was the main carbonate present with an availability of approximately 50%.

Samples 11716, 5299, 5301 and 5307 had positive NAPP values but NAGpH values greater than 4.5. However, the NAPP values are negative when estimated based on pyritic S and effective ANC from ABCC testwork, which is consistent with the NAGpH results.

For 8 out of 12 non-coal materials the proportion of pyritic sulphur tends to be greater than 50% ranging up to 77%. Exceptions are samples 12105 with 6% pyritic S, 12136 with 31% pyritic S, 12069 with 40% pyritic S and 3882 with 41% pyritic S.

Results suggest that the total S in non-coal samples is likely to be mainly pyritic, and that coal samples are likely to include a higher proportion of non pyritic S forms. Assessment of sulphur speciation results in conjunction ABCC testing show that coal samples plotting in the upper right hand uncertain domain are likely to be NAF.

5.8 Multi-Element Analysis of Solids and Water Extracts

Results of multi-element scans of solids from 36 selected samples were compared to the median soil abundance (from Bowen, 1979) to highlight enriched elements. The extent of enrichment is reported as the Geochemical Abundance Index (GAI), which relates the actual concentration with an average or median abundance on a log 2 scale. The GAI is expressed in integer increments where a GAI of 0 indicates the element is present at a concentration similar to, or less than, median soil abundance; and a GAI of 6 indicates approximately a 100-fold enrichment above median soil abundance. As a general rule, a GAI of 3 or greater signifies enrichment that warrants further examination.

Results of multi-element analysis of solids are presented in Table B5, Appendix B, and the corresponding GAI values are presented in Table B6.

Many of the samples are slightly enriched in Be relative to median soils, but they are within normal ranges for sedimentary rock. Samples 4025 (sandstone) and 12041 (sandstone) showed enrichment in As, with sample 4025 also enriched in S. The As enrichment is likely to be due to small amounts arsenopyrite associated with pyrite or oxidation products containing arsenic. A number of samples also showed enrichment in S, which was already discussed in relation to acid forming potential. Other individual samples show enrichment of W and Tl.

The same sample solids were subjected to water extraction at a solids:liquor ratio of 1:2. Results are shown in Table B7 (Appendix B), and the concentration ranges for each element is shown in Figure 9.

The pH was slightly acidic to alkaline ranging from 4.9 to 9.8. ECs were variable, ranging from non-saline to saline (0.2 mS/cm to 2 mS/cm). In general, samples expected to be PAF/PAF-LC have the highest salinities.

There is a general positive correlation between sulphate concentration and sulphur content (R2 = 0.75), suggesting that the sulphate released in the leachate is mostly associated with oxidation/neutralisation reactions even in samples that have been classified as NAF.

Five samples (12041, 12136, 3954, 4025 and 4080) were classified PAF/PAF-LC. Sample 4080 had an acidic pH of 4.9, saline EC of approximately 2 mS/cm, and elevated S of 1.3%S. The acidic pH in sample 4080 is associated with elevated Fe, Mn and SO_4, and slightly elevated Co, Ni and Zn. The other PAF samples (S ranging from 0.3%S to 0.86%S) had slightly acidic (pH 5.5) to alkaline (pH 7.2) pH extracts, and moderate concentrations of Co, Mn, Ni and Zn, with concentrations generally increasing as a function of S.

The remaining 31 samples were classified as NAF. These samples had circum-neutral to slightly alkaline pH extracts and generally showed a lack of elevated metals/metalloids concentrations, with the exception of aluminium, which was elevated in some samples. Among the elements of environmental concern, aluminium, arsenic, manganese and molybdenum are detected in the majority of the samples, however median concentrations for these elements are generally low (for example median concentrations for manganese is 0.03 mg/L, and for arsenic and molybdenum is 0.02 mg/L).

Results indicate that significant metal/metalloid release from materials represented by the samples tested would only be associated with generation of ARD. The solubility of metals/metalloids will largely be determined by pH and therefore control of acid generation will effectively control metal/metalloid leaching.

Water extracts from NAF materials indicated that metalliferous drainage is unlikely to contain significant metal/metalloid concentrations, but elevated SO_4 may occur where there is significant pyrite present.

Extracts show that initial metal/metalloid release associated with any ARD generated from pyritic materials would include Co, Fe, Mn, Ni, and Zn.

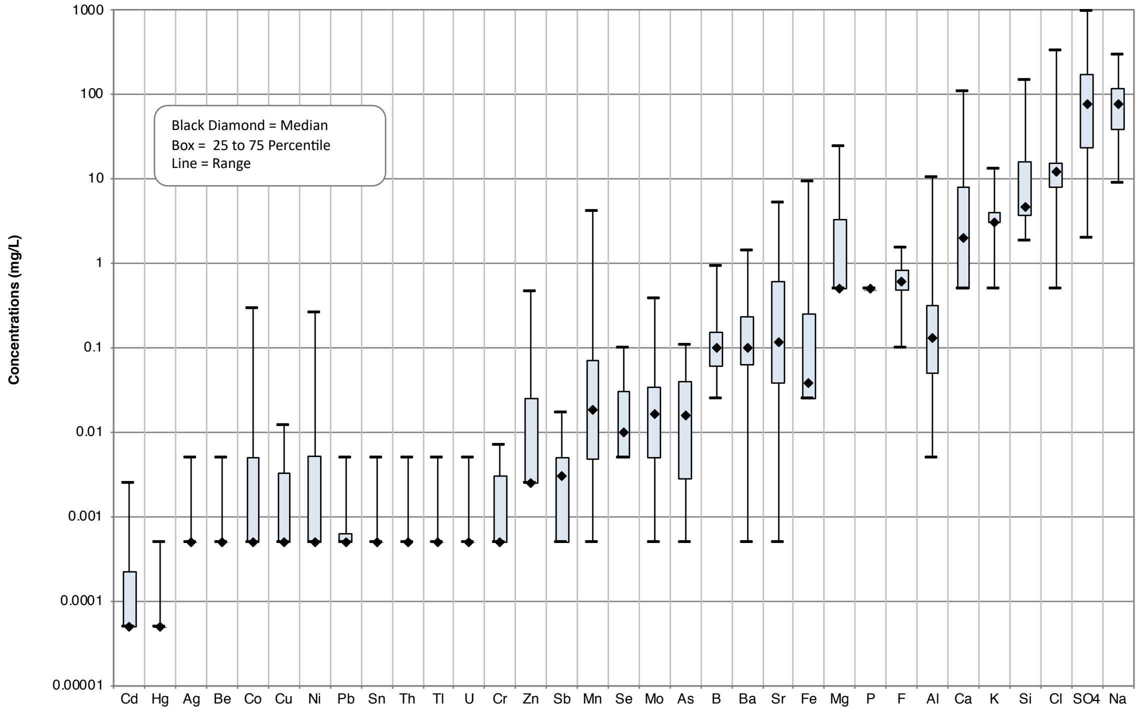

Figure 9 – Box plot of elemental concentrations in water extracts of overburden/interburden and coal materials.

5.9 Sample Classification and Distribution of ARD Rock Types

The results and discussions presented above were used to classify samples as NAF, PAF, PAF low capacity (PAF-LC) or UC in Table B1 and B2 (Appendix B). PAF-LC samples are defined as having an acid capacity of 5 kg H_2SO_4/t or less.

The full geochemical data set from the combined 2013 EGi Study and 2018 EGi Study was used to determine whether total S alone could be used as an indicator of ARD potential. Figure 10 is a box plot showing the S distribution for all samples classified either as PAF/PAF-LC or NAF, split into overburden/interburden and coal groupings. The figure shows that for overburden/interburden materials, a total S cut-off of 0.1%S discriminates well between NAF and PAF-LC/PAF samples, with over 90% of NAF samples having less than 0.1%S, and approximately 95% of PAF-LC/PAF samples having over 0.1%S. However, total S is a poor discriminator for coal materials due to the presence of organic S, and NAF and PAF-LC/PAF classes show considerable overlap in S values.

Final sample classifications were based on the full geochemical testing where available. For overburden/interburden samples with S testing only, the S cut off indicated in Figure 10 was applied, so that those samples with S values of less than or equal to 0.1%S were classified NAF and those with S greater than 0.1%S were classified PAF. Coal samples were only classified where full geochemical testing was available.

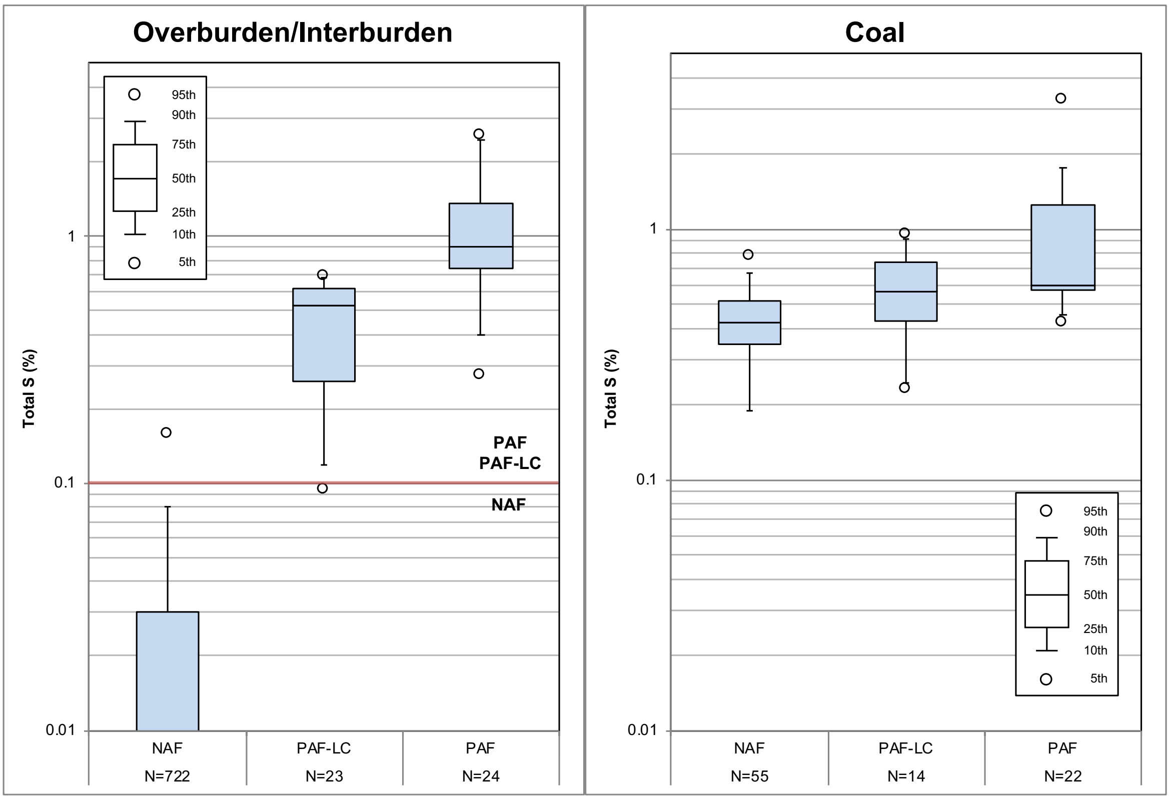

Figure 10 – Box plot showing the distribution of S for overburden/interburden and coal materials as a function of ARD classification. Box plots show 5th, 10th, 25th, 50th (median), 75th, 90th and 95th percentiles.

Table 1 shows the approximate breakdown of geochemical rock types for the Project target stratigraphy based on the sample intervals tested to date (not taking spatial distribution or mining blocks into account) for overburden/interburden and coal.

Table 1 – Geochemical breakdown for coal and overburden/interburden materials for samples tested to date

Material Type	ARD Classification	
	NAF	PAF/PAF-LC
	Inc. UC(NAF)	Inc. UC(PAF)/UC(PAF-LC)
Coal	80.0%	20.0%
Overburden/Interburden	97.5%	2.5%

The estimated proportions of ARD classes indicate the vast majority of overburden/interburden is likely to be NAF, with PAF-LC/PAF materials estimated to be only 2.5%. Coal materials are likely to be mainly NAF, but coal tends to be more elevated in S than other lithologies (See Figure 5) and coal materials include a greater proportion of PAF.

Figures 11 to 15 show down hole profiles of total S, ANC and NAPP values for each of the holes tested, with the stratigraphic position of coal seams plotted for reference. The plots also show sample ARD classifications for each parameter, with NAF (including UC(NAF)) samples represented as blue symbols, PAF-LC (including UC(PAF-LC)) samples as orange symbols, and PAF (including UC(PAF)) samples as red symbols. Note that many of the coal quality samples were not tested and classified by EGi, but total S results were available, providing a guide to the presence of pyritic horizons. These samples are shown as black symbols on the total S profiles.

The profiles emphasise the preferential distribution of higher total S and PAF/PAF-LC samples in distinct zones associated with coal seams, coal seam partings, and immediate roof and floor. The vast majority of overburden/interburden is NAF with low S (most less than 0.2%S) and with a median ANC of 25 kg H_2SO_4/t. The PAF/PAF-LC intercepts of seam roof, partings and floor are generally thin (less than 0.3 m), and dilution and mixing during mining is expected to be sufficient to negate any serious ARD risk from these materials if they report to overburden.

Overall, results of the 2013 EGi Study and 2018 EGi Study, together with visual inspection of holes GNC007, GNC010 and GNC011 as part of this study indicate that overburden/interburden will be mainly NAF, with excess acid buffering.

The Project will involve development to the base of the Hebden Seam, but with a stepped pit floor, so that the final pit floor will consist of two different seam floors: the floor of the Barrett 1 Seam; and floor of the Hebden Seam H2. All of the samples representing the floors of the Barrett and Hebden Seam series were classified NAF, suggesting that any final pit floor below these seams are likely to be NAF.

Given the expected high proportions of NAF (over 97% in the sample set tested) relative to PAF (less than 3%), operational blending of NAF and PAF overburden/interburden together with the excess alkaline leachate from NAF materials is expected to be a robust approach to controlling ARD from PAF materials.

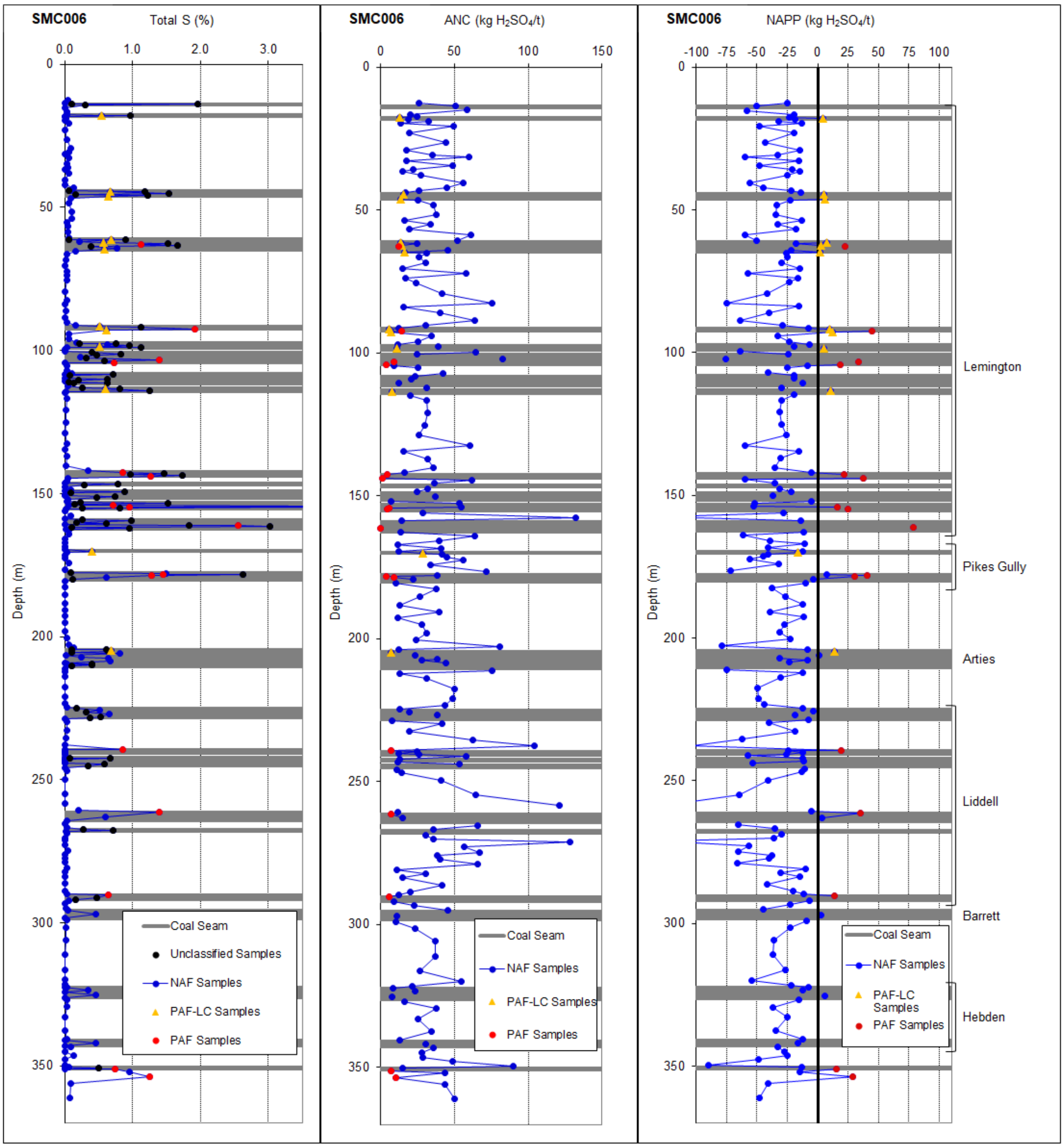

Figure 11 – Total S, ANC and NAPP profiles for hole SMC006.

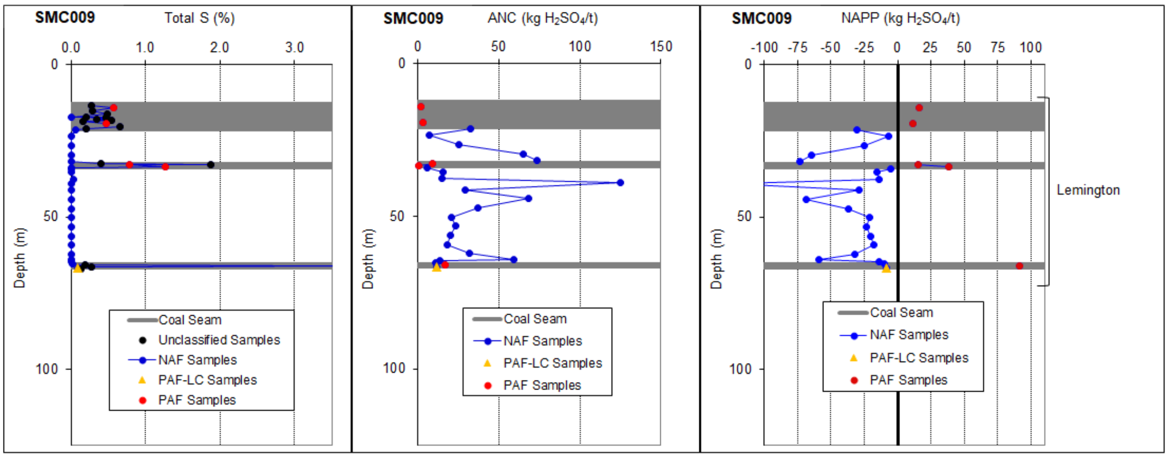

Figure 12 – Total S, ANC and NAPP profiles for hole SMC009.

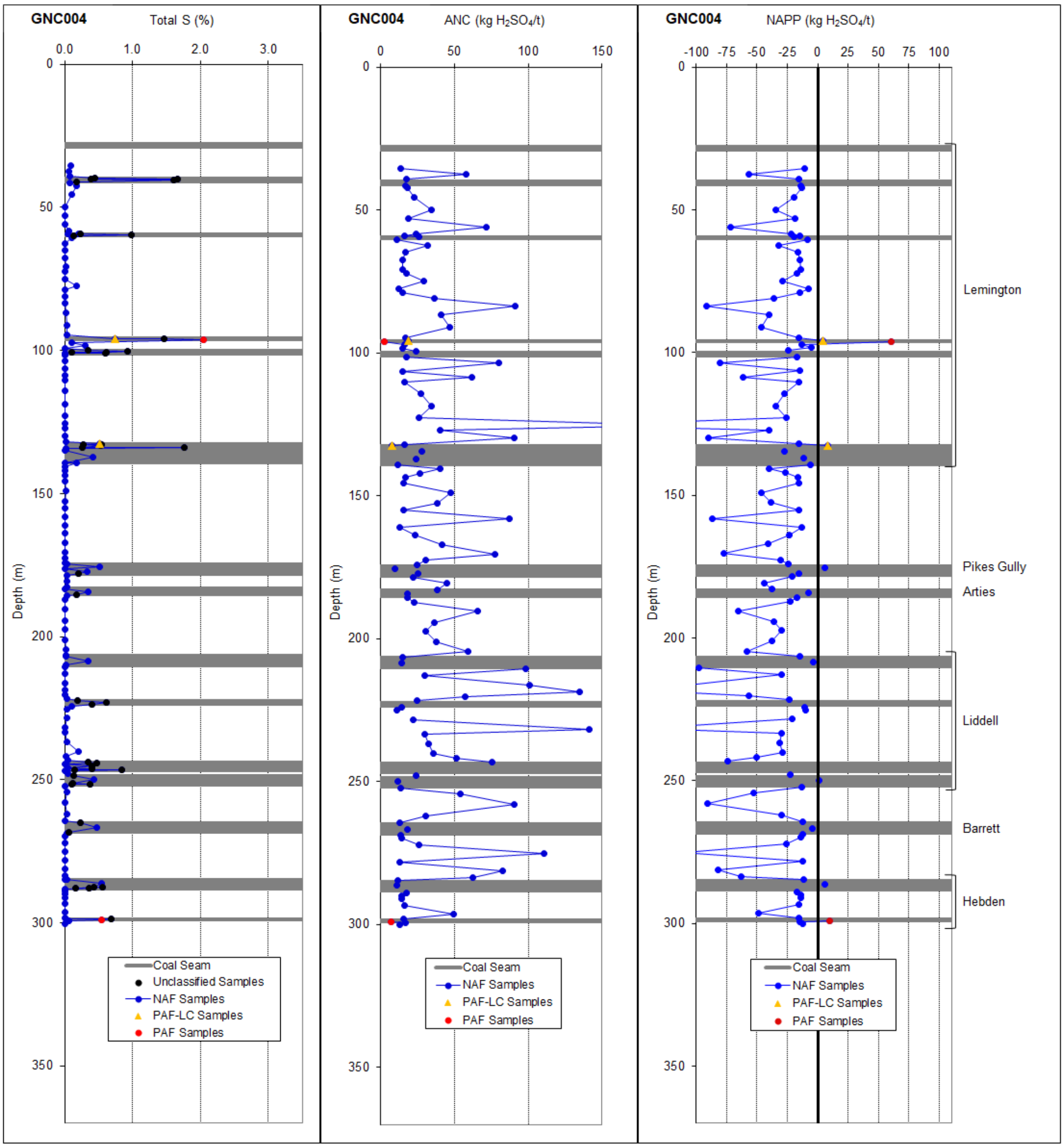

Figure 13 – Total S, ANC and NAPP profiles for hole GNC004.

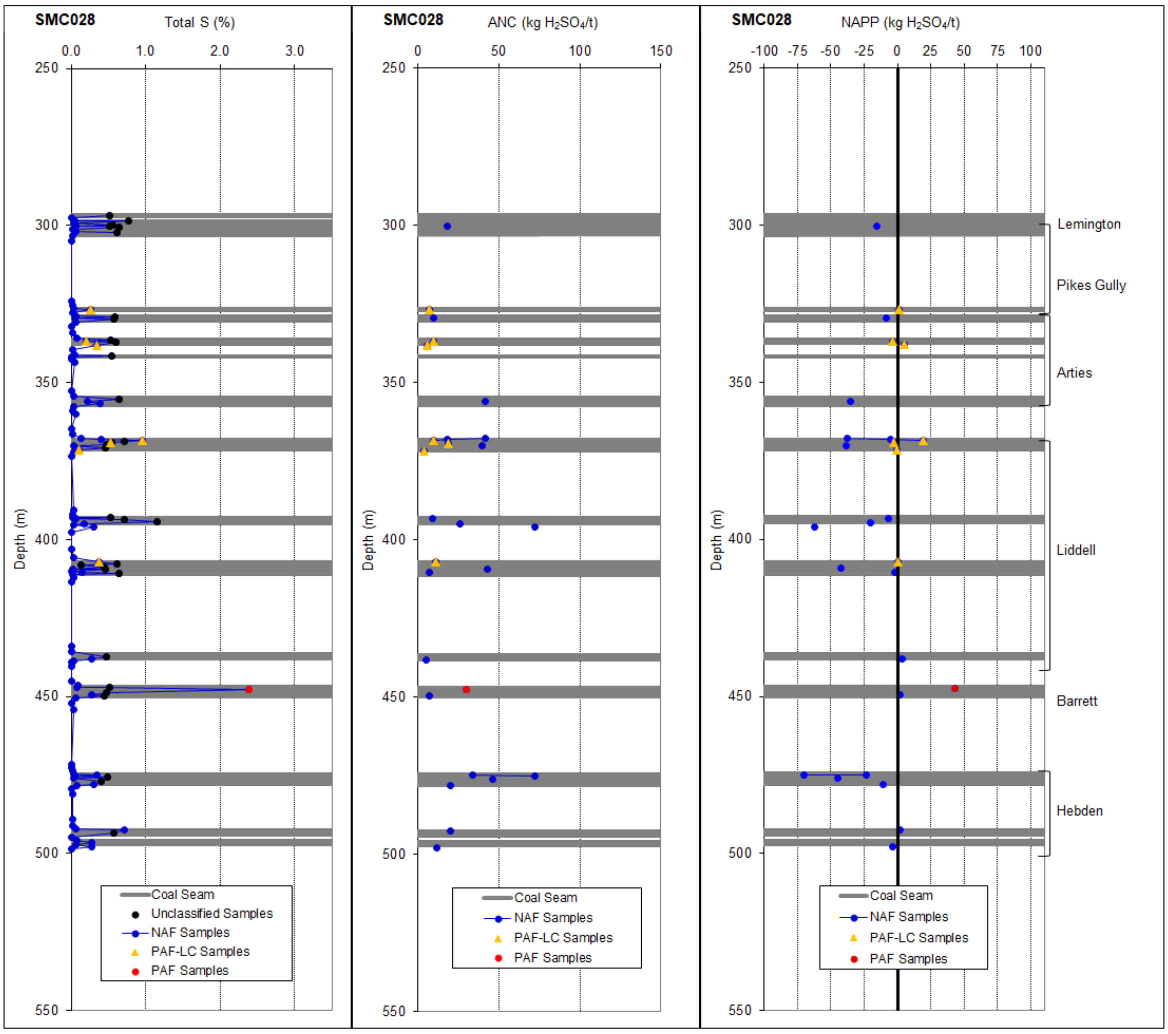

Figure 14 – Total S, ANC and NAPP profiles for hole SMC028.

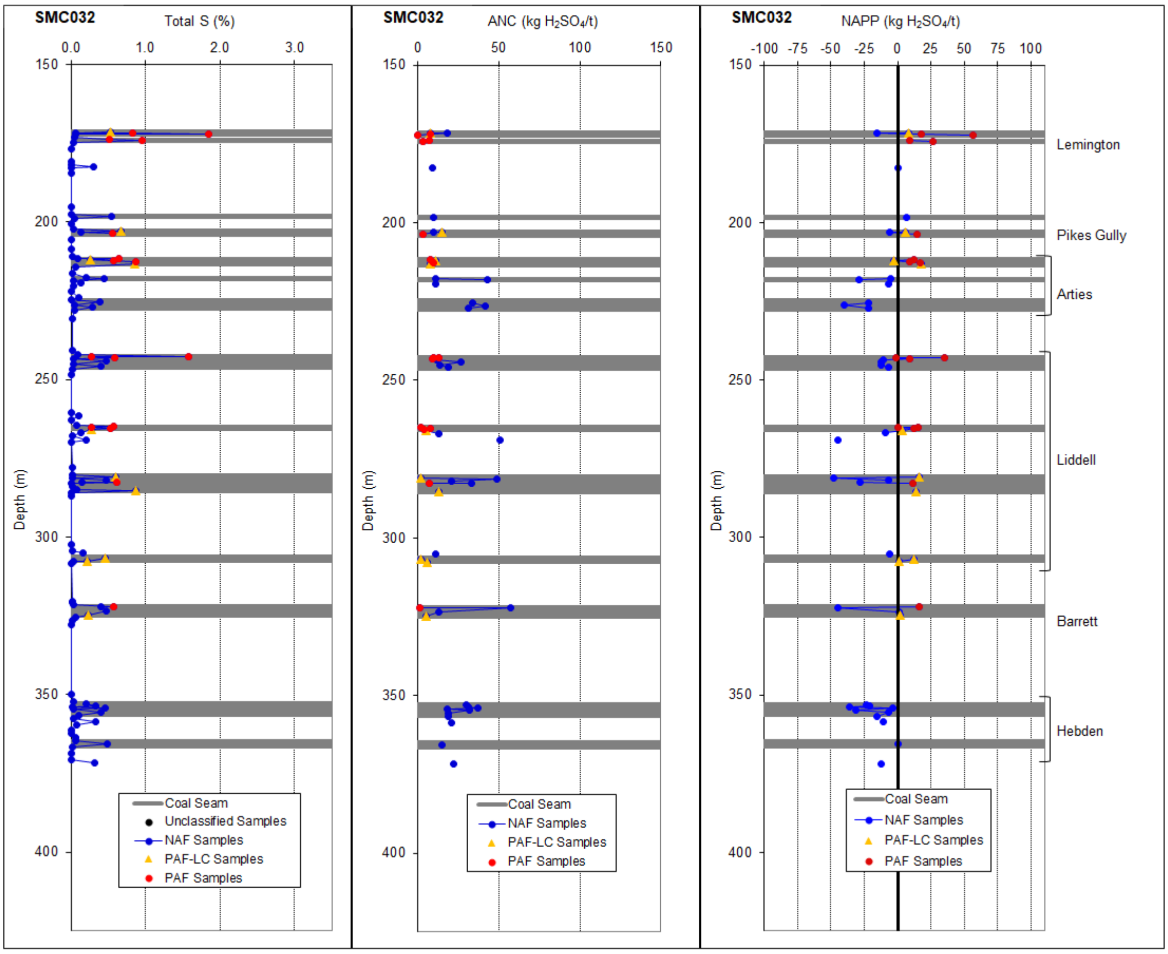

Figure 15 – Total S, ANC and NAPP profiles for hole SMC032.

6.0 Summary of Leach Column Test Results

Leach column testing of representative overburden/interburden materials was carried out as part of follow up work for the Mount Owen Complex geochemical assessment. Detailed leach column results are presented in the 2014 EGi Study, but a summary of relevant results and findings are discussed here.

Eight leach columns were commissioned, comprising five individual major overburden and interburden sedimentary units, plus two blended columns as follows:

- Weathered Zone (sample 6831)
- Non acid forming (NAF) Sandstone (sample 6832)
- NAF Claystone (sample 6833)
- NAF Siltstone (sample 6834)
- PAF Overburden/Interburden (sample 6835)
- PAF-LC Overburden/Interburden (sample 6836)
- Blended PAF Overburden/Interburden /NAF Sandstone (sample 6837)
- Blended PAF-LC Overburden/Interburden /NAF Sandstone (sample 6838)

The weathered zone, NAF sandstone, NAF claystone and NAF siltstone columns were set up to evaluate neutral drainage chemistry. The PAF and PAF-LC overburden/interburden columns were set up to evaluate leaching characteristics of typical PAF and PAF-LC materials, including reaction rates and acid loadings, and metal/metalloid release. The blended columns were made up of PAF and PAF-LC overburden/interburden material mixed with NAF sandstone to help assess the effectiveness of operational blending for control of ARD.

Most of the overburden/interburden materials placed will be dominated by NAF sandstone, claystone and siltstone. Column testing showed that these NAF overburden/interburden materials are likely to be a source of alkalinity in leachate and unlikely to release significant concentrations of metals/metalloids. Figure 16 is a plot of EC trends for the NAF column. Results show that values steadied at around 1 dS/m or just under by around week 12 to week 32, after which the weathered zone, NAF sandstone and NAF claystone samples show a gradual decreasing trend. Figures 17 and 18 show that the EC is mainly controlled by SO_4 and Cl salts. Results indicate these materials may release some moderate initial salinity, which will gradually deplete with flushing. NAF materials subjected to water extracts at a ratio of 1:2 listed in Table B1 and B2 showed low salinities, with a non saline median EC of 0.3 dS/m, and 99% of NAF samples produced ECs within the non saline to slightly saline range at less than 0.8 dS/m. Overall, results suggest low salinity potential from overburden/interburden materials.

Results for PAF materials confirmed these materials are likely to generate significant ARD with short lag times. Acid release would be associated with elevated Al, As, Co, Cu, Fe, Mn, Ni and Zn, and slightly elevated Cd and Cr. However, results also showed that thorough blending with NAF materials is likely to be an effective strategy in controlling ARD from PAF materials for at least 12 months.

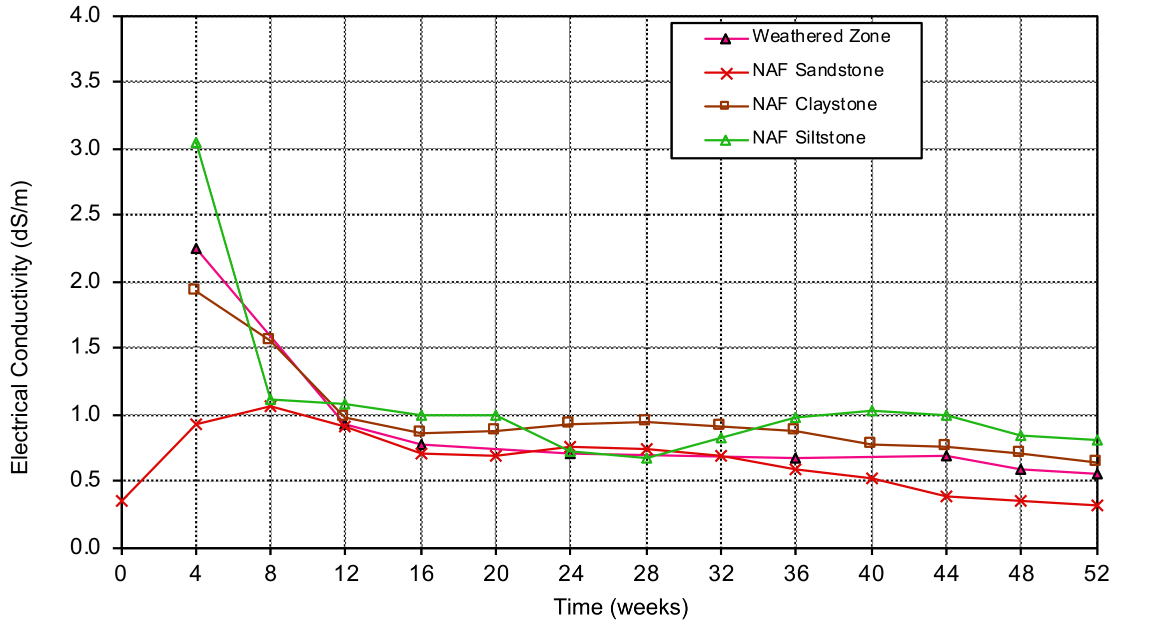

Figure 16 –Column leachate EC trends for NAF samples tested as part of the Mount Owen Complex geochemical assessment.

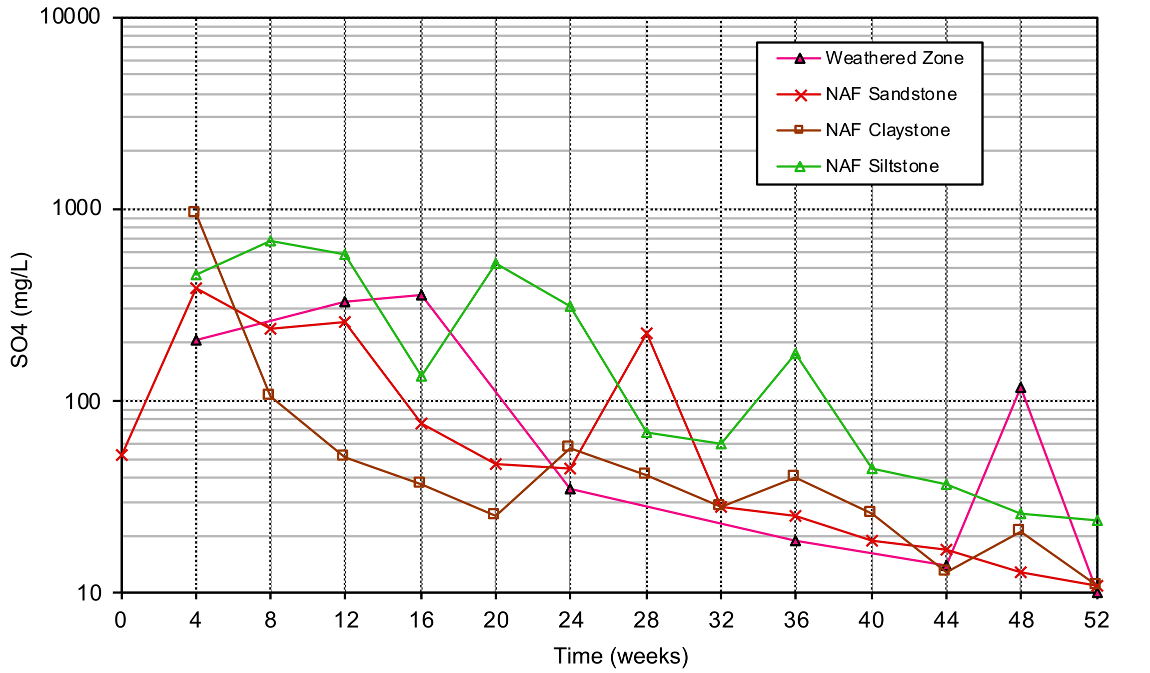

Figure 17 –Column leachate SO_4 trends for NAF samples tested as part of the Mount Owen Complex geochemical assessment.

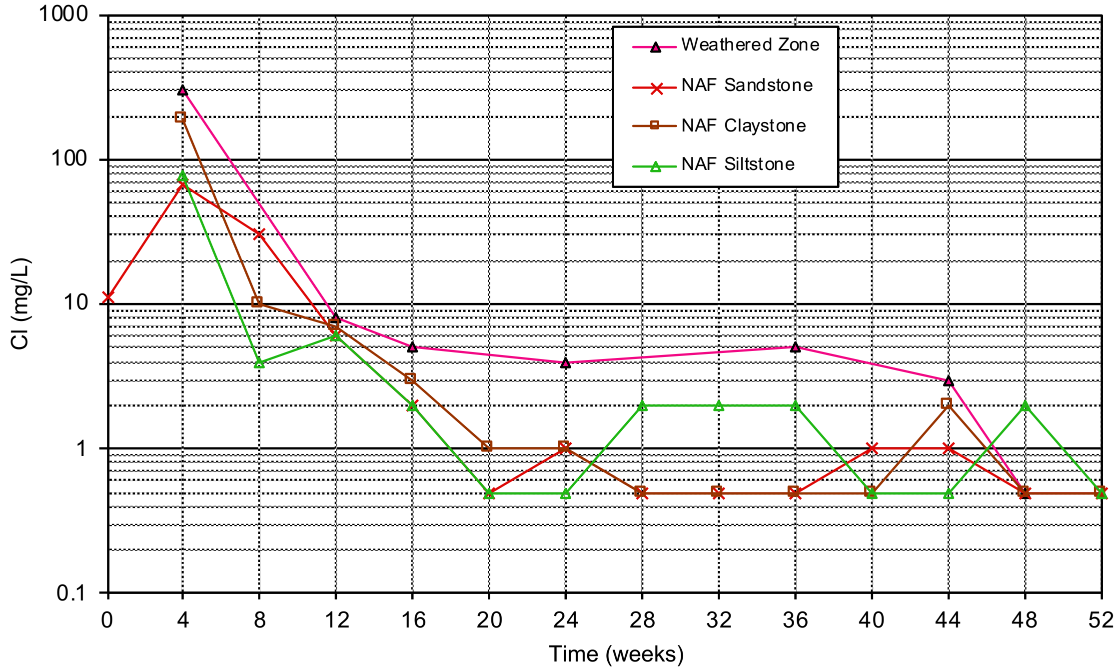

Figure 18 –Column leachate Cl trends for NAF samples tested as part of the Mount Owen Complex geochemical assessment.

The leach column results indicate that overburden/interburden materials from the Mount Owen Complex are likely to produce excess alkalinity, with low metal/metalloid concentrations, and initial moderate salinity dominated by SO_4 and Cl salts. Salinity concentrations are expected to decrease over time with continued flushing, and overburden/interburden materials are expected to have an overall low salinity potential. The alkalinity is expected to report to infiltrating waters in overburden/interburden dumps, providing an additional factor of safety in ARD management through interaction with PAF materials and any associated acid leachate.

7.0 Washery Wastes Results

Washery wastes were not geochemically assessed for this assessment, as it was assumed that the S distribution in the coal to be targeted by the Project was comparable to that of the coal mined by the current operations. Testing of coarse and fine (tailings) reject materials was carried out as part of the 2013 EGi Study of the Mount Owen Complex.

Figure 19 is a box plot showing total S distribution by coal seam, comparing results for coal seams intersected by drilling for the Project and S data from the CHPP raw coal sampler collected between 2009 and 2013. The plot shows that median S concentrations and ranges for each coal seam group are generally comparable between the two data sets. Arties Seam samples show the greatest difference, with slightly higher S in Project samples compared to CHPP, but the ranges are still within the general S ranges for the CHPP samples. The Lemington Seam Group coal shows slightly higher S than other seam groups, consistent with the marginal marine depositional environment noted in Section 2. The data available indicate that the previous work on rejects materials for the Mount Owen Complex will be a reasonable guide to what will be produced as part of the Project. Periodic geochemical testing of rejects materials during development of the Project would confirm this.

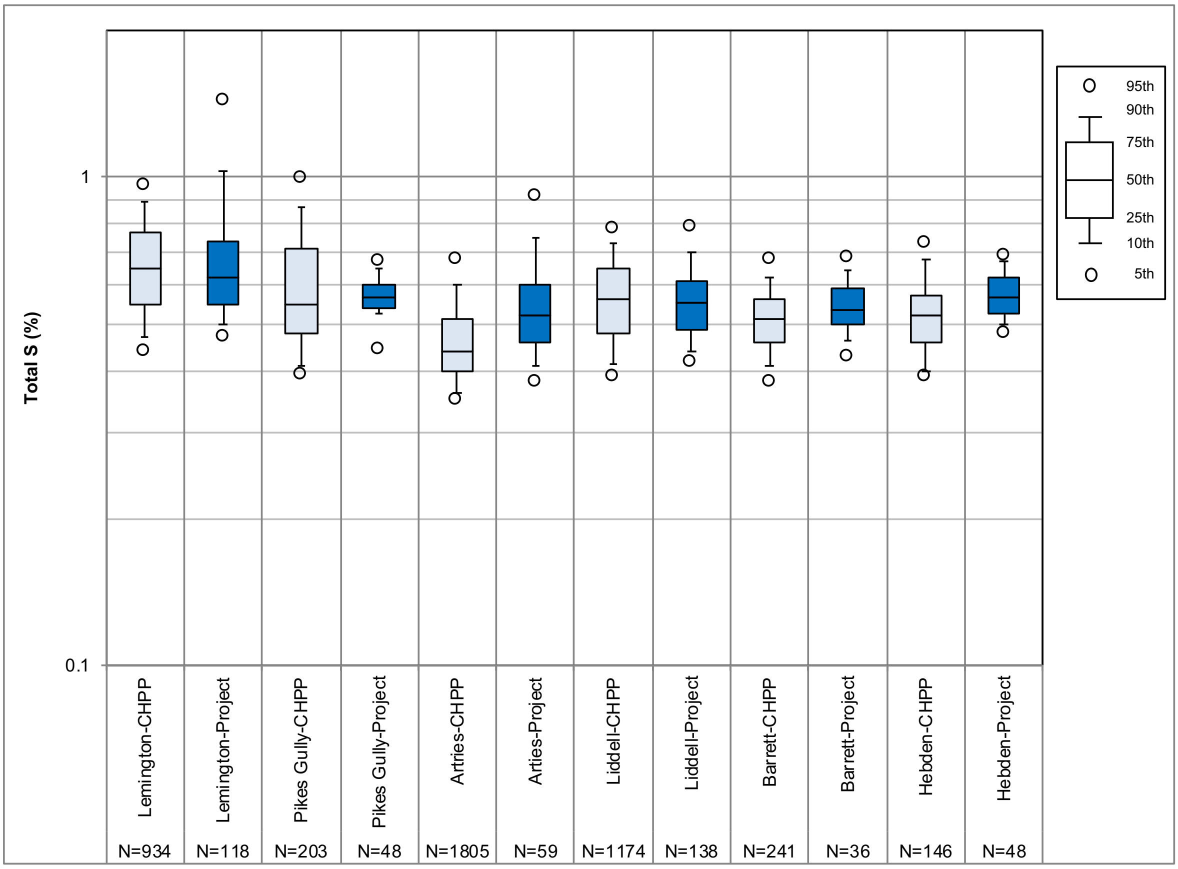

Figure 19 – Box plots showing the distribution of total S split by coal seam and project. Box plots show 5th, 10th, 25th, 50th (median), 75th, 90th and 95th percentiles. Distributions for the raw coal sampler from 2009-2013 are labelled CHPP and coloured light blue, and those for the Project are labelled Project and coloured dark blue.

A total of 181 washery waste samples from the stratigraphic interval targeted by the Project were geochemically tested in 2013 as part of the 2013 EGi Study of the Mount Owen Complex.

Total S was carried out on all 181 samples as shown in Table B8, Appendix B. A subset of 42 samples were subjected to standard ARD characterisation comprising pH/EC (13 samples excluded due to insufficient sample), ANC, ANC/MPA, NAPP, and single addition NAG with results shown in Table B9.

The $pH_{1:2}$ values were circum-neutral to slightly alkaline, ranging from 7.8 to 9.4. $EC_{1:2}$ values were non saline (0.4 dS/m or less) to slightly saline (0.4 to 0.8 dS/m), and ranged from 0.21 to 0.48 dS/m. Results show a lack of immediately available acidity and salinity in these samples.

Total S values for the rejects vary from 0.03% to 4.57%S. Figure 20 is a plot showing the S distribution for the coarse and fine rejects. The S distribution in the fine rejects is distinctively higher than the coarse rejects, with a median of 0.7%S in the fine rejects compared to 0.2%S in the coarse. Results indicate that S minerals preferentially report to the fine rejects stream.

ANC values range from 13 to 140 kg H_2SO_4/t, but are generally moderate to high, with all but three samples having ANC values greater than 20 kg H_2SO_4/t. Figure 21 is a plot showing the ANC distribution for the coarse and fine rejects. Although Figure 20 indicated S preferentially reported to the fine rejects stream, Figure 21 shows that this is balanced by the tendency for ANC minerals to also report to the fine rejects.

Figure 22 is an acid-base account plot of ANC versus total S for the rejects samples. Results show that all but two samples are NAPP negative, with 55% of samples having an ANC/MPA of 2 or more, indicating a high factor of safety. The plot highlights the higher S and ANC in the fine rejects relative to the coarse rejects, as described above.

Figure 23 is an ARD classification plot for the rejects samples. Thirty eight samples plot in the NAF domain, but 15 of these have elevated S of over 0.5%S and pyrite oxidation may not have completed in single addition NAG testing of some of these samples. Sulphur speciation and ABCC testing was carried out to confirm the NAF classification for these samples. Two samples plot in the PAF domain and two samples plot in the lower left uncertain domain. Calculated NAG, sulphur speciation and ABCC testing was carried out to confirm the classification of these four samples.

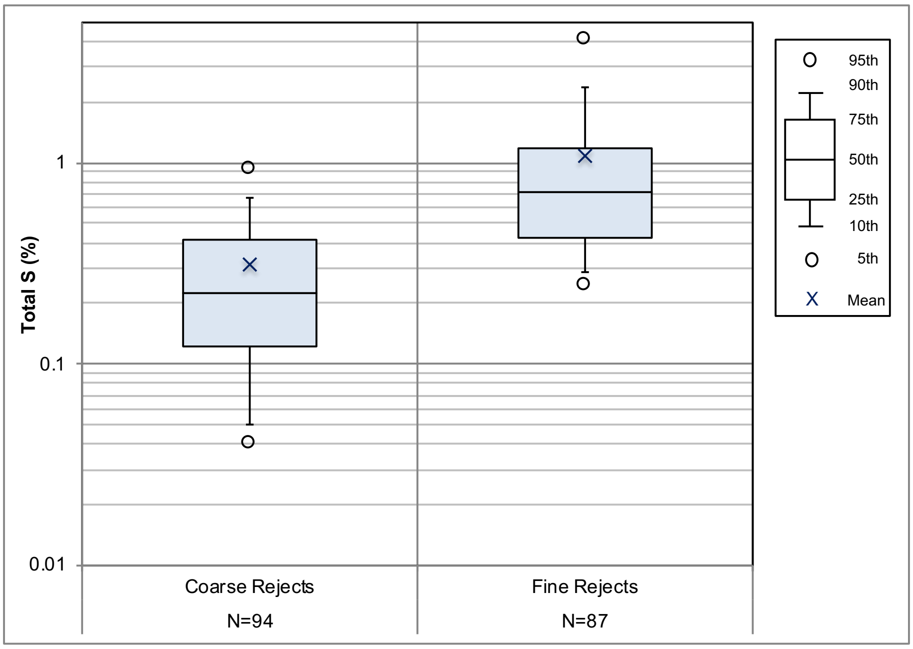

Figure 20 – Box plot showing the distribution of total S for coarse and fine rejects. Box plots show 5th, 10th, 25th, 50th (median), 75th, 90th and 95th percentiles and means.

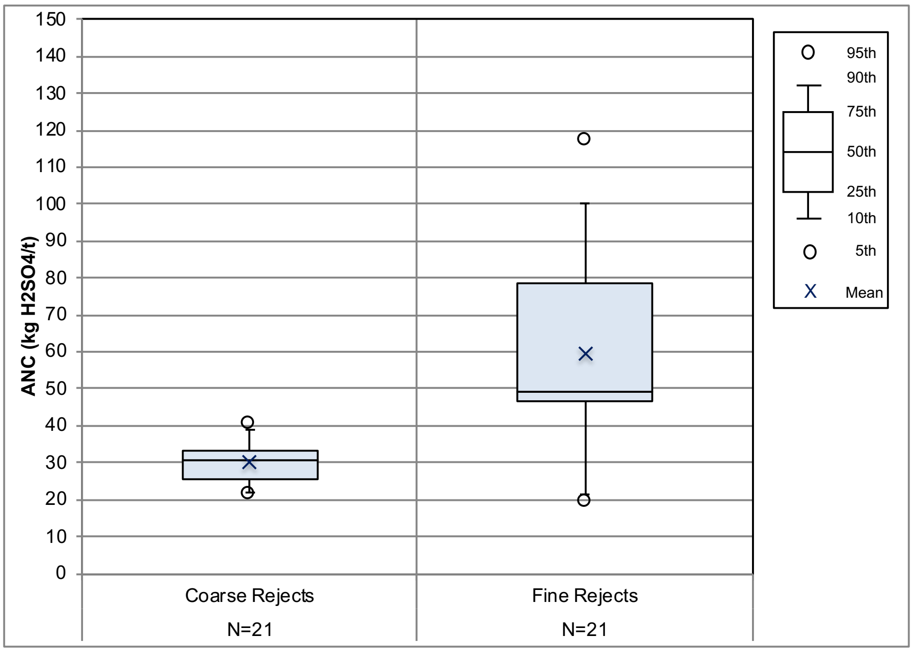

Figure 21 – Box plot showing the distribution of total ANC for coarse and fine rejects. Box plots show 5th, 10th, 25th, 50th (median), 75th, 90th and 95th percentiles and means.

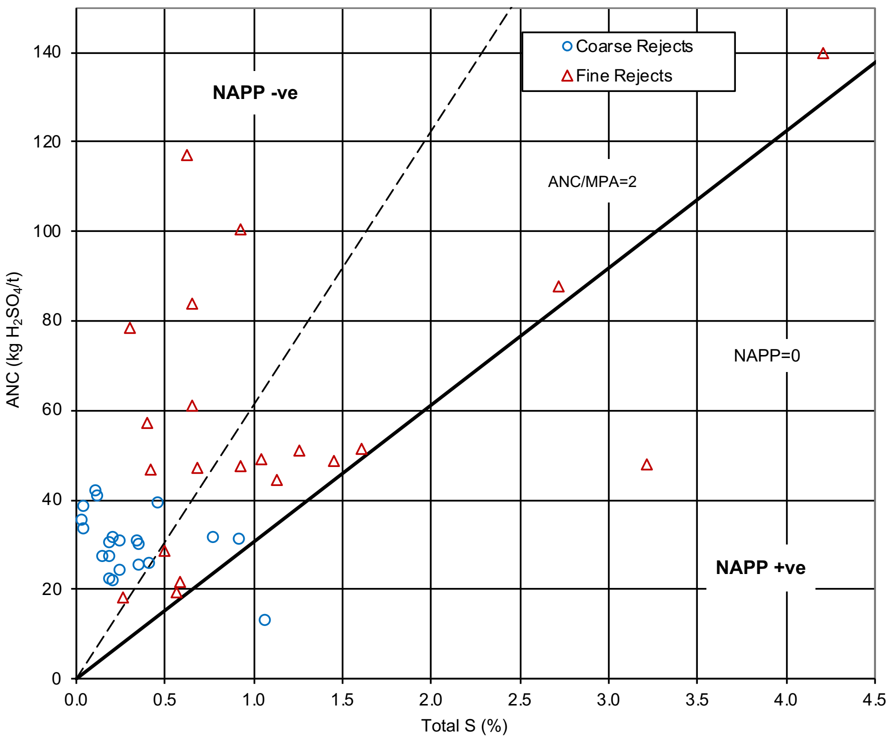

Figure 22 – Acid-base account (ABA) plot showing ANC versus total S for coarse and fine rejects samples.

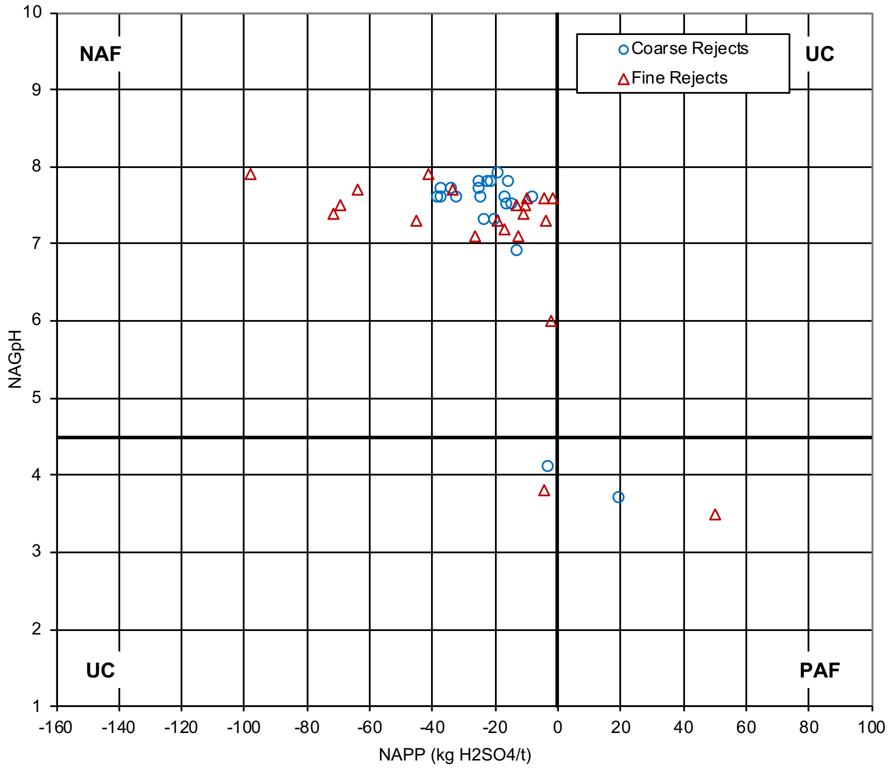

Figure 23 – ARD classification plot showing NAGpH versus NAPP for coarse and fine rejects samples, with ARD classification domains indicated.

Extended boil and calculated NAG testing results for the four samples plotting in the PAF and lower left uncertain domains are shown in Table B9 (Appendix B). The calculated NAG values were positive, indicating these samples are likely to be PAF.

ABCC testing was carried out on 12 selected samples and results are shown in Figures C24 to C30 (Appendix C). The ABCC profile for coarse rejects sample 6131 plots close to the ferroan dolomite standard curve (Figure C27), and indicates slow reactivity with an effective ANC of around 70% of the total ANC. Samples 6126, 6145 and 6158 have profiles that plot between the dolomite and ferroan dolomite standard curves (Figures C24, C26 and C28), indicating reaction rates slower than dolomite and a readily available ANC portion of 60% to 80% of the total ANC. The ABCC profiles for the remaining eight samples show strong buffering, with profiles plotting close to those of calcite and dolomite standard curves and indicating 60% to 100% of the ANC is readily available. ABCC results suggest that most of the ANC measured is likely to be fast reacting and effective.

Sulphur speciation test results for 11 selected rejects samples (including three coarse and eight fine (tailings) rejects) with elevated total S of 0.5%S or more are shown in Table B10 (Appendix B). Results indicate that the total S in the rejects will include a significant portion of pyritic S, with the acid generating S content estimated at over 50% for all samples. Table B10 includes a re-calculated NAPP value based on the proportion of acid generating S and readily available ANC estimated from ABCC testing. The recalculated NAPP values for samples 6126 (coarse reject), 6148 (fine reject) and 6158 (fine reject) are close to the calculated NAG value, and the samples are classified PAF and PAF-LC. The recalculated NAPP value for sample 6145 (coarse reject) is marginal at 0 kg H_2SO_4/t, but has a calculated NAG value of 2 kg H_2SO_4/t and is classified PAF-LC. The calculated NAPP value for sample 6164 (coarse reject) is 10 kg H_2SO_4/t, and a single addition NAGpH is 6, and the sample is assumed to be PAF. The remaining calculated NAPP results were negative, consistent with original NAPP and NAGpH values, and were classified NAF.

Kinetic NAG tests were carried out on four selected rejects samples with total S of 0.9% and above. Results are shown in Figures C31 to C34 (Appendix C). The pyritic nature of these samples was confirmed by sulphur speciation testing. The samples have varying ANC from 13 to 49 kg H_2SO_4/t, but all show a relatively rapid drop with time, reaching pH 4 in 15 minutes or less, and indicating lag times of 1 to 2 months before onset of acid conditions after exposure to atmospheric oxidation.

Most samples (90%) were classified NAF based on results discussed above. Although the fine rejects tended to have elevated S, this was offset by elevated and generally readily available ANC. Two samples were classified PAF and three samples PAF-LC. Four of the PAF/PAF-LC samples were from the Liddell Seam group and one from the Hebden Seam group. Note that although the Lemington Seam rejects samples were classified NAF, these showed high S relative to other seams (Figure 19). Note also that isolated pyritic zones associated with the Pikes Gully Seam Group were observed at two locations in the Mount Owen North Pit wall as part of the 2018 EGi Study. Overall, based on samples tested in 2013, results suggest that coarse and fine rejects produced as part of the Project are likely to be predominantly NAF. However, additional operational monitoring would be required to confirm the ARD classification and variation of the Lemington, Liddell, Hebden and Pikes Gully Seam Group materials.

Multi-element scans were carried out on 10 selected rejects samples solids. Results of multi-element analysis of solids are presented in Table B11 (Appendix B) and the corresponding GAI values in Table B12. A number of samples showed enrichment to slight enrichment in S (already discussed above in regard to acid forming potential) and slight enrichment in Be. Although slightly enriched relative to soils, Be contents are within the typical range for coal and carbonaceous materials. Liddell Seam group coarse rejects sample 6145 is elevated in S and also has elevated Tl and slightly elevated As. The elevated Tl and As are likely to be associated with pyrite in this sample. One sample is enriched in Ba, but this has low solubility in sulphate solutions and is not expected to be of environmental concern.

The same rejects samples were subjected to water extraction at a solids:liquor ratio of 1:2. Results are shown in Table B13. The extracts have slightly alkaline pH values of 8.7 to 9.4, and apart from sample 6136, show low concentrations of major cations/anions and metals/metalloids. Coarse rejects sample 6136 has slightly elevated Al, As and Mo, but also has elevated Si of 27 mg/L, and the slightly elevated metals/metalloids in this sample are most likely due to the presence of fine particulates in the solution after filtering.

Results indicate that the coarse rejects and tailings potentially representative of the Project (and Mount Owen Complex generally) are likely to be NAF overall, and not significantly enriched in elements of environmental concern. Water extracts indicate metals and metalloids are unlikely to be mobilised to any significant extent from circum-neutral to slightly alkaline leachates. However, the presence of some higher S rejects are indicated (Lemington, Pikes Gully, Liddell and Hebden Seam Groups), which could cause local impacts on rehabilitation due to upward migration of acid and salinity if placed close to final surfaces.

The thorough intermingling of coarse rejects and overburden observed on site (Section 2), and the excess ANC in the overburden suggests, that these bulk fill zones are unlikely to result in any significant effects on rehabilitation.

The vast majority of the tailings represented by the samples collected are expected to be NAF with excess ANC and are not expected to require special handling. However, the tailings are not mixed with neutralising overburden materials, and spigotting tailings can result in preferential deposition and concentration of pyritic materials, potentially resulting in PAF zones. Risks associated with the upward movement of acid and salinity from PAF material can be effectively managed through selected addition of neutralising materials (such as limestone) and use of an appropriately designed capping system that controls upward water flux. It is understood that Glencore procedures require the preparation of a detailed capping design for tailings facilities appropriate to the properties of the consolidated tailings, which will include consideration of any PAF zones that may occur close to the surface of the tailings facility.

Understanding the overall ARD hazard of tailings materials would require ongoing testing as recommended in the 2013 EGi Study, with focus on tailings from seams identified as having higher acid forming and salinity potential (such as Lemington, Pikes Gully, Liddell and Hebden Seam Groups), and would need to include sampling of deposited materials to check for any segregation and concentration of pyritic materials.

8.0 Mine Water Management and Quality

Dam ECD2 accepts water from a number of sites from the Mount Owen Complex, including Glendell Pit, and the GRAWTS. ECD2 represents one of the key mine water management storages for the current approved operations. Table 2 summarises the EC, SO_4 and Cl concentrations for sampling from monitoring point ECD2, which are considered likely to be typical of water quality during the life of the Project. Results show saline water quality (measured as EC) that is much higher than EC from leach columns and water extracts of NAF materials (see Section 6). Salinity at ECD2 is due to Cl and SO_4 salts, as with salinity measured from leach columns and water extracts.

Table 2 – Summary of EC, Cl and SO_4 quality (2009 to 2017) for ECD2.

	EC (dS/m)	SO_4 (mg/L)	Cl (mg/L)
Number of Samples	92	91	90
Minimum	2.8	5	394
Maximum	7.4	1,450	1,370
Median	5.2	930	862

Overall, the low salinity potential of NAF overburden/interburden, and the expected relatively minor PAF overburden/interburden, washery waste and pit wall materials indicate that the Project is not likely to have a significant impact on pit water quality, or require modification of the current saline water management. More detailed assessment and modelling of surface and groundwater salinity balance and impacts are provided in separate surface water impact (GHD, 2019) and groundwater impact (AGE, 2019) assessments for the Project.

9.0 Conclusions and Recommendations

Results indicate that the vast bulk (over 95%) of overburden/interburden materials represented by the samples tested are likely to be NAF, with a significant excess of acid neutralising capacity and low leachable salinity. Occasional thin (generally less than 0.3 m) zones of elevated S were identified close to coal seams, but dilution and mixing during mining should be sufficient to mitigate any ARD generation.

Fresh overburden/interburden had a median ANC of 25 kg H_2SO_4/t, providing a potential source of buffering to help mitigate any ARD from PAF materials. Fresh sandstone tended to have higher ANC than other lithologies, having a median of 35 kg H_2SO_4/t, and is also the most common lithology. Given the expected high proportions of NAF (greater than 97% of overburden/interburden intervals tested were classified NAF) relative to PAF (less than 3%), operational blending of NAF and PAF overburden/interburden together with the excess alkaline leachate from NAF materials is expected to be a robust approach to controlling ARD from PAF materials.

The Project will involve development to the base of the Hebden Seam, but with a stepped pit floor, so that the final pit floor will consist of two different seam floors: the floor of the Barrett 1 Seam; and floor of the Hebden Seam H2. All of the samples representing the floors of the Barrett and Hebden Seam series were classified NAF, suggesting that any final pit floor below these seams are likely to be NAF.

The coal materials represented by the samples tested appear to be mainly NAF, but may include potentially acid forming (PAF) and PAF-LC portions. Two occurrences of coal horizons generating ARD were observed in the current pit walls, but the vast majority of the pit walls showed no evidence of ARD, supporting the isolated nature of these pyritic horizons.

Results of coarse rejects and tailings testing carried out as part of the 2013 EGi Study of the Mount Owen Complex are expected to be applicable to the Project, which indicate these are likely to be mainly NAF. However, rejects from Lemington, Pikes Gully, Liddell and Hebden Seam Groups may have a greater ARD hazard.

Kinetic NAG and leach column testing indicated that PAF materials are reactive and can rapidly generate ARD within weeks to a couple of months after exposure to atmospheric oxidation conditions. Constituents associated with ARD are likely to include Al, As, Co, Cu, Fe, Mn, Ni and Zn, and slightly elevated Cd and Cr. However, leach column results also show that thorough blending with NAF materials is likely to be an effective strategy in controlling ARD from PAF materials for at least 12 months.

Water extraction and leach column testing of NAF overburden/interburden and rejects indicated that these materials have low salinity potential and are unlikely to release significant metal/metalloid concentrations.

Overall, the geochemical characteristics of coal, overburden/interburden, coarse rejects and fine tailings material associated with the Project are expected to be consistent with those of existing operations at the Mount Owen Complex:

- The vast majority of overburden/interburden, coal and washery wastes for the Project are expected to be NAF with excess ANC and are not expected to require special handling. Dilution and mixing during mining are expected to be sufficient to mitigate ARD from any occasional thin zones of pyrite that may be present in pit walls and pit backfill, and prevent any significant impacts on downstream water quality.
- Although the PAF mine materials do not appear to represent a concern in terms of downstream water quality impacts, placement of PAF materials close to final surfaces could cause local effects on rehabilitation success through upward migration of acid and salinity into the growth horizon. The thorough intermingling of coarse rejects and overburden observed on site (Section 2), and the excess ANC in the overburden suggests, that these bulk fill zones are unlikely to result in any significant effects on rehabilitation.
- With regard to tailings disposal, fine rejects (tailings) are not mixed with neutralising overburden materials, and spigotting fine rejects can result in preferential deposition and concentration of pyritic materials, potentially resulting in PAF zones. These aspects need to be considered in the detailed final rehabilitation design of the tailings storage facilities (TSFs).
- Weathered Permian materials are likely to be NAF, but the 2013 EGi Study for the Mount Owen Complex indicated these materials were sodic and dispersive, and may require treatment (e.g. with gypsum or lime) if used as a plant growing horizon, exposed on dump surfaces or used in engineered structures. Finer grained fresh Permian materials may also be partly sodic and require treatment.
- The low salinity potential of NAF overburden/interburden, and the expected relatively minor PAF overburden/interburden, washery waste and pit wall materials indicate that the Project is not likely to have a significant impact on pit water quality, or require modification of the current saline water management. More detailed assessment and modelling of surface and groundwater salinity balance and impacts are provided in separate surface water impact (GHD, 2019) and groundwater impact (AGE, 2019) assessments for the Project.

The following additional investigations were recommended as part of the Geochemical Assessment for the Mount Owen Continued Operations Modification 2 and these recommendations remain relevant to the Project:

- Carry out visual inspection of any further core drilling in the Project Area for evidence of pyrite occurrence to confirm the strong dominance of NAF overburden/interburden across the deposit.
- The potential impacts of fine rejects on final rehabilitation of the TSFs are uncertain, and it should be demonstrated that either the TSF will not contain zones of PAF materials close to surface, or that the final TSF capping design will be effective in controlling upward flux of any potential ARD products. This will need to be considered in the detailed final rehabilitation design of the TSFs.

- The Mount Owen Complex Surface Water Management and Monitoring Plan (SWMMP) includes water quality monitoring provisions to monitor for ARD effects (Glencore, 2019). Some modifications are recommended, consistent with recommendations for the Mount Owen Continued Operations Modification 2:
  - The monitoring points should be expanded to include key pit dewatering points.
  - The parameters listed in the SWMMP should include the following relevant to ARD: pH, EC, SO_4, Ca, Mg, K, Na, Cl, Al, As, Co, Cu, Fe, Mn, Ni and Zn.
  - Alkalinity should also be monitored at the same frequency as pH and EC for all sites.
  - pH, EC, alkalinity SO_4, Ca, Mg, K, Na and Cl be determined monthly at water quality monitoring sites ECD2, W10, West Pit dewatering, North Pit dewatering and Glendell Pit dewatering for 12 months and reviewed.

10.0 References

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APPENDIX A

Assessment of Acid Forming Characteristics

Assessment of Acid Forming Characteristics

Introduction

Acid rock drainage (ARD) is produced by the exposure of sulphide minerals such as pyrite to atmospheric oxygen and water. The ability to identify in advance any mine materials that could potentially produce ARD is essential for timely implementation of mine waste management strategies.

A number of procedures have been developed to assess the acid forming characteristics of mine waste materials. The most widely used methods are the Acid-Base Account (ABA) and the Net Acid Generation (NAG) test. These methods are referred to as static procedures because each involves a single measurement in time.

Acid-Base Account

The acid-base account involves static laboratory procedures that evaluate the balance between acid generation processes (oxidation of sulphide minerals) and acid neutralising processes (dissolution of alkaline carbonates, displacement of exchangeable bases, and weathering of silicates).

The values arising from the acid-base account are referred to as the potential acidity and the acid neutralising capacity, respectively. The difference between the potential acidity and the acid neutralising capacity value is referred to as the net acid producing potential (NAPP).

The chemical and theoretical basis of the ABA are discussed below.

Potential Acidity

The potential acidity that can be generated by a sample is calculated from an estimate of the pyrite (FeS_2) content and assumes that the pyrite reacts under oxidising conditions to generate acid according to the following reaction:

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

Based on the above reaction, the potential acidity of a sample containing 1 %S as pyrite would be 30.6 kilograms of H_2SO_4 per tonne of material (i.e. kg H_2SO_4/t). The pyrite content estimate can be based on total S and the potential acidity determined from total S is referred to as the maximum potential acidity (MPA), and is calculated as follows:

$$\text{MPA (kg } H_2SO_4/t) = (\text{Total \%S}) \times 30.6$$

The use of an MPA calculated from total sulphur is a conservative approach because some sulphur may occur in forms other than pyrite. Sulphate-sulphur, organic sulphur and native sulphur, for example, are non-acid generating sulphur forms. Also, some sulphur may occur as other metal sulphides (e.g. covellite, chalcocite, sphalerite, galena) which yield less acidity than pyrite when oxidised or, in some cases, may be non-acid generating.

The total sulphur content is commonly used to assess potential acidity because of the difficulty, costs and uncertainty involved in routinely determining the speciation of sulphur forms within samples, and determining reactive sulphide-sulphur contents. However, if the sulphide mineral forms are known then allowance can be made for non- and lesser acid generating forms to provide a better estimate of the potential acidity.

Acid Neutralising Capacity (ANC)

The acid formed from pyrite oxidation will to some extent react with acid neutralising minerals contained within the sample. This inherent acid buffering is quantified in terms of the ANC.

The ANC is commonly determined by the Modified Sobek method. This method involves the addition of a known amount of standardised hydrochloric acid (HCl) to an accurately weighed sample, allowing the sample time to react (with heating), then back-titrating the mixture with standardised sodium hydroxide (NaOH) to determine the amount of unreacted HCl. The amount of acid consumed by reaction with the sample is then calculated and expressed in the same units as the MPA (kg H_2SO_4/t).

Net Acid Producing Potential (NAPP)

The NAPP is a theoretical calculation commonly used to indicate if a material has potential to produce acidic drainage. It represents the balance between the capacity of a sample to generate acid (MPA) and its capacity to neutralise acid (ANC). The NAPP is also expressed in units of kg H_2SO_4/t and is calculated as follows:

$$\text{NAPP} = \text{MPA} - \text{ANC}$$

If the MPA is less than the ANC then the NAPP is negative, which indicates that the sample may have sufficient ANC to prevent acid generation. Conversely, if the MPA exceeds the ANC then the NAPP is positive, which indicates that the material may be acid generating.

ANC/MPA Ratio

The ANC/MPA ratio is frequently used as a means of assessing the risk of acid generation from mine waste materials. The ANC/MPA ratio is another way of looking at the acid base account. A positive NAPP is equivalent to an ANC/MPA ratio less than 1, and a negative NAPP is equivalent to an ANC/MPA ratio greater than 1. A NAPP of zero is equivalent to an ANC/MPA ratio of 1.

The purpose of the ANC/MPA ratio is to provide an indication of the relative margin of safety (or lack thereof) within a material. Various ANC/MPA values are reported in the literature for indicating safe values for prevention of acid generation. These values typically range from 1 to 3. As a general rule, an ANC/MPA ratio of 2 or more signifies that there is a high probability that the material will remain circum-neutral in pH and thereby should not be problematic with respect to acid rock drainage.

Acid-Base Account Plot

Sulphur and ANC data are often presented graphically in a format similar to that shown in Figure A-1. This figure includes a line indicating the division between NAPP positive samples from NAPP negative samples. Also shown are lines corresponding to ANC/MPA ratios of 2 and 3.

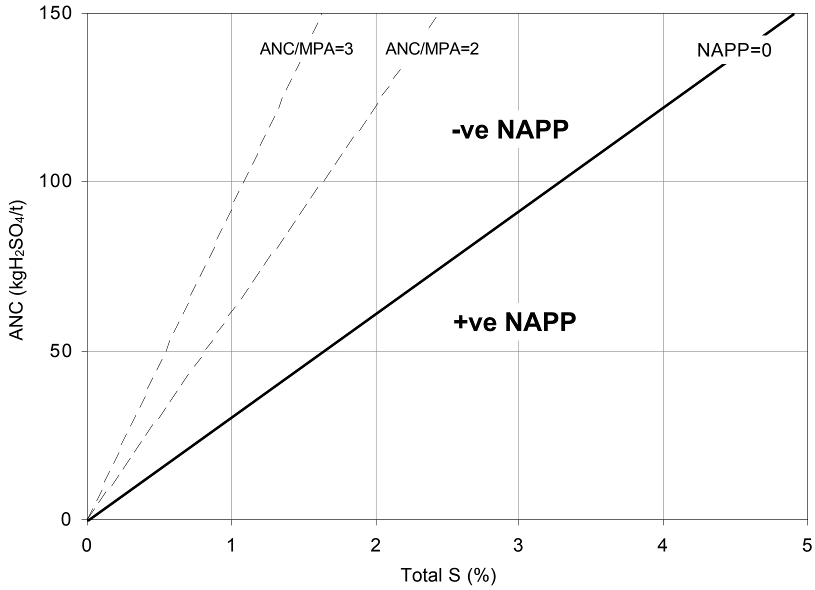


Figure A-1: Acid-base account (ABA) plot

Net Acid Generation (NAG) Test

The NAG test is used in association with the NAPP to classify the acid generating potential of a sample. The NAG test involves reaction of a sample with hydrogen peroxide to rapidly oxidise any sulphide minerals contained within a sample. During the NAG test both acid generation and acid neutralisation reactions can occur simultaneously. The end result represents a direct measurement of the net amount of acid generated by the sample. The final pH is referred to as the NAGpH and the amount of acid produced is commonly referred to as the NAG capacity, and is expressed in the same units as the NAPP (kg H_2SO_4/t).

Several variations of the NAG test have been developed to accommodate the wide geochemical variability of mine waste materials. The four main NAG test procedures currently used by EGi are the single addition NAG test, the sequential NAG test, the kinetic NAG test, and the extended boil and calculated NAG test.

Single Addition NAG Test

The single addition NAG test involves the addition of 250 ml of 15% hydrogen peroxide to 2.5 g of sample. The peroxide is allowed to react with the sample overnight and the following day the sample is gently heated to accelerate the oxidation of any remaining sulphides, then vigorously boiled for several minutes to decompose residual peroxide. When cool, the NAGpH and NAG capacity are measured.

An indication of the form of the acidity is provided by initially titrating the NAG liquor to pH 4.5, then continuing the titration up to pH 7. The titration value at pH 4.5 includes acidity due to free acid (i.e. H_2SO_4) as well as soluble iron and aluminium. The titration value at pH 7 also includes metallic ions that precipitate as hydroxides at between pH 4.5 and 7.

Sequential NAG Test

When testing samples with high sulphide contents it is not uncommon for oxidation to be incomplete in the single addition NAG test. This can sometimes occur when there is catalytic breakdown of the hydrogen peroxide before it has had a chance to oxidise all of the sulphides in a sample. To overcome this limitation, a sequential NAG test is often carried out. This test may also be used to assess the relative geochemical lag of PAF samples with high ANC.

The sequential NAG test is a multi-stage procedure involving a series of single addition NAG tests on the one sample (i.e. 2.5 g of sample is reacted two or more times with 250 ml aliquots of 15% hydrogen peroxide). At the end of each stage, the sample is filtered and the solution is used for measurement of NAGpH and NAG capacity. The NAG test is then repeated on the solid residue. The cycle is repeated until such time that there is no further catalytic decomposition of the peroxide, or when the NAGpH is greater than pH 4.5. The overall NAG capacity of the sample is then determined by summing the individual acid capacities from each stage.

Kinetic NAG Test

The kinetic NAG test is the same as the single addition NAG test except that the temperature and pH of the liquor are recorded. Variations in these parameters during the test provide an indication of the kinetics of sulphide oxidation and acid generation. This, in turn, can provide an insight into the behaviour of the material under field conditions. For example, the pH trend gives an estimate of relative reactivity and may be related to prediction of lag times and oxidation rates similar to those measured in leach columns. Also, sulphidic samples commonly produce a temperature excursion during the NAG test due to the decomposition of the peroxide solution, catalysed by sulphide surfaces and/or oxidation products.

Extended Boil and Calculated NAG Test

Organic acids may be generated in NAG tests due to partial oxidation of carbonaceous materials[1] such as coal washery wastes. This can lead to low NAGpH values and high acidities in standard single addition NAG tests unrelated to acid generation from sulphides. Organic acid effects can therefore result in misleading NAG values and misclassification of the acid forming potential of a sample.

The extended boil and calculated NAG tests can be used to account for the relative proportions of pyrite derived acidity and organic acidity in a given NAG solution, thus providing a more reliable

[1] Stewart, W., Miller, S., Thomas, J.E., and Smart R. (2003), 'Evaluation of the Effects of Organic Matter on the Net Acid Generation (NAG) Test', in *Proceedings of the Sixth International Conference on Acid Rock drainage (ICARD), Cairns, 12-18th July 2003*, 211-222.

measure of the acid forming potential of a sample. The procedure involves two steps to differentiating pyritic acid from organic derived acid:

Extended Boil NAG	decompose the organic acids and hence remove the influence of non-pyritic acidity on the NAG solution.
Calculated NAG	calculate the net acid potential based on the balance of cations and anions in the NAG solution, which will not be affected by organic acid.

The extended boiling test is carried out on the filtered liquor of a standard NAG test, and involves vigorous boiling of the solution on a hot plate for 3-4 hours. After the boiling step the solution is cooled and the pH measured. An extended boil NAGpH less than 4.5 confirms the sample is potentially acid forming (PAF), but a pH value greater than 4.5 does not necessarily mean that the sample is non acid forming (NAF), due to some loss of free acid during the extended boiling procedure. To address this issue, a split of the same filtered NAG solution is assayed for concentrations of S, Ca, Mg, Na, K and Cl, from which a calculated NAG value is determined[2].

The concentration of dissolved S is used to calculate the amount of acid (as H_2SO_4) generated by the sample and the concentrations of Ca, Mg, Na and K are used to estimate the amount of acid neutralised (as H_2SO_4). The concentration of Cl is used to correct for soluble cations associated with Cl salts, which may be present in the sample and unrelated to acid generating and acid neutralising reactions.

The calculated NAG value is the amount of acid neutralised subtracted from the amount of acid generated. A positive value indicates that the sample has excess acid generation and is likely to be PAF, and a zero or negative value indicates that the sample has excess neutralising capacity and is likely to be NAF.

Sample Classification

The acid forming potential of a sample is classified on the basis of the acid-base and NAG test results into one of the following categories:

- Barren;
- Non-acid forming (NAF);
- Potentially acid forming (PAF); and
- Uncertain (UC).

Barren

A sample classified as barren essentially has no acid generating capacity and no acid buffering capacity. This category is most likely to apply to highly weathered materials. In essence, it represents an 'inert' material with respect to acid generation. The criteria used to classify a sample

[2] Environmental Geochemistry International, Levay and Co. and ACeSSS, 2008. *ACARP Project C15034: Development of ARD Assessment for Coal Process Wastes*, EGi Document No. 3207/817, July 2008.

as barren may vary between sites, but for hard rock mines it generally applies to materials with a total sulphur content ≤ 0.1 %S and an ANC ≤ 5 kg H_2SO_4/t.

Non-acid forming (NAF)

A sample classified as NAF may, or may not, have a significant sulphur content but the availability of ANC within the sample is more than adequate to neutralise all the acid that theoretically could be produced by any contained sulphide minerals. As such, material classified as NAF is considered unlikely to be a source of acidic drainage. A sample is usually defined as NAF when it has a negative NAPP and the final NAG pH ≥ 4.5.

Potentially acid forming (PAF)

A sample classified as PAF always has a significant sulphur content, the acid generating potential of which exceeds the inherent acid neutralising capacity of the material. This means there is a high risk that such a material, even if pH circum-neutral when freshly mined or processed, could oxidise and generate acidic drainage if exposed to atmospheric conditions. A sample is usually defined as PAF when it has a positive NAPP and a final NAGpH < 4.5.

Uncertain (UC)

An uncertain classification is used when there is an apparent conflict between the NAPP and NAG results (i.e. when the NAPP is positive and NAGpH > 4.5, or when the NAPP is negative and NAGpH ≤ 4.5). Uncertain samples are generally given a tentative classification that is shown in brackets e.g. UC(NAF).

Figure A-2 shows the format of the classification plot that is typically used for presentation of NAPP and NAG data. Marked on this plot are the quadrats representing the NAF, PAF and UC classifications.

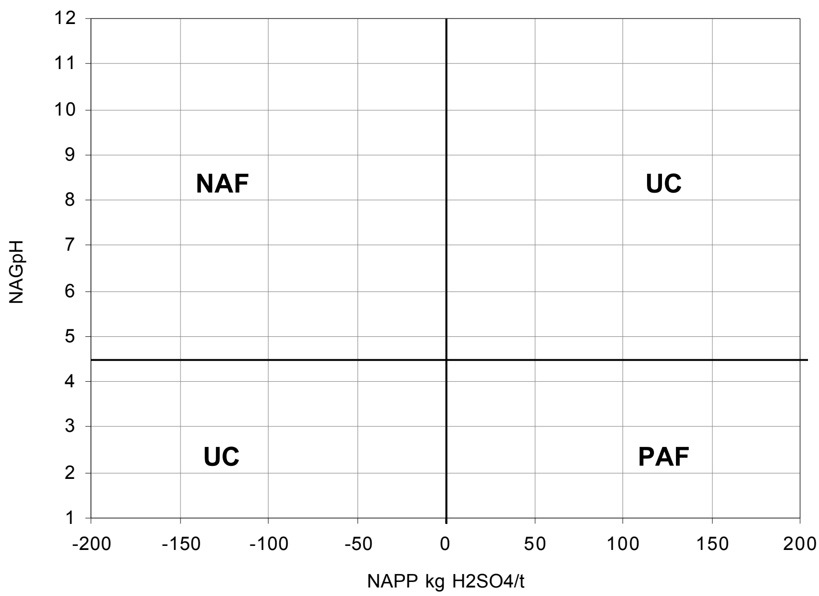


Figure A-2 ARD classification plot

Other Methods

Other test procedures may be used to define the acid forming characteristics of a sample.

pH and Electrical Conductivity

The pH and electrical conductivity (EC) of a sample is determined by equilibrating the sample in deionised water for a minimum of 12 hours (or overnight), typically at a solid to water ratio of 1:2 (w/w). This gives an indication of the inherent acidity and salinity of the waste material when initially exposed in a waste emplacement area.

Acid Buffering Characteristic Curve (ABCC) Test

The ABCC test involves slow titration of a sample with acid while continuously monitoring pH. These data provides an indication of the portion of ANC within a sample that is readily available for acid neutralisation.

APPENDIX B

Acid Forming Characteristics and Multi-Element Testing Tables

Table B1: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen Complex (2013 EGi Study).

Hole Name	Depth (m)			Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION NAG			ARD Classification
	From	To	Interval											Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	
SMC009	12.72	13.18	0.46	Coal	LDK	Lemington	FR		184135					0.48	15							
SMC009	13.18	13.65	0.47	Tuff/Coal			FR		184136					0.28	9							UC(PAF)
SMC009	13.65	14.80	1.15	Coal	LDJ	Lemington	FR		184144		5311	6.6	0.13	0.58	18	2	16	0.11	2.3	66	94	PAF
SMC009	14.80	15.58	0.78	Tuff/Carb Mudstone			FR		184145					0.29	9							UC(PAF)
SMC009	15.58	16.98	1.40	Coal	LDGH	Lemington	FR		184146					0.49	15							
SMC009	16.98	17.05	0.07	Tuff			FR		184147					<0.01	0							NAF
SMC009	17.05	17.23	0.18	Coal	LDE	Lemington	FR		184148					0.48	15							
SMC009	17.23	17.28	0.05	Carb Mudstone			FR		184149					0.21	6							UC(PAF)
SMC009	17.28	17.83	0.55	Coal	LDD	Lemington	FR		184150					0.48	15							
SMC009	17.83	17.87	0.04	Tuff			FR		184151					0.35	11							UC(PAF)
SMC009	17.87	18.41	0.54	Coal	LDC	Lemington	FR		184152					0.54	17							
SMC009	18.41	18.65	0.24	Tuff			FR		184153					0.16	5							UC(PAF)
SMC009	18.65	19.70	1.05	Coal	LDB	Lemington	FR		184154		5312	6.9	0.13	0.47	14	3	11	0.24	2.2	69	103	PAF
SMC009	19.70	19.75	0.05	Core Loss			FR															
SMC009	19.75	21.00	1.25	Coal	LDA	Lemington	FR		184156					0.66	20							
SMC009	21.00	21.10	0.10	Sandstone			PW		184157					0.21	6							UC(PAF)
SMC009	21.10	21.80	0.70	Sandstone			PW	Minor Coal, Geotech Sample Removed		186420	3887	7.3	0.40	0.07	2	32	-30	15.12	8.1	0	0	NAF
SMC009	21.80	24.76	2.96	Sandstone			SW			186421	3888	7.5	0.44	<0.01	0	7	-7	47.24	7.4	0	0	NAF
SMC009	24.76	28.06	3.30	Sandstone			SW	Inc. TF		186422	3889	7.6	0.42	<0.01	0	25	-25	165.62	8.0	0	0	NAF
SMC009	28.06	30.93	2.87	Sandstone			SW	Siderite		186423	3890	7.7	0.40	<0.01	0	65	-65	424.52	8.3	0	0	NAF
SMC009	30.93	32.51	1.58	Sandstone			SW			186424	3891	7.8	0.42	<0.01	0	74	-74	482.16	9.0	0	0	NAF
SMC009	32.51	32.67	0.16	Tuff/Conglomerate			FR		184158					0.40	12							UC(PAF)
SMC009	32.67	32.87	0.20	Coal	LCG	Lemington	FR		184159					1.87	57							
SMC009	32.87	32.93	0.06	Tuff			FR		184160		6802			0.79	24	9	15	0.37	2.5	16	29	PAF
SMC009	32.93	33.76	0.83	Coal	LCF	Lemington	FR		184161		5313	4.1	0.46	1.27	39	1	38	0.02	2.3	25	28	PAF
SMC009	33.76	33.92	0.16	Mudstone			FR		184162					<0.01	0							NAF
SMC009	33.92	34.20	0.28	Mudstone			FR			186425	3892			0.01	0	6	-6	19.39				NAF
SMC009	34.20	36.54	2.34	Sandstone/Siltstone			FR			186426	3893			0.01	0	16	-16	51.70				NAF
SMC009	36.54	38.42	1.88	Mudstone/Sandstone			FR			186427	3894			0.03	1	15	-14	16.26				NAF
SMC009	38.42	39.73	1.31	Sandstone			FR	Siderite		186428	3895			<0.01	0	125	-125	819.35				NAF
SMC009	39.73	42.74	3.01	Core Loss			FR	Geotech Sample Removed		186429	3896			<0.01	0	30	-29	193.09				NAF
SMC009	42.74	45.74	3.00	Sandstone			FR			186430	3897			<0.01	0	68	-68	446.96				NAF
SMC009	45.74	48.74	3.00	Conglomerate			FR			186431	3898	7.7	0.45	<0.01	0	37	-37	243.81	8.9	0	0	NAF
SMC009	48.74	51.72	2.98	Conglomerate			FR			186432	3899	7.6	0.38	<0.01	0	21	-21	138.35	8.5	0	0	NAF
SMC009	51.72	54.74	3.02	Conglomerate			FR			186433	3900	7.8	0.55	<0.01	0	23	-23	152.71	8.3	0	0	NAF
SMC009	54.74	57.74	3.00	Conglomerate			FR			186434	3901	7.5	0.53	<0.01	0	20	-20	133.96	8.4	0	0	NAF
SMC009	57.74	60.76	3.02	Conglomerate			FR			186435	3902	7.4	0.49	<0.01	0	18	-18	117.60	8.2	0	0	NAF
SMC009	60.76	63.74	2.98	Conglomerate			FR			186436	3903	7.7	0.50	<0.01	0	32	-32	209.15	8.3	0	0	NAF
SMC009	63.74	64.47	0.73	Conglomerate			FR			186437	3904	8.1	0.55	<0.01	0	59	-59	387.15	8.6	0	0	NAF
SMC009	64.47	64.85	0.38	Siltstone/Coal	LCEBAND	Lemington	FR	Minor Pyrite		186438	3905	8.2	0.56	<0.01	0	14	-14	89.99	4.0	3	13	NAF
SMC009	64.85	65.54	0.69	Mudstone			FR			186439	3906	8.0	0.59	0.02	1	11	-10	17.61	6.1	0	2	NAF
SMC009	65.54	65.68	0.14	Mudstone			FR		184163					0.19	6							UC(PAF)
SMC009	65.68	66.43	0.75	Coal	LCE	Lemington	FR	Calcite	184164		5314	6.6	0.36	3.54	108	17	91	0.16	2.2	61	67	PAF
SMC009	66.43	66.56	0.13	Mudstone			FR		184165					0.27	8							UC(PAF)
SMC009	66.56	66.96	0.40	Mudstone/Sandstone			FR			186440	3907	7.3	0.57	0.09	3	11	-9	4.16	4.2	1	9	PAF-LC
SMC009	66.96	67.12	0.16	Mudstone/Sandstone			FR		184166					0.14	4							UC(PAF)
SMC006	0.00	0.20	0.20	Soil			EW	Open Hole - No Sample														
SMC006	0.20	2.00	1.80	Mudstone			CW	Open Hole - No Sample														
SMC006	2.00	3.00	1.00	Mudstone/Sandstone			EW	Open Hole - No Sample														
SMC006	3.00	9.00	6.00	Sandstone			MW	Open Hole - No Sample														
SMC006	9.00	10.00	1.00	Coal/Sandstone			SW	Open Hole - No Sample														
SMC006	10.00	11.00	1.00	Sandstone			FR	Open Hole - No Sample														
SMC006	11.00	11.80	0.80	Siltstone			FR	Open Hole - No Sample														
SMC006	11.80	13.26	1.46	Mudstone/Sandstone/Conglomerate			FR	NR 0.12m		186451	3908	8.6	0.61	0.05	2	26	-25	17.21	8.3	0	0	NAF
SMC006	13.26	13.81	0.55	Siderite/Siltstone/Tuff			FR	Siderite		186452	3909	8.4	0.43	<0.01	0	51	-51	331.52	8.4	0	0	NAF
SMC006	13.81	13.88	0.07	Tuff			FR		184001					0.11	3							UC(PAF)
SMC006	13.88	14.17	0.29	Coal	LCJ	Lemington	FR		184700					1.96	60							
SMC006	14.17	14.31	0.14	Mudstone			FR		184699					0.30	9							UC(PAF)
SMC006	14.31	15.92	1.61	Sandstone			FR	Minor coal		186453	3910	8.5	0.38	<0.01	0	58	-58	381.04	8.5	0	0	NAF
SMC006	15.92	17.22	1.30	Mudstone			FR	Lesser SS		186454	3911	8.3	0.52	0.03	1	20	-19	21.86	8.2	0	0	NAF
SMC006	17.22	17.72	0.50	Sandstone			FR			186455	3912	8.2	0.42	0.03	1	24	-24	26.65	8.1	0	0	NAF
SMC006	17.72	17.85	0.13	Mudstone/Sandstone			FR		184744		6803			0.55	17	13	4	0.76	3.3	2	7	PAF-LC
SMC006	17.85	18.13	0.28	Coal	LCH	Lemington	FR		184745					0.97	30							
SMC006	18.13	18.24	0.11	Tuff/Mudstone			FR		184746					<0.01	0							NAF
SMC006	18.24	18.51	0.27	Coal/Tuff			FR			186456	3913	8.5	0.84	<0.01	0	19	-19	123.66	3.4	8	31	NAF
SMC006	18.51	18.74	0.23	Core Loss			FR															
SMC006	18.74	19.29	0.55	Siltstone/Mudstone/Coal			FR			186457	3914	8.1	0.38	0.02	1	33	-32	53.69	7.5	0	0	NAF
SMC006	19.29	19.85	0.56	Tuff			FR	Minor Coal		186458	3915	7.8	0.38	<0.01	0	14	-13	89.23	7.2	0	0	NAF
SMC006	19.85	21.33	1.48	Siltstone			FR	Minor Coal		186459	3916	8.4	0.38	0.06	2	50	-48	26.99	7.6	0	0	NAF
SMC006	21.33	24.87	3.54	Sandstone/Siltstone			FR			186460	3917	8.3	0.29	<0.01	0	19	-19	126.16	7.9	0	0	NAF
SMC006	24.87	27.81	2.94	Sandstone/Mudstone/Siltstone			FR			186461	3918	8.2	0.53	0.04	1	44	-43	36.11	7.8	0	0	NAF
SMC006	27.81	30.60	2.79	Sandstone/Siltstone			FR			186462	3919	8.5	0.43	0.09	3	18	-15	6.36	4.5	0	8	NAF
SMC006	30.60	30.92	0.32	Siltstone/Mudstone			FR	Minor Coal		186463	3920	7.6	0.38	0.06	2	35	-33	19.16	7.6	0	0	NAF
SMC006	30.92	31.98	1.06	Sandstone			FR			186464	3921	8.4	0.51	<0.01	0	60	-60	390.56	7.7	0	0	NAF
SMC006	31.98	33.44	1.46	Mudstone/Siltstone/Tuff			FR			186465	3922	7.8	0.42	0.06	2	17	-16	9.51	7.5	0	0	NAF
SMC006	33.44	35.79	2.35	Sandstone			FR			186466	3923			0.03	1	49	-48	53.40				NAF
SMC006	35.79	36.16	0.37	Mudstone/Coal			FR			186467	3924			0.05	2	22	-21	14.68				NAF
SMC006	36.16	36.99	0.83	Sandstone/Siltstone			FR			186468	3925			0.01	0	15	-15	48.92				NAF
SMC006	36.99	38.86	1.87	Mudstone/Siltstone			FR			186469	3926	8.3	0.39	0.07	2	28	-25	12.87	7.9	0	0	NAF
SMC006	38.86	41.95	3.09	Sandstone/Siltstone			FR			186470	3927	8.2	0.38	0.01	0	56	-56	183.09	8.5	0	0	NAF
SMC006	41.95	42.41	0.46	Siltstone/Mudstone			FR			186471	3928	8.1	0.37	<0.01	0	45	-45	292.79	8.6	0	0	NAF
SMC006	42.41	43.91	1.50	Sandstone			FR			186472	3929	8.4	0.29	0.13	4	26	-22	6.52	8.3	0	0	NAF
SMC006	43.91	44.17	0.26	Mudstone			FR			186473	3930	9.2	0.84	0.09	3	17	-14	6.14	7.5	0	0	NAF

Table B1: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen Complex (2013 EGi Study).

Hole Name	Depth (m) From	Depth (m) To	Depth (m) Interval	Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS Total %S	MPA	ANC	NAPP	ANC/MPA	SINGLE ADDITION NAG NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	ARD Classification
SMC006	44.17	44.30	0.13	Mudstone			FR		184747					0.06	2							UC(NAF)
SMC006	44.30	44.54	0.24	Coal	LCG	Lemington	FR		184748					1.18	36							
SMC006	44.54	44.73	0.19	Carb Mudstone/Mudstone			FR		184749		6804			0.67	21	16	5	0.77	3.8	1	11	PAF-LC
SMC006	44.73	45.23	0.50	Coal	LCFU	Lemington	FR		184750					1.53	47							
SMC006	45.23	45.73	0.50	Sandstone/Mudstone			FR		184751					0.16	5							UC(PAF)
SMC006	45.73	46.13	0.40	Coal	LCFL	Lemington	FR		184752					1.22	37							
SMC006	46.13	46.28	0.15	Mudstone/Carb Mudstone			FR		184754		6805			0.64	20	14	6	0.70	3.9	1	10	PAF-LC
SMC006	46.28	47.17	0.89	Sandstone/Conglomerate			FR			186474	3931	8.2	0.72	0.09	3	26	-23	9.29	7.6	0	0	NAF
SMC006	47.17	49.60	2.43	Sandstone/Siltstone			FR			186475	3932	8.3	0.61	0.06	2	36	-34	19.52	7.8	0	0	NAF
SMC006	49.60	53.57	3.97	Sandstone/Mudstone			FR	Siderite at base		186476	3933	8.2	0.67	0.10	3	38	-35	12.41	7.9	0	0	NAF
SMC006	53.57	54.11	0.54	Mudstone			FR			186477	3934	8.5	0.57	0.10	3	16	-13	5.27	7.4	0	0	NAF
SMC006	54.11	56.15	2.04	Sandstone			FR			186478	3935			0.04	1	34	-33	27.68				NAF
SMC006	56.15	57.10	0.95	Mudstone/Siltstone			FR			186479	3936			0.05	2	19	-18	12.67				NAF
SMC006	57.10	60.20	3.10	Sandstone			FR			186480	3937			0.05	2	61	-60	40.13				NAF
SMC006	60.20	61.07	0.87	Mudstone/Siltstone/Sandstone			FR			186481	3938	8.4	0.50	0.06	2	52	-50	28.29	7.8	0	0	NAF
SMC006	61.07	61.21	0.14	Mudstone/Siltstone			FR		184755					0.06	2							UC(NAF)
SMC006	61.21	61.34	0.13	Coal	LCD	Lemington	FR		184756					0.90	28							
SMC006	61.34	61.49	0.15	Carb Mudstone/Mudstone			FR		184757		6806			0.69	21	14	7	0.65	3.3	4	21	PAF-LC
SMC006	61.49	62.35	0.86	Mudstone/Sandstone			FR			186482	3939	8.6	0.38	0.22	7	25	-18	3.71	7.5	0	0	NAF
SMC006	62.35	62.49	0.14	Mudstone			FR		184758		6807			0.57	17	15	3	0.83	3.5	2	8	PAF-LC
SMC006	62.49	62.81	0.32	Coal	LCC	Lemington	FR		184759					1.52	47							
SMC006	62.81	62.94	0.13	Tuff			FR		184760		6808			1.13	35	12	22	0.35	3.0	7	12	PAF
SMC006	62.94	63.54	0.60	Coal	LCB	Lemington	FR		184761					1.67	51							
SMC006	63.54	63.74	0.20	Tuff			FR		184762					0.39	12							UC(PAF)
SMC006	63.74	64.69	0.95	Coal	LCA	Lemington	FR		184763		5297	7.2	0.12	0.77	24	45	-22	1.93	7.1	0	0	NAF
SMC006	64.69	64.81	0.12	Siltstone			FR		184764		6809			0.59	18	16	2	0.91	3.0	4	7	PAF-LC
SMC006	64.81	65.64	0.83	Mudstone/Sandstone			FR			186483	3940	8.4	0.30	0.16	5	31	-26	6.32	8.3	0	0	NAF
SMC006	65.64	67.11	1.47	Sandstone			FR			186484	3941			0.03	1	26	-25	28.58				NAF
SMC006	67.11	69.82	2.71	Mudstone/Sandstone			FR			186485	3942			0.02	1	30	-30	49.79				NAF
SMC006	69.82	71.04	1.22	Mudstone/Siltstone			FR			186486	3943			0.01	0	15	-15	49.61				NAF
SMC006	71.04	73.59	2.55	Sandstone/Mudstone			FR			186487	3944			0.03	1	58	-57	63.42				NAF
SMC006	73.59	74.08	0.49	Mudstone			FR			186488	3945			0.04	1	17	-16	14.06				NAF
SMC006	74.08	76.71	2.63	Sandstone			FR			186489	3946			0.03	1	24	-23	26.44				NAF
SMC006	76.71	82.06	5.35	Sandstone			FR	Two Bags		186490	3947			<0.01	0	42	-41	271.68				NAF
SMC006	82.06	83.15	1.09	Sandstone			FR			186491	3948			0.03	1	76	-75	82.59				NAF
SMC006	83.15	84.50	1.35	Mudstone/Siltstone			FR			186492	3949			0.01	0	16	-15	51.38				NAF
SMC006	84.50	87.73	3.23	Mudstone/Sandstone			FR			186493	3950			0.02	1	41	-40	66.39				NAF
SMC006	87.73	89.58	1.85	Sandstone			FR			186494	3951			<0.01	0	64	-64	417.77				NAF
SMC006	89.58	91.10	1.52	Conglomerate/Sandstone			FR			186495	3952			0.04	1	31	-29	24.97				NAF
SMC006	91.10	91.53	0.43	Mudstone			FR			186496	3953	7.2	0.43	0.16	5	13	-8	2.59	7.1	0	0	NAF
SMC006	91.53	91.69	0.16	Mudstone/Carb Mudstone			FR		184765		6810			0.52	16	6	10	0.39	3.1	3	9	PAF-LC
SMC006	91.69	92.35	0.66	Coal	LBLM	Lemington	FR		184766					1.13	35							
SMC006	92.35	92.46	0.11	Mudstone/Siltstone			FR		184767		6811			1.92	59	14	45	0.24	2.4	28	47	PAF
SMC006	92.46	93.29	0.83	Sandstone/Mudstone			FR			186497	3954	5.3	1.29	0.62	19	7	12	0.38	3.5	4	12	PAF-LC
SMC006	93.29	95.20	1.91	Sandstone/Mudstone			FR			186498	3955	8.4	0.31	0.06	2	35	-33	18.81	7.5	0	0	NAF
SMC006	95.20	96.81	1.61	Sandstone/Mudstone			FR			186499	3956	7.5	0.32	0.07	2	25	-23	11.80	7.4	0	0	NAF
SMC006	96.81	97.38	0.57	Siltstone/Mudstone			FR			186500	3957	7.6	0.29	0.18	6	12	-7	2.19	5.8	0	1	NAF
SMC006	97.38	97.48	0.10	Mudstone			FR		184768					0.22	7							UC(PAF)
SMC006	97.48	97.68	0.20	Coal	LBK	Lemington	FR		184769					0.76	23							
SMC006	97.68	98.01	0.33	Siltstone/Tuff/Carb Siltstone			FR		184770		6812			0.63	19	39	-20	2.03	7.4	0	0	NAF
SMC006	98.01	98.50	0.49	Coal	LBJU	Lemington	FR		184771					0.96	29							
SMC006	98.50	98.64	0.14	Carb Mudstone			FR		184772		6813			0.52	16	11	5	0.68	3.8	2	13	PAF-LC
SMC006	98.64	99.01	0.37	Coal	LBJL	Lemington	FR		184773					1.12	34							
SMC006	99.01	99.15	0.14	Siltstone			FR		184774					0.03	1							NAF
SMC006	99.15	100.14	0.99	Siltstone/Sandstone			FR			186501	3958	7.9	0.48	<0.01	0	64	-64	420.67	8.2	0	0	NAF
SMC006	100.14	100.69	0.55	Mudstone			FR			186502	3959	7.8	0.45	0.01	0	25	-25	81.55	8.4	0	0	NAF
SMC006	100.69	100.78	0.09	Mudstone			FR		184775					0.40	12							UC(PAF)
SMC006	100.78	101.72	0.94	Coal	LBHU/LBHL	Lemington	FR	Incudes 8cm TF parting	184776_78					0.83	25							
SMC006	101.72	101.82	0.10	Sandstone			FR		184779					0.48	15							UC(PAF)
SMC006	101.82	102.74	0.92	Sandstone			FR			186503	3960	7.6	0.32	0.24	7	83	-76	11.29	8.1	0	0	NAF
SMC006	102.74	102.83	0.09	Mudstone			FR		184780					0.32	10							UC(PAF)
SMC006	102.83	103.47	0.64	Coal	LBG	Lemington	FR		184781		5298	6.8	0.12	1.39	43	9	34	0.21	3.0	10	23	PAF
SMC006	103.47	104.08	0.61	Coal	LBF	Lemington	FR		184782					0.59	18							
SMC006	104.08	104.23	0.15	Mudstone			FR		184783		6814			0.73	22	4	19	0.17	2.8	8	11	PAF
SMC006	104.23	104.72	0.49	Sandstone			FR			186504	3961	7.8	0.37	0.01	0	9	-9	29.75	6.2	0	2	NAF
SMC006	104.72	105.85	1.13	Mudstone			FR			186505	3962	8.1	0.41	0.03	1	26	-25	27.98	7.5	0	0	NAF
SMC006	105.85	106.20	0.35	Carb Mudstone/Coal			FR	Not Available		186506												
SMC006	106.20	107.95	1.75	Sandstone			FR			186507	3964	8.0	0.36	0.04	1	42	-41	34.48	7.6	0	0	NAF
SMC006	107.95	108.18	0.23	Mudstone/Coal			FR			186508	3965	7.4	0.35	0.11	3	23	-20	6.87	7.3	0	0	NAF
SMC006	108.18	108.27	0.09	Mudstone			FR		184784					0.01	0							NAF
SMC006	108.27	108.71	0.44	Coal	LBE	Lemington	FR	Calcite	184785					0.71	22							
SMC006	108.71	108.78	0.07	Sandstone/Carb Mudstone			FR		184786					0.08	2							UC(NAF)
SMC006	108.78	109.50	0.72	Sandstone/Tuff			FR			186509	3966			0.04	1	21	-20	17.23				NAF
SMC006	109.50	109.63	0.13	Sandstone			FR		184787					0.01	0							NAF
SMC006	109.63	110.24	0.61	Coal	LBD	Lemington	FR		184788					0.63	19							
SMC006	110.24	110.33	0.09	Mudstone			FR		184789					0.20	6							UC(PAF)
SMC006	110.33	110.87	0.54	Sandstone			FR			186510	3967			<0.01	0	12	-12	79.67				NAF
SMC006	110.87	110.96	0.09	Mudstone			FR		184790					0.07	2							UC(NAF)
SMC006	110.96	111.46	0.50	Coal	LBC	Lemington	FR		184791					0.63	19							
SMC006	111.46	111.59	0.13	Mudstone			FR		184792					0.13	4							UC(PAF)
SMC006	111.59	112.99	1.40	Mudstone/Sandstone			FR			186511	3968			0.05	2	32	-30	20.64				NAF
SMC006	112.99	113.07	0.08	Mudstone			FR		184793					0.26	8							UC(PAF)
SMC006	113.07	113.44	0.37	Coal	LBB	Lemington	FR		184794					0.81	25							

Table B1: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen Complex (2013 EGi Study).

Hole Name	Depth (m)			Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION NAG			ARD Classification
	From	To	Interval											Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	
SMC006	113.44	113.58	0.14	Carb Mudstone			FR		184795		6815			0.60	18	8	11	0.43	3.2	4	14	PAF-LC
SMC006	113.58	114.23	0.65	Coal	LBA	Lemington	FR		184796					1.26	39							
SMC006	114.23	114.33	0.10	Siltstone			FR		184797					0.02	1							
SMC006	114.33	115.32	0.99	Sandstone/Siltstone			FR			186512	3969			<0.01	0	20	-20	130.66				NAF
SMC006	115.32	117.98	2.66	Sandstone/Mudstone			FR			186513	3970			0.03	1	31	-30	33.87				NAF
SMC006	117.98	123.79	5.81	Sandstone			FR			186514	3971			0.02	1	32	-31	52.36				NAF
SMC006	123.79	126.81	3.02	Sandstone			FR			186515	3972			0.02	1	30	-29	49.10				NAF
SMC006	126.81	130.80	3.99	Sandstone			FR			186516	3973			0.01	0	26	-26	86.13				NAF
SMC006	130.80	134.07	3.27	Sandstone/Conglomerate			FR			186517	3974			0.03	1	61	-60	66.01				NAF
SMC006	134.07	135.19	1.12	Siltstone			FR			186518	3975			<0.01	0	15	-15	100.46				NAF
SMC006	135.19	138.86	3.67	Conglomerate			FR			186519	3976			0.04	1	32	-31	26.26				NAF
SMC006	138.86	141.50	2.64	Conglomerate			FR			186520	3977			0.02	1	36	-35	58.12				NAF
SMC006	141.50	142.51	1.01	Conglomerate			FR			186521	3978	7.6	0.71	0.35	11	16	-6	1.52	7.8	0	0	NAF
SMC006	142.51	142.60	0.09	Siltstone/Mudstone			FR		184798		6816			0.86	26	4	22	0.17	2.6	16	23	PAF
SMC006	142.60	143.17	0.57	Coal	LAM	Lemington	FR		184799					1.47	45							
SMC006	143.17	143.47	0.30	Coal	LAL	Lemington	FR		184800					0.97	30							
SMC006	143.47	143.87	0.40	Coal	LAK	Lemington	FR		184601					1.73	53							
SMC006	143.87	144.01	0.14	Sandstone/Mudstone			FR		184602		6817			1.27	39	2	37	0.04	2.3	30	37	PAF
SMC006	144.01	145.02	1.01	Sandstone/Mudstone			FR			186522	3979	7.9	0.63	0.05	2	62	-60	40.33	7.9	0	0	NAF
SMC006	145.02	146.43	1.41	Mudstone/Sandstone/Siltstone			FR			186523	3980	7.7	0.56	0.04	1	36	-35	29.71	8.1	0	0	NAF
SMC006	146.43	146.58	0.15	Sandstone			FR		184603					<0.01	0							NAF
SMC006	146.58	146.92	0.34	Coal	LAJU	Lemington	FR		184604					0.78	24							
SMC006	146.92	147.05	0.13	Sandstone/Carb Mudstone			FR		184605					0.29	9							UC(PAF)
SMC006	147.05	148.48	1.43	Sandstone			FR			186524	3981	7.8	0.68	<0.01	0	32	-31	206.82	8.2	0	0	NAF
SMC006	148.48	149.05	0.57	Mudstone			FR			186525	3982	7.6	0.49	0.09	3	25	-22	8.97	7.8	0	0	NAF
SMC006	149.05	149.18	0.13	Mudstone/Carb Mudstone			FR		184606					0.01	0							NAF
SMC006	149.18	149.57	0.39	Coal	LAJM	Lemington	FR		184607					0.88	27							
SMC006	149.57	149.71	0.14	Mudstone			FR		184608					0.09	3							UC(NAF)
SMC006	149.71	150.79	1.08	Sandstone/Siltstone			FR			186526	3983	7.7	0.47	<0.01	0	37	-37	242.88	7.6	0	0	NAF
SMC006	150.79	150.91	0.12	Siltstone			FR		184609					<0.01	0							NAF
SMC006	150.91	151.46	0.55	Coal	LAJ	Lemington	FR	Calcite	184610					0.74	23							
SMC006	151.46	151.59	0.13	Carb Mudstone			FR		184611					0.48	15							UC(PAF)
SMC006	151.59	152.33	0.74	Mudstone			FR			186527	3984	8.5	0.37	0.05	2	7	-5	4.56	6.2	0	1	NAF
SMC006	152.33	153.07	0.74	Sandstone			FR			186528	3985	8.2	0.23	0.04	1	53	-52	43.39	7.5	0	0	NAF
SMC006	153.07	153.18	0.11	Sandstone/Carb Mudstone/Tuff			FR		184612					0.23	7							UC(PAF)
SMC006	153.18	153.62	0.44	Coal	LAHU	Lemington	FR		184613					1.52	47							
SMC006	153.62	153.72	0.10	Sandstone			FR		184614					0.15	5							UC(PAF)
SMC006	153.72	154.17	0.45	Sandstone			FR			186529	3986	8.1	0.39	0.07	2	55	-52	25.50	7.6	0	0	NAF
SMC006	154.17	154.25	0.08	Mudstone			FR		184615		6818			0.71	22	6	16	0.28	2.7	7	12	PAF
SMC006	154.25	154.61	0.36	Coal	LAH	Lemington	FR		184616					4.16	127							
SMC006	154.61	154.77	0.16	Mudstone			FR		184617		6819			0.95	29	5	24	0.16	2.6	11	16	PAF
SMC006	154.77	154.98	0.21	Coal	LAG	Lemington	FR		184618					3.56	109							
SMC006	154.98	155.02	0.04	Mudstone			FR		184619					0.26	8							UC(PAF)
SMC006	155.02	155.35	0.33	Coal	LAF	Lemington	FR		184620					0.81	25							
SMC006	155.35	155.45	0.10	Sandstone			FR		184621					0.02	1							NAF
SMC006	155.45	156.91	1.46	Sandstone			FR			186530	3987	8.0	0.47	<0.01	0	28	-28	186.16	7.7	0	0	NAF
SMC006	156.91	158.39	1.48	Sandstone			FR			186531	3988	7.9	0.54	0.09	3	132	-130	48.11	7.9	0	0	NAF
SMC006	158.39	159.23	0.84	Mudstone/Siltstone			FR	Minor Coal		186532	3989	7.8	0.30	<0.01	0	14	-14	91.98	6.9	0	0	NAF
SMC006	159.23	159.32	0.09	Mudstone			FR		184623					0.26	8							UC(PAF)
SMC006	159.32	159.81	0.49	Coal	LAE	Lemington	FR		184624					0.99	30							
SMC006	159.81	160.34	0.53	Mudstone/Coal			FR		184625					0.18	6							UC(PAF)
SMC006	160.34	160.61	0.27	Coal	LAD	Lemington	FR		184626					0.62	19							
SMC006	160.61	160.82	0.21	Tuff			FR		184627					0.01	0							NAF
SMC006	160.82	161.16	0.34	Coal	LAC	Lemington	FR		184628					1.83	56							
SMC006	161.16	161.34	0.18	Mudstone			FR		184629		6820			2.56	78	0	78	0.00	2.2	32	41	PAF
SMC006	161.34	161.63	0.29	Coal	LAB	Lemington	FR		184630					3.02	92							
SMC006	161.63	162.12	0.49	Siltstone/Mudstone			FR		184631					0.11	3							UC(PAF)
SMC006	162.12	162.46	0.34	Coal	LAA	Lemington	FR		184632					0.96	29							
SMC006	162.46	162.57	0.11	Siltstone/Carb Siltstone			FR		184633					0.02	1							NAF
SMC006	162.57	162.99	0.42	Siltstone/Mudstone			FR	Minor Coal		186533	3990	7.5	0.35	0.06	2	14	-12	7.43	5.2	0	3	NAF
SMC006	162.99	165.05	2.06	Sandstone/Siltstone/Mudstone			FR			186534	3991	7.6	0.72	0.07	2	64	-61	29.68	8.1	0	0	NAF
SMC006	165.05	166.54	1.49	Sandstone/Siltstone			FR	Siderite Band		186535	3992			0.01	0	40	-40	130.51				NAF
SMC006	166.54	167.60	1.06	Mudstone			FR			186536	3993			0.01	0	11	-11	37.57				NAF
SMC006	167.60	169.13	1.53	Sandstone			FR			186537	3994			<0.01	0	41	-41	269.08				NAF
SMC006	169.13	169.99	0.86	Mudstone/Sandstone/Siltstone			FR			186538	3995			<0.01	0	12	-12	81.30				NAF
SMC006	169.99	170.16	0.17	Coal	PG3	Pikes Gully	FR			186539	3996	4.2	1.33	0.41	13	29	-16	2.27	2.8	14	37	PAF-LC
SMC006	170.16	171.03	0.87	Sandstone			FR			186540	3997	7.3	0.21	0.03	1	42	-41	45.73	7.6	0	0	NAF
SMC006	171.03	171.89	0.86	Sandstone			FR			186541	3998	7.4	0.25	<0.01	0	45	-45	292.47	7.8	0	0	NAF
SMC006	171.89	173.02	1.13	Sandstone/Mudstone			FR			186542	3999	7.6	0.24	<0.01	0	56	-56	365.71	7.9	0	0	NAF
SMC006	173.02	175.37	2.35	Sandstone/Siltstone/Mudstone			FR	Coally		186543	4000	7.8	0.28	0.07	2	34	-32	15.91	8.2	0	0	NAF
SMC006	175.37	177.68	2.31	Sandstone			FR			186544	4001			<0.01	0	72	-72	468.72				NAF
SMC006	177.68	177.80	0.12	Sandstone			FR		184622					0.09	3							UC(NAF)
SMC006	177.80	177.99	0.19	Coal	PG2U	Pikes Gully	FR		184634		5299	6.9	0.13	1.50	46	39	7	0.84	7.2	0	0	UC(NAF)
SMC006	177.99	178.27	0.28	Mudstone/Carb Mudstone			FR		184635		6821			1.45	44	4	40	0.09	2.3	21	35	PAF
SMC006	178.27	178.42	0.15	Coal	PG2L	Pikes Gully	FR		184636					2.63	80							
SMC006	178.42	178.64	0.22	Mudstone			FR		184637		6822			1.28	39	9	30	0.23	2.4	15	25	PAF
SMC006	178.64	180.04	1.40	Coal	PG1	Pikes Gully	FR		184638		5300	7.2	0.10	0.61	19	22	-4	1.19	6.5	0	1	NAF
SMC006	180.04	180.16	0.12	Sandstone			FR		184639					0.12	4							UC(PAF)
SMC006	180.16	181.29	1.13	Siltstone/Sandstone/Mudstone			FR			186545	4002			<0.01	0	10	-10	68.22				NAF
SMC006	181.29	183.84	2.55	Sandstone			FR			186546	4003			<0.01	0	38	-37	245.20				NAF
SMC006	183.84	186.88	3.04	Sandstone			FR			186547	4004			<0.01	0	27	-27	175.11				NAF
SMC006	186.88	189.73	2.85	Sandstone/Siltstone			FR			186548	4005			<0.01	0	13	-13	84.25				NAF
SMC006	189.73	191.92	2.19	Sandstone/Siltstone			FR	Siderite Band		186549	4006			<0.01	0	40	-39	258.70				NAF

Table B1: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen Complex (2013 EGi Study).

Hole Name	Depth (m) From	Depth (m) To	Depth (m) Interval	Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS Total %S	MPA	ANC	NAPP	ANC/MPA	SINGLE ADDITION NAG NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	ARD Classification
SMC006	191.92	193.23	1.31	Sandstone			FR			186550	4007			0.01	0	12	-12	38.80				NAF
SMC006	193.23	197.23	4.00	Conglomerate			FR	Two Bags		186551	4008			0.01	0	28	-27	90.84				NAF
SMC006	197.23	198.71	1.48	Sandstone			FR			186552	4009			<0.01	0	31	-31	203.86				NAF
SMC006	198.71	202.11	3.40	Conglomerate			FR			186553	4010			0.03	1	24	-23	26.14				NAF
SMC006	202.11	203.46	1.35	Sandstone/Conglomerate			FR			186554	4011	8.1	0.20	0.07	2	81	-79	37.80	8.3	0	0	NAF
SMC006	203.46	204.40	0.94	Mudstone/Siderite			FR	Siderite Band		186555	4012	7.5	0.18	0.14	4	12	-8	2.91	8.0	0	0	NAF
SMC006	204.40	204.56	0.16	Mudstone			FR		184640					0.11	3							UC(PAF)
SMC006	204.56	204.71	0.15	Coal	ARU3	Arties	FR		184641					0.61	19							
SMC006	204.71	205.01	0.30	Mudstone			FR		184642		6823			0.69	21	7	14	0.34	2.9	4	15	PAF-LC
SMC006	205.01	205.44	0.43	Coal	ARU2/ARU1	Arties	FR	Incudes 11cm CY/CS parting	184643_45					0.64	20							
SMC006	205.44	205.56	0.12	Siltstone			FR		184646					0.10	3							UC(NAF)
SMC006	205.56	206.37	0.81	Coal	ART4	Arties	FR		184647		5301	7.3	0.09	0.81	25	23	1	0.94	7.5	0	0	UC(NAF)
SMC006	206.37	206.71	0.34	Mudstone			FR		184648					0.02	1							NAF
SMC006	206.71	207.53	0.82	Coal	ART4L1/L2/L3	Arties	FR	Incudes ST partings	184649_53		5302	7.4	0.09	0.25	8	39	-31	5.06	7.6	0	0	NAF
SMC006	207.53	207.77	0.24	Tuff			FR		184654		6824			0.64	20	28	-9	1.44	6.9	0	0	NAF
SMC006	207.77	209.12	1.35	Coal	ART3	Arties	FR		184655		5303	7.5	0.09	0.67	21	44	-24	2.15	7.4	0	0	NAF
SMC006	209.12	209.26	0.14	Tuff			FR		184656					<0.01	0							NAF
SMC006	209.26	209.65	0.39	Coal	ART2	Arties	FR		184657					0.41	13							
SMC006	209.65	209.72	0.07	Tuff/Carb Mudstone			FR		184658					0.04	1							NAF
SMC006	209.72	210.27	0.55	Coal	ART1	Arties	FR		184659					0.41	13							
SMC006	210.27	210.39	0.12	Sandstone			FR		184660					0.10	3							UC(NAF)
SMC006	210.39	211.79	1.40	Sandstone/Siltstone			FR			186556	4013	7.3	0.21	<0.01	0	75	-75	492.73	7.9	0	0	NAF
SMC006	211.79	212.48	0.69	Mudstone			FR			186557	4014			0.01	0	13	-13	42.77				NAF
SMC006	212.48	215.24	2.76	Sandstone/Siltstone			FR			186558	4015			<0.01	0	31	-31	203.18				NAF
SMC006	215.24	219.97	4.73	Sandstone			FR	Two Bags		186559	4016			<0.01	0	50	-50	326.18				NAF
SMC006	219.97	222.22	2.25	Sandstone/Siderite/Mudstone			FR	Siderite Band		186560	4017			0.01	0	49	-49	159.68				NAF
SMC006	222.22	224.32	2.10	Sandstone			FR			186561	4018			<0.01	0	44	-44	286.45				NAF
SMC006	224.32	225.00	0.68	Mudstone			FR			186562	4019			0.03	1	13	-12	14.48				NAF
SMC006	225.00	225.07	0.07	Mudstone			FR		184661					0.18	6							UC(PAF)
SMC006	225.07	226.21	1.14	Coal	LID8	Liddell	FR		184662		5304	7.4	0.12	0.52	16	20	-4	1.24	7.1	0	0	NAF
SMC006	226.21	226.29	0.08	Tuff			FR		184663					0.32	10							UC(PAF)
SMC006	226.29	227.47	1.18	Coal	LID7	Liddell	FR		184664		5305	7.8	0.13	0.66	20	39	-18	1.91	7.4	0	0	NAF
SMC006	227.47	228.34	0.87	Coal	LID6	Liddell	FR		184665					0.53	16							
SMC006	228.34	228.46	0.12	Sandstone			FR		184666					0.37	11							UC(PAF)
SMC006	228.46	228.94	0.48	Sandstone			FR			186563	4020			<0.01	0	8	-8	51.94				NAF
SMC006	228.94	230.30	1.36	Sandstone/Siltstone			FR			186564	4021			0.03	1	41	-40	45.08				NAF
SMC006	230.30	234.93	4.63	Sandstone			FR	Lesser ST, Two Bags		186565	4022			0.03	1	19	-19	21.23				NAF
SMC006	234.93	236.10	1.17	Conglomerate/Sandstone			FR			186566	4023			0.02	1	63	-62	102.20				NAF
SMC006	236.10	239.15	3.05	Sandstone			FR			186567	4024			<0.01	0	104	-104	679.34				NAF
SMC006	239.15	239.52	0.37	Sandstone			FR			186568	4025	6.7	0.67	0.86	26	7	19	0.27	2.7	14	19	PAF
SMC006	239.52	239.68	0.16	Coal	LID5B BAND 2	Liddell	FR			186569	4026	8.3	0.16	<0.01	0	25	-24	160.97	6.2	0	2	NAF
SMC006	239.68	240.54	0.86	Mudstone			FR			186570	4027	8.1	0.14	<0.01	0	12	-12	81.02	7.5	0	0	NAF
SMC006	240.54	240.73	0.19	Coal	LID5B BAND 1	Liddell	FR			186571	4028	8.2	0.12	<0.01	0	26	-26	170.36	5.8	0	3	NAF
SMC006	240.73	241.83	1.10	Sandstone/Siltstone			FR			186572	4029	8.1	0.23	<0.01	0	58	-58	378.30	7.6	0	0	NAF
SMC006	241.83	242.31	0.48	Mudstone			FR			186573	4030			<0.01	0	13	-13	84.35				NAF
SMC006	242.31	242.44	0.13	Mudstone			FR		184667					0.08	2							UC(NAF)
SMC006	242.44	242.87	0.43	Coal	LID5B	Liddell	FR		184668					0.67	21							
SMC006	242.87	243.03	0.16	Sandstone			FR		184669					<0.01	0							NAF
SMC006	243.03	243.35	0.32	Sandstone			FR			186574	4031			<0.01	0	12	-12	77.67				NAF
SMC006	243.35	244.14	0.79	Mudstone/Coal			FR			186575	4032			<0.01	0	54	-53	349.84				NAF
SMC006	244.14	244.25	0.11	Mudstone			FR		184670					0.01	0							NAF
SMC006	244.25	245.09	0.84	Coal	LID5	Liddell	FR		184671					0.59	18							
SMC006	245.09	245.21	0.12	Mudstone			FR		184672					0.34	10							UC(PAF)
SMC006	245.21	246.58	1.37	Sandstone			FR	Coally		186576	4033			0.01	0	11	-11	35.39				NAF
SMC006	246.58	247.26	0.68	Mudstone/Siltstone			FR			186577	4034			0.03	1	14	-13	15.50				NAF
SMC006	247.26	252.22	4.96	Sandstone			FR	Two Bags		186578	4035			<0.01	0	41	-41	269.13				NAF
SMC006	252.22	257.39	5.17	Sandstone			FR	Two Bags		186579	4036			<0.01	0	65	-65	422.88				NAF
SMC006	257.39	259.18	1.79	Sandstone			FR			186580	4037	7.7	0.28	0.01	0	121	-121	395.92	7.7	0	0	NAF
SMC006	259.18	259.82	0.64	Siltstone/Calcite/Siderite			FR	Calcite&Siderite, Band Not Available		186581												
SMC006	259.82	261.42	1.60	Siltstone			FR			186582	4039	7.8	0.29	0.20	6	11	-5	1.86	7.3	0	0	NAF
SMC006	261.42	261.54	0.12	Carb Mudstone/Mudstone			FR		184673		6825			1.39	43	7	35	0.17	2.5	26	32	PAF
SMC006	261.54	264.29	2.75	Coal	LID4	Liddell	FR		184674		5306	7.4	0.12	0.60	18	15	3	0.81	6.9	0	0	UC(NAF)
SMC006	264.29	264.41	0.12	Siltstone			FR		184675					0.03	1							NAF
SMC006	264.41	266.25	1.84	Sandstone			FR			186583	4040	7.5	0.28	<0.01	0	66	-65	428.92	7.7	0	0	NAF
SMC006	266.25	267.34	1.09	Siltstone/Siderite			FR	Siderite Band		186584	4041			0.03	1	36	-35	39.33				NAF
SMC006	267.34	267.44	0.10	Carb Mudstone			FR		184676					0.28	9							UC(PAF)
SMC006	267.44	267.85	0.41	Coal	LID3	Liddell	FR		184677					0.71	22							
SMC006	267.85	267.96	0.11	Sandstone/Mudstone			FR		184678					0.02	1							NAF
SMC006	267.96	269.59	1.63	Sandstone			FR	Siderite		186585	4042			0.03	1	31	-30	33.62				NAF
SMC006	269.59	270.99	1.40	Mudstone/Sandstone			FR			186586	4043			<0.01	0	36	-36	236.04				NAF
SMC006	270.99	271.39	0.40	Mudstone/Siderite			FR	Sideirte bands, coally		186587	4044			<0.01	0	128	-128	838.32				NAF
SMC006	271.39	274.43	3.04	Sandstone			FR	Lesser ST		186588	4045			<0.01	0	57	-57	372.09				NAF
SMC006	274.43	275.04	0.61	Mudstone/Siderite/Siltstone			FR	Sideirte bands, coally		186589	4046			0.05	2	67	-65	43.80				NAF
SMC006	275.04	277.02	1.98	Sandstone			FR			186590	4047			0.01	0	38	-38	125.13				NAF
SMC006	277.02	277.64	0.62	Sandstone/Mudstone			FR	Sideirte bands		186591	4048			0.01	0	40	-40	131.78				NAF
SMC006	277.64	280.23	2.59	Sandstone			FR			186592	4049			<0.01	0	66	-66	431.38				NAF
SMC006	280.23	281.42	1.19	Sandstone/Siltstone/Mudstone			FR			186593	4050			0.03	1	11	-10	12.04				NAF
SMC006	281.42	283.01	1.59	Sandstone/Siltstone			FR			186594	4051			<0.01	0	31	-31	200.98				NAF
SMC006	283.01	284.35	1.34	Sandstone/Mudstone			FR			186595	4052			0.01	0	15	-15	49.54				NAF
SMC006	284.35	288.33	3.98	Sandstone			FR	Two Bags		186596	4053			0.01	0	42	-42	137.13				NAF
SMC006	288.33	289.31	0.98	Siltstone			FR			186597	4054			0.01	0	20	-20	66.60				NAF
SMC006	289.31	290.34	1.03	Sandstone/Siltstone			FR			186598	4055	7.9	0.27	0.03	1	12	-11	13.50	7.5	0	0	NAF
SMC006	290.34	290.45	0.11	Sandstone/Carb Siltstone			FR		184679		6826			0.64	20	6	14	0.30	2.6	11	16	PAF

Table B1: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen Complex (2013 EGi Study).

Hole Name	Depth (m) From	Depth (m) To	Depth (m) Interval	Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS Total %S	MPA	ANC	NAPP	ANC/MPA	SINGLE ADDITION NAG NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	ARD Classification
SMC006	290.45	291.73	1.28	Coal	LID12	Liddell	FR		184680					0.47	14							
SMC006	291.73	292.02	0.29	Carb Mudstone/Siltstone			FR		184681					0.16	5							UC(PAF)
SMC006	292.02	292.25	0.23	Siltstone/Coal			FR	Core Loss?		186599	4056	9.1	0.37	0.06	2	9	-7	4.82	3.6	5	17	NAF
SMC006	292.25	294.50	2.25	Siltstone			FR			186600	4057	8.7	0.33	0.01	0	23	-22	74.42	8.0	0	0	NAF
SMC006	294.50	295.56	1.06	Siltstone/Mudstone			FR			186601	4058	8.8	0.41	0.02	1	46	-45	74.63	7.6	0	0	NAF
SMC006	295.56	295.68	0.12	Mudstone/Carb Mudstone			FR		184682					0.05	2							NAF
SMC006	295.68	298.38	2.70	Coal	BAR13/12	Barrett	FR		184687		5307	7.5	0.12	0.46	14	11	3	0.79	5.9	0	2	UC(NAF)
SMC006	298.38	298.50	0.12	Sandstone			FR		184686					<0.01	0							NAF
SMC006	298.50	299.60	1.10	Sandstone			FR			186602	4059			0.04	1	11	-9	8.66				NAF
SMC006	299.60	303.48	3.88	Sandstone			FR	Lesser ST, Two Bags		186603	4060			0.02	1	23	-23	37.98				NAF
SMC006	303.48	308.48	5.00	Sandstone			FR	Two Bags		186604	4061			0.02	1	37	-36	60.60				NAF
SMC006	308.48	313.65	5.17	Sandstone			FR	Two Bags		186605	4062			0.01	0	37	-37	120.82				NAF
SMC006	313.65	319.05	5.40	Sandstone			FR	Two Bags		186606	4063			<0.01	0	26	-26	172.65				NAF
SMC006	319.05	320.82	1.77	Sandstone			FR			186607	4064			<0.01	0	55	-54	356.93				NAF
SMC006	320.82	322.31	1.49	Siltstone			FR			186608	4065			0.01	0	22	-22	71.27				NAF
SMC006	322.31	322.53	0.22	Mudstone/Coal			FR			186609	4066			0.04	1	9	-7	7.12				NAF
SMC006	322.53	322.63	0.10	Mudstone			FR		184688					<0.01	0							NAF
SMC006	322.63	324.21	1.58	Coal	UH2	Hebden	FR		184689		5308	7.3	0.11	0.35	11	23	-13	2.18	7.2	0	0	NAF
SMC006	324.21	324.41	0.20	Tuff			FR		184690					<0.01	0							NAF
SMC006	324.41	326.15	1.74	Coal	UH1	Hebden	FR		184691		5309	7.4	0.10	0.46	14	8	6	0.57	5.1	0	6	UC(NAF)
SMC006	326.15	326.24	0.09	Siltstone			FR		184692					<0.01	0							NAF
SMC006	326.24	327.57	1.33	Siltstone			FR			186610	4067			0.04	1	17	-15	13.49				NAF
SMC006	327.57	331.03	3.46	Sandstone			FR	Two Bags		186611	4068			0.03	1	37	-37	40.81				NAF
SMC006	331.03	334.87	3.84	Sandstone			FR	Two Bags		186612	4069			<0.01	0	25	-25	165.09				NAF
SMC006	334.87	340.30	5.43	Sandstone			FR	Two Bags		186613	4070			<0.01	0	35	-35	227.59				NAF
SMC006	340.30	340.99	0.69	Siltstone/Mudstone			FR			186614	4071	7.8	0.27	0.03	1	13	-12	14.26	7.2	0	0	NAF
SMC006	340.99	341.09	0.10	Mudstone/Carb Mudstone			FR	Calcite	184693					0.01	0							NAF
SMC006	341.09	342.81	1.72	Coal	HEB	Hebden	FR		184694		5310	7.2	0.10	0.46	14	30	-16	2.16	7.6	0	0	NAF
SMC006	342.81	342.92	0.11	Sandstone			FR		184695					<0.01	0							NAF
SMC006	342.92	343.75	0.83	Sandstone			FR			186615	4072	7.9	0.24	0.09	3	36	-33	13.05	7.6	0	0	NAF
SMC006	343.75	346.36	2.61	Sandstone/Siltstone			FR			186616	4073	7.6	0.23	<0.01	0	28	-28	180.98	8.2	0	0	NAF
SMC006	346.36	346.56	0.20	Coal/Mudstone/Sandstone			FR			186617	4074	9.4	0.26	0.13	4	29	-25	7.28	8.3	0	0	NAF
SMC006	346.56	349.04	2.48	Sandstone/Siltstone			FR			186618	4075	8.3	0.26	<0.01	0	49	-49	320.02	8.1	0	0	NAF
SMC006	349.04	350.19	1.15	Sandstone			FR			186619	4076	8.2	0.27	<0.01	0	90	-90	588.42	8.2	0	0	NAF
SMC006	350.19	350.37	0.18	Mudstone			FR			186620	4077	8.0	0.43	0.07	2	15	-13	6.97	7.7	0	0	NAF
SMC006	350.37	350.51	0.14	Mudstone			FR		184696					<0.01	0							NAF
SMC006	350.51	350.94	0.43	Coal	UNK		FR	Calcite	184697					0.50	15							
SMC006	350.94	351.06	0.12	Mudstone			FR	Calcite	184698					<0.01	0							NAF
SMC006	351.06	351.24	0.18	Carb Mudstone			FR			186621	4078	7.2	0.83	0.75	23	7	16	0.32	3.1	6	21	PAF
SMC006	351.24	352.98	1.74	Sandstone			FR			186622	4079	7.3	0.29	0.96	29	44	-14	1.49	7.5	0	0	NAF
SMC006	352.98	354.25	1.27	Siltstone			FR			186623	4080	4.7	2.11	1.26	39	10	28	0.26	2.6	16	27	PAF
SMC006	354.25	358.04	3.79	Sandstone			FR	Two Bags		186625	4081	7.2	0.30	0.09	3	44	-41	15.93	8.1	0	0	NAF
SMC006	358.04	364.09	6.05	Sandstone			FR	Two Bags		186624	4082	7.1	0.20	0.08	2	50	-48	20.49	7.9	0	0	NAF
GNC004	0.00	4.75	4.75					Open Hole - No Sample														
GNC004	4.75	9.05	4.30	Sandstone			HW	Open Hole - No Sample														
GNC004	9.05	10.75	1.70	Carb Mudstone			MW	Open Hole - No Sample														
GNC004	10.75	11.25	0.50	Weathered Coal				Open Hole - No Sample														
GNC004	11.25	12.82	1.57	Carb Siltstone				Open Hole - No Sample														
GNC004	12.82	13.65	0.83	Siltstone				Open Hole - No Sample														
GNC004	13.65	13.92	0.27	Coal				Open Hole - No Sample														
GNC004	13.92	16.75	2.83	Sandstone				Open Hole - No Sample														
GNC004	16.75	23.45	6.70	Sandstone				Open Hole - No Sample														
GNC004	23.45	23.75	0.30	Carb Mudstone				Open Hole - No Sample														
GNC004	23.75	25.75	2.00	Sandstone				Open Hole - No Sample														
GNC004	25.75	27.00	1.25	Sandstone				Open Hole - No Sample														
GNC004	27.00	27.90	0.90	Sandstone				Open Hole - No Sample														
GNC004	27.90	28.90	1.00	Coal	LCF	Lemington		Open Hole - No Sample														
GNC004	28.90	33.08	4.18	Sandstone				Open Hole - No Sample														
GNC004	33.08	34.53	1.45	Sandstone				Open Hole - No Sample														
GNC004	34.53	36.55	2.02	Sandstone			FR			31106	4475	7.5	0.15	0.09	3	14	-11	4.93	8.2	0	0	NAF
GNC004	36.55	38.51	1.96	Sandstone			FR			31107	4476	8.1	0.22	0.06	2	58	-56	31.69	8.4	0	0	NAF
GNC004	38.51	39.76	1.25	Sandstone			FR			31108	4477	7.7	0.33	0.08	2	18	-15	7.29	8.5	0	0	NAF
GNC004	39.76	39.88	0.12	Sandstone/Mudstone			FR		184247					0.44	13							UC(PAF)
GNC004	39.88	40.11	0.23	Coal	LCB	Lemington	FR		184248					1.67	51							
GNC004	40.11	40.26	0.15	Tuff			FR		184249					0.39	12							UC(PAF)
GNC004	40.26	40.91	0.65	Coal	LCA	Lemington	FR		184250					1.60	49							
GNC004	40.91	41.02	0.11	Sandstone			FR		184251					0.17	5							UC(PAF)
GNC004	41.02	41.93	0.91	Sandstone			FR			31109	4478	8.3	0.42	0.08	2	17	-14	6.81	8.2	0	0	NAF
GNC004	41.93	42.71	0.78	Carb Mudstone			FR			31110	4479	8.2	0.32	0.17	5	18	-13	3.50	8.1	0	0	NAF
GNC004	42.71	48.49	5.78	Sandstone/Mudstone/Siltstone			FR	Siderite (2 bags for NAG samples)		31111	4480	7.8	0.33	0.11	3	23	-20	6.86	8.0	0	0	NAF
GNC004	48.49	51.47	2.98	Sandstone			FR	Siderite		31112	4481	7.9	0.28	0.01	0	35	-34	113.04	7.8	0	0	NAF
GNC004	51.47	54.53	3.06	Sandstone			FR			31113	4482	6.8	0.02	<0.01	0	19	-18	121.51	7.9	0	0	NAF
GNC004	54.53	57.55	3.02	Sandstone			FR	Calcite		31114	4483	8.2	0.26	<0.01	0	72	-72	469.30	7.8	0	0	NAF
GNC004	57.55	59.06	1.51	Sandstone			FR			31115	4484	7.8	0.21	0.06	2	24	-22	13.06	8.1	0	0	NAF
GNC004	59.06	59.31	0.25	Siltstone			FR			31116	4485	7.9	0.20	0.05	2	16	-15	10.52	7.5	0	0	NAF
GNC004	59.31	59.35	0.04	Mudstone			FR			31117	4486	8.2	0.19	0.21	6	26	-19	4.03	7.4	0	0	NAF
GNC004	59.35	59.49	0.14	Mudstone/Siderite			FR	Siderite	184252					0.23	7							UC(PAF)
GNC004	59.49	59.89	0.40	Coal	LBLM	Lemington	FR		184253					0.98	30							
GNC004	59.89	60.03	0.14	Sandstone			FR		184254					0.14	4							UC(PAF)
GNC004	60.03	60.88	0.85	Sandstone			FR			31118	4487	7.7	0.20	0.10	3	11	-8	3.71	7.5	0	0	NAF
GNC004	60.88	64.21	3.33	Sandstone			FR			31119	4488	7.6	0.16	<0.01	0	32	-32	209.43	8.2	0	0	NAF
GNC004	64.21	65.58	1.37	Mudstone/Siltstone/Sandstone			FR			31120	4489	7.5	0.20	0.01	0	17	-16	54.48	8.4	0	0	NAF
GNC004	65.58	69.56	3.98	Sandstone			FR	(2 bags for NAG samples)		31121	4490	7.7	0.17	<0.01	0	15	-15	96.10	8.3	0	0	NAF

Table B1: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen Complex (2013 EGi Study).

Hole Name	Depth (m) From	Depth (m) To	Depth (m) Interval	Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS Total %S	MPA	ANC	NAPP	ANC/MPA	SINGLE ADDITION NAG NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	ARD Classification
GNC004	69.56	71.92	2.36	Sandstone			FR			31122	4491	7.8	0.16	0.02	1	15	-14	24.41	8.3	0	0	NAF
GNC004	71.92	72.65	0.73	Siltstone			FR			31123	4492	8.1	0.18	0.01	0	17	-17	56.48	8.1	0	0	NAF
GNC004	72.65	77.37	4.72	Sandstone			FR	(2 bags for NAG samples)		31124	4493	7.9	0.15	<0.01	0	29	-29	192.51	8.5	0	0	NAF
GNC004	77.37	77.59	0.22	Coal/Mudstone			FR			31125	4494	8.2	0.18	0.17	5	13	-7	2.43	8.9	0	0	NAF
GNC004	77.59	80.01	2.42	Sandstone/Siltstone			FR			31126	4495			0.01	0	15	-15	48.74				NAF
GNC004	80.01	82.09	2.08	Sandstone/Mudstone/Siltstone			FR			31127	4496			<0.01	0	36	-36	238.47				NAF
GNC004	82.09	84.95	2.86	Sandstone			FR	Siderite		31128	4497			<0.01	0	91	-91	597.76				NAF
GNC004	84.95	88.61	3.66	Sandstone			FR			31129	4498			0.02	1	41	-40	66.54				NAF
GNC004	88.61	93.64	5.03	Conglomerate			FR	(2 bags for NAG samples)		31130	4499			0.03	1	47	-46	51.43				NAF
GNC004	93.64	95.73	2.09	Conglomerate			FR			31131	4500			0.03	1	17	-16	18.20				NAF
GNC004	95.73	95.87	0.14	Conglomerate			FR		186054		6827			0.75	23	19	4	0.82	3.9	1	8	PAF-LC
GNC004	95.87	96.08	0.21	Coal	BAND1		FR		186055					1.46	45							
GNC004	96.08	96.21	0.13	Carb Mudstone/Sandstone			FR		186056		6828			2.05	63	2	60	0.04	2.3	37	46	PAF
GNC004	96.21	97.98	1.77	Sandstone			FR			31132	4501	6.8	0.22	0.11	3	16	-13	4.88	8.4	0	0	NAF
GNC004	97.98	98.71	0.73	Sandstone/Siltstone			FR			31133	4502	7.8	0.18	0.30	9	15	-6	1.60	5.9	0	1	NAF
GNC004	98.71	99.95	1.24	Siltstone/Carb Mudstone			FR	Calcite		31134	4503			<0.01	0	24	-24	158.19				NAF
GNC004	99.95	100.05	0.10	Mudstone			FR		184255					0.34	10							UC(PAF)
GNC004	100.05	100.41	0.36	Coal	LAM	Lemington	FR	Pyrite	184256					0.93	28							
GNC004	100.41	100.72	0.31	Coal	LAL	Lemington	FR		184257					0.61	19							
GNC004	100.72	100.84	0.12	Mudstone			FR		184258					0.10	3							UC(NAF)
GNC004	100.84	101.00	0.16	Coal	LAK	Lemington	FR		184259					0.60	18							
GNC004	101.00	101.12	0.12	Mudstone			FR		184260					0.01	0							NAF
GNC004	101.12	102.05	0.93	Mudstone			FR			31135	4504			0.01	0	18	-17	57.47				NAF
GNC004	102.05	105.06	3.01	Sandstone			FR	Calcite		31136	4505	8.3	0.24	<0.01	0	80	-80	524.98	7.5	0	0	NAF
GNC004	105.06	107.82	2.76	Sandstone/Siltstone			FR			31137	4506	8.2	0.17	<0.01	0	15	-15	98.89	8.1	0	0	NAF
GNC004	107.82	109.52	1.70	Sandstone			FR			31138	4507	6.9	0.21	0.01	0	62	-61	201.30	7.8	0	0	NAF
GNC004	109.52	111.25	1.73	Siltstone/Sandstone			FR			31139	4508	6.8	0.15	0.01	0	16	-16	52.75	7.3	0	0	NAF
GNC004	111.25	117.20	5.95	Sandstone			FR	Siderite, minor calcite		31140	4509			<0.01	0	27	-27	179.65				NAF
GNC004	117.20	120.33	3.13	Conglomerate/Sandstone			FR	(2 bags for NAG samples)		31141	4510			<0.01	0	35	-34	225.96				NAF
GNC004	120.33	125.21	4.88	Sandstone			FR			31142	4511			<0.01	0	26	-26	170.15				NAF
GNC004	125.21	125.72	0.51	Siltstone			FR	Calcite, Siderite		31143	4512			0.01	0	202	-202	659.65				NAF
GNC004	125.72	128.46	2.74	Sandstone			FR			31144	4513			<0.01	0	40	-40	262.77				NAF
GNC004	128.46	131.37	2.91	Siltstone			FR	Siderite		31145	4514			0.01	0	90	-90	427.53				NAF
GNC004	131.37	132.54	1.17	Sandstone			FR			31146	4515			0.02	1	16	-16	26.46				NAF
GNC004	132.54	132.65	0.11	Sandstone			FR		184261		6829			0.52	16	8	8	0.49	3.2	2	9	PAF-LC
GNC004	132.65	132.95	0.30	Coal	LAJU	Lemington	FR		184262					0.55	17							
GNC004	132.95	132.99	0.04	Carb Mudstone/Mudstone			FR		184263					0.27	8							UC(PAF)
GNC004	132.99	133.55	0.56	Coal	LAJ	Lemington	FR		184264					0.53	16							
GNC004	133.55	133.99	0.44	Carb Mudstone/Mudstone			FR		184265					0.26	8							UC(PAF)
GNC004	133.99	134.11	0.12	Coal	LAHU	Lemington	FR		184266					1.76	54							
GNC004	134.11	134.21	0.10	Siltstone			FR		184267					0.02	1							NAF
GNC004	134.21	135.01	0.80	Siltstone/Carb Mudstone			FR			31147	4516			0.02	1	28	-27	45.79				NAF
GNC004	135.01	135.09	0.08	Mudstone			FR		184268					0.01	0							NAF
GNC004	135.09	139.14	4.05	Coal/Mudstone	LAHM/H/G/F/E/D/C/B/A	Lemington	FR	Calcite	184269_84		5315	6.7	0.28	0.42	13	24	-11	1.88	6.9	0	0	NAF
GNC004	139.14	139.24	0.10	Siltstone			FR		184285					0.01	0							NAF
GNC004	139.24	139.37	0.13	Siltstone/Carb Mudstone			FR			31148	4517	6.7	0.15	0.18	6	12	-6	2.12	5.6	0	1	NAF
GNC004	139.37	141.68	2.31	Sandstone			FR			31149	4518	8.2	0.15	<0.01	0	41	-40	265.60	8.6	0	0	NAF
GNC004	141.68	142.55	0.87	Siltstone	BAND2		FR	Siderite, incl BAND2 10cm		31150	4519	7.5	0.22	<0.01	0	27	-26	173.45	8.3	0	0	NAF
GNC004	142.55	144.67	2.12	Sandstone			FR			31151	4520	8.1	0.22	<0.01	0	17	-17	110.30	8.1	0	0	NAF
GNC004	144.67	146.61	1.94	Siltstone/Mudstone			FR			31152	4521			0.01	0	16	-16	52.04				NAF
GNC004	146.61	151.54	4.93	Sandstone/Siltstone			FR	Siderite, Calcite		31153	4522			0.02	1	47	-47	77.38				NAF
GNC004	151.54	153.66	2.12	Siltstone/Sandstone			FR	Siderite, Calcite		31154	4523			<0.01	0	39	-39	252.70				NAF
GNC004	153.66	156.64	2.98	Sandstone/Siltstone			FR			31155	4524			<0.01	0	16	-16	102.85				NAF
GNC004	156.64	159.67	3.03	Sandstone			FR			31156	4525			<0.01	0	87	-87	570.65				NAF
GNC004	159.67	162.66	2.99	Sandstone			FR	Siderite		31157	4526			<0.01	0	13	-13	86.17				NAF
GNC004	162.66	164.94	2.28	Sandstone/Siltstone			FR			31158	4527			<0.01	0	24	-23	154.32				NAF
GNC004	164.94	169.20	4.26	Sandstone			FR			31159	4528			<0.01	0	41	-41	270.75				NAF
GNC004	169.20	171.67	2.47	Conglomerate			FR			31160	4529	8.3	0.18	<0.01	0	78	-78	507.63	7.6	0	0	NAF
GNC004	171.67	173.56	1.89	Conglomerate/Sandstone			FR			31161	4530	7.6	0.19	<0.01	0	31	-31	200.54	8.5	0	0	NAF
GNC004	173.56	174.62	1.06	Sandstone			FR			31162	4531	7.7	0.20	<0.01	0	24	-24	159.90	8.5	0	0	NAF
GNC004	174.62	174.73	0.11	Sandstone			FR		184286					0.03	1							NAF
GNC004	174.73	176.14	1.41	Coal	PG3/2	Pikes Gully	FR	Calcite	184287_89		5316	7.3	0.28	0.51	16	10	6	0.64	5.9	0	1	UC(NAF)
GNC004	176.14	176.68	0.54	Mudstone/Siltstone			FR		184290					<0.01	0							NAF
GNC004	176.68	177.96	1.28	Coal	PG1	Pikes Gully	FR	Calcite	184291		5317	7.2	0.35	0.33	10	25	-15	2.52	7.4	0	0	NAF
GNC004	177.96	178.11	0.15	Mudstone/Coal			FR		184292					0.21	6							UC(PAF)
GNC004	178.11	178.92	0.81	Mudstone/Carb Mudstone			FR			31163	4532			0.03	1	22	-21	24.20				NAF
GNC004	178.92	182.49	3.57	Siltstone/Sandstone			FR	(2 bags for NAG samples)		31164	4533			0.03	1	45	-44	49.18				NAF
GNC004	182.49	183.11	0.62	Sandstone			FR	Minor Coal		31165	4534			0.03	1	39	-38	42.17				NAF
GNC004	183.11	183.23	0.12	Sandstone/Mudstone			FR		184293					<0.01	0							NAF
GNC004	183.23	185.17	1.94	Coal/Tuff	ART3U/3/2/1	Arties	FR		184294_300		5318	6.8	0.31	0.35	11	18	-8	1.73	7.3	0	0	NAF
GNC004	185.17	185.32	0.15	Mudstone			FR		186001					0.17	5							UC(PAF)
GNC004	185.32	186.24	0.92	Mudstone/Sandstone			FR			31166	4535			0.03	1	18	-18	20.09				NAF
GNC004	186.24	188.10	1.86	Sandstone/Siltstone			FR	Siderite, Calcite		31167	4536			0.01	0	23	-23	74.97				NAF
GNC004	188.10	192.69	4.59	Sandstone			FR	(2 bags for NAG samples)		31168	4537			<0.01	0	66	-65	428.81				NAF
GNC004	192.69	196.09	3.40	Sandstone/Siltstone			FR	Siderite (2 bags for NAG samples)		31169	4538			0.01	0	36	-36	118.59				NAF
GNC004	196.09	198.74	2.65	Sandstone/Siltstone			FR	Siderite		31170	4539			0.01	0	30	-30	99.34				NAF
GNC004	198.74	203.33	4.59	Sandstone/Siltstone			FR	(2 bags for NAG samples)		31171	4540			0.01	0	38	-38	123.85				NAF
GNC004	203.33	206.01	2.68	Sandstone/Siltstone			FR	Siderite		31172	4541			0.02	1	59	-58	96.58				NAF
GNC004	206.01	206.71	0.70	Mudstone/Siltstone			FR	Siderite		31173	4542			0.02	1	15	-15	24.75				NAF
GNC004	206.71	206.79	0.08	Mudstone			FR		186002					0.02	1							NAF
GNC004	206.79	209.97	3.18	Coal/Tuff	LID8/7/6/6L	Liddell	FR		186003_8		5319	7.2	0.26	0.35	11	14	-4	1.35	7.1	0	0	NAF
GNC004	209.97	210.09	0.12	Siderite/Carb Mudstone			FR	Siderite	186009					0.02	1							NAF
GNC004	210.09	211.12	1.03	Siltstone/Mudstone			FR	Siderite		31174	4543			0.01	0	98	-98	320.45				NAF

Table B1: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen Complex (2013 EGi Study).

Hole Name	Depth (m) From	Depth (m) To	Depth (m) Interval	Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS Total %S	MPA	ANC	NAPP	ANC/MPA	SINGLE ADDITION NAG NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	ARD Classification
GNC004	211.12	214.79	3.67	Sandstone/Mudstone			FR			31175	4544			0.01	0	30	-30	98.39				NAF
GNC004	214.79	217.66	2.87	Sandstone/Mudstone			FR	Siderite, Calcite		31176	4545	7.5	0.17	<0.01	0	101	-101	658.44	8.9	0	0	NAF
GNC004	217.66	219.44	1.78	Sandstone			FR			31177	4546	7.4	0.15	<0.01	0	135	-134	879.22	8.6	0	0	NAF
GNC004	219.44	221.01	1.57	Siltstone/Mudstone			FR	Siderite		31178	4547	8.0	0.15	<0.01	0	57	-57	373.40	8.3	0	0	NAF
GNC004	221.01	222.33	1.32	Sandstone/Carb Mudstone			FR			31179	4548			0.04	1	25	-24	20.44				NAF
GNC004	222.33	222.46	0.13	Mudstone			FR		186010					0.19	6							UC(PAF)
GNC004	222.46	223.53	1.07	Coal/Mudstone	LID5C	Liddell	FR		186011					0.62	19							
GNC004	223.53	223.64	0.11	Mudstone			FR		186012					0.40	12							UC(PAF)
GNC004	223.64	224.72	1.08	Sandstone/Mudstone			FR			31180	4549	7.7	0.14	0.11	3	14	-11	4.21	8.2	0	0	NAF
GNC004	224.72	225.69	0.97	Mudstone			FR			31181	4550	8.2	0.18	0.03	1	11	-10	12.12	8.1	0	0	NAF
GNC004	225.69	225.77	0.08	Core Loss			FR															
GNC004	225.77	230.92	5.15	Sandstone			FR	Siderite		31182	4551	7.8	0.23	0.03	1	22	-21	24.14	8.3	0	0	NAF
GNC004	230.92	232.77	1.85	Sandstone			FR			31183	4552	7.9	0.19	<0.01	0	141	-141	923.74	8.2	0	0	NAF
GNC004	232.77	234.26	1.49	Mudstone/Sandstone			FR			31184	4553	7.7	0.18	<0.01	0	30	-30	194.09	8.4	0	0	NAF
GNC004	234.26	239.48	5.22	Siderite/Sandstone/Siltstone			FR	Siderite		31185	4554	8.2	0.24	0.04	1	33	-31	26.70	8.3	0	0	NAF
GNC004	239.48	240.78	1.30	Siltstone/Carb Mudstone			FR			31186	4555	8.3	0.17	0.21	6	36	-29	5.54	8.7	0	0	NAF
GNC004	240.78	242.89	2.11	Mudstone			FR			31187	4556			0.02	1	51	-51	83.72				NAF
GNC004	242.89	243.74	0.85	Mudstone			FR	Siderite		31188	4557			0.05	2	76	-74	49.53				NAF
GNC004	243.74	243.86	0.12	Mudstone			FR		186013					0.35	11							UC(PAF)
GNC004	243.86	244.64	0.78	Coal	LID5B	Liddell	FR		186014					0.47	14							
GNC004	244.64	244.71	0.07	Tuff			FR		186015					0.01	0							NAF
GNC004	244.71	245.80	1.09	Coal	LID5A	Liddell	FR		186016					0.40	12							
GNC004	245.80	245.85	0.05	Tuff			FR		186017					0.05	2							NAF
GNC004	245.85	246.34	0.49	Coal	LID4B	Liddell	FR	Calcite	186018					0.40	12							
GNC004	246.34	246.46	0.12	Carb Mudstone			FR		186019					0.15	5							UC(PAF)
GNC004	246.46	246.85	0.39	Coal	LID4A	Liddell	FR		186020					0.84	26							
GNC004	246.85	247.00	0.15	Mudstone/Carb Mudstone			FR		186021					<0.01	0							NAF
GNC004	247.00	248.56	1.56	Mudstone/Carb Mudstone			FR			31189	4558			0.05	2	24	-22	15.70				NAF
GNC004	248.56	248.67	0.11	Carb Mudstone			FR		186022					0.14	4							UC(PAF)
GNC004	248.67	250.94	2.27	Coal/Tuff	LID3B/3A/2/1	Liddell	FR		186023_27		5320	6.7	0.42	0.43	13	12	1	0.92	5.7	0	1	UC(NAF)
GNC004	250.94	251.42	0.48	Carb Mudstone			FR		186028					0.12	4							UC(PAF)
GNC004	251.42	251.68	0.26	Coal	LID1L	Liddell	FR		186029					0.37	11							
GNC004	251.68	251.78	0.10	Mudstone			FR		186030					0.10	3							UC(NAF)
GNC004	251.78	252.75	0.97	Mudstone/Siltstone			FR			31190	4559			0.01	0	14	-13	44.70				NAF
GNC004	252.75	255.80	3.05	Sandstone			FR			31191	4560			0.03	1	54	-53	58.61				NAF
GNC004	255.80	260.36	4.56	Sandstone			FR			31192	4561			<0.01	0	91	-91	593.06				NAF
GNC004	260.36	263.75	3.39	Siltstone/Sandstone			FR	Siderite		31193	4562			0.03	1	30	-30	33.19				NAF
GNC004	263.75	264.91	1.16	Mudstone			FR			31194	4563			<0.01	0	13	-13	83.92				NAF
GNC004	264.91	265.06	0.15	Sandstone/Mudstone			FR		186031					0.24	7							UC(PAF)
GNC004	265.06	268.35	3.29	Coal	BAR3U/3/2/1/1L	Barrett	FR		186032_38		5321	7.5	0.22	0.47	14	19	-4	1.29	7.2	0	0	NAF
GNC004	268.35	268.46	0.11	Mudstone			FR		186039					0.07	2							UC(NAF)
GNC004	268.46	268.93	0.47	Siltstone/Carb Mudstone			FR			31195	4564			0.03	1	13	-12	14.57				NAF
GNC004	268.93	270.68	1.75	Sandstone/Siltstone			FR			31196	4565			0.01	0	14	-14	46.74				NAF
GNC004	270.68	273.72	3.04	Sandstone			FR			31197	4566			<0.01	0	26	-26	169.07				NAF
GNC004	273.72	276.75	3.03	Sandstone			FR			31198	4567			<0.01	0	111	-111	724.24				NAF
GNC004	276.75	279.71	2.96	Sandstone/Siltstone			FR			31199	4568			<0.01	0	13	-13	83.13				NAF
GNC004	279.71	282.75	3.04	Sandstone			FR	Siderite, Calcite		31200	4569			<0.01	0	83	-82	539.22				NAF
GNC004	282.75	284.57	1.82	Sandstone			FR			31201	4570			<0.01	0	63	-63	410.73				NAF
GNC004	284.57	284.94	0.37	Siltstone			FR			31202	4571			0.01	0	12	-12	38.76				NAF
GNC004	284.94	285.04	0.10	Siltstone			FR		186040					0.04	1							NAF
GNC004	285.04	287.31	2.27	Coal	UH3/2/1	Hebden	FR	Calcite	186041_45		5322	7.3	0.23	0.55	17	11	6	0.64	5.7	0	1	UC(NAF)
GNC004	287.31	287.48	0.17	Carb Mudstone			FR		186046					0.43	13							UC(PAF)
GNC004	287.48	287.75	0.27	Coal	H1	Hebden	FR		186047					0.56	17							
GNC004	287.75	287.79	0.04	Mudstone			FR		186048					0.16	5							UC(PAF)
GNC004	287.79	288.01	0.22	Coal	H2	Hebden	FR		186049					0.36	11							
GNC004	288.01	288.17	0.16	Sandstone/Mudstone			FR		186050					<0.01	0							NAF
GNC004	288.17	289.66	1.49	Siltstone/Mudstone/Sandstone			FR			31203	4572			0.01	0	18	-17	57.34				NAF
GNC004	289.66	290.38	0.72	Sandstone/Coal	H3/H4	Hebden	FR	Incl H3(3cm)&H4(4cm) with SS parting		31204	4573			<0.01	0	14	-14	93.79				NAF
GNC004	290.38	291.83	1.45	Sandstone/Siltstone			FR			31205	4574			<0.01	0	14	-14	92.97				NAF
GNC004	291.83	294.81	2.98	Siltstone/Sandstone			FR			31206	4575	8.2	0.16	0.01	0	16	-16	52.99	8.1	0	0	NAF
GNC004	294.81	297.85	3.04	Sandstone			FR			31207	4576	8.1	0.22	<0.01	0	49	-49	321.60	8.6	0	0	NAF
GNC004	297.85	298.56	0.71	Siltstone			FR			31208	4577	7.8	0.17	<0.01	0	16	-15	101.35	8.5	0	0	NAF
GNC004	298.56	298.67	0.11	Mudstone			FR		186051					0.02	1							NAF
GNC004	298.67	298.92	0.25	Coal	LHB	Hebden	FR		186052					0.69	21							
GNC004	298.92	299.06	0.14	Siltstone			FR		186053		6830			0.55	17	7	9	0.44	2.8	7	12	PAF
GNC004	299.06	299.57	0.51	Siltstone			FR	Siderite		31209	4578	8.2	0.28	0.07	2	17	-15	7.83	8.3	0	0	NAF
GNC004	299.57	300.84	1.27	Sandstone			FR			31210	4579	7.8	0.13	0.01	0	13	-13	42.23	8.2	0	0	NAF
GNC006	0.00	1.00	1.00	Mudstone/Soil			CW			GNC006-1	5238	6.8	0.30	<0.01	0	4	-4	28.05				NAF
GNC006	1.00	2.00	1.00	Sandstone/Mudstone			EW			GNC006-2	5239	7.4	0.29	<0.01	0	80	-80	520.66				NAF
GNC006	2.00	3.00	1.00	Sandstone			EW			GNC006-3	5240	8.5	0.34	0.03	1	102	-101	111.55				NAF
GNC006	3.00	6.00	3.00	Sandstone			EW			GNC006-4	5241	8.3	0.32	0.01	0	8	-8	27.64				NAF
GNC006	6.00	7.00	1.00	Sandstone			MW			GNC006-5	5242	7.6	0.32	<0.01	0	10	-10	63.98				NAF
GNC006	7.00	8.50	1.50	Sandstone			MW			GNC006-6	5243	8.2	0.29	<0.01	0	10	-10	66.26				NAF
GNC008	0.00	1.00	1.00	Sandstone			HW			GNC008-1	5244	8.1	0.29	<0.01	0	3	-3	21.78				NAF
GNC008	1.00	2.00	1.00	Sandstone			MW			GNC008-2	5245	7.8	0.31	0.01	0	11	-11	36.56				NAF
GNC008	2.00	3.00	1.00	Sandstone			MW			GNC008-3	5246	8.3	0.30	<0.01	0	39	-39	252.69				NAF
GNC008	3.00	7.00	4.00	Conglomerate			MW			GNC008-4	5247	7.7	0.28	<0.01	0	16	-16	107.42				NAF
GNC008	7.00	12.00	5.00	Conglomerate			MW			GNC008-5	5248	6.8	0.29	<0.01	0	19	-19	126.90				NAF
GNC008	12.00	13.50	1.50	Sandstone			MW			GNC008-6	5249	7.6	0.33	0.04	1	19	-18	15.42				NAF
GNC010	0.00	1.00	1.00	Conglomerate/Coal			HW			GNC010-1	5250	6.6	0.40	<0.01	0	5	-4	29.90	5.6	0	5	NAF
GNC010	1.00	2.00	1.00	Conglomerate			HW			GNC010-2	5251	7.2	0.38	0.01	0	23	-22	73.97	8.2	0	0	NAF
GNC010	2.00	3.00	1.00	Conglomerate			HW			GNC010-3	5252	8.4	0.24	<0.01	0	10	-10	63.25	6.9	0	0	NAF
GNC010	3.00	5.00	2.00	Conglomerate			HW			GNC010-4	5253	8.3	0.25	<0.01	0	26	-26	172.21	7.8	0	0	NAF

Table B1: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen Complex (2013 EGi Study).

Hole Name	Depth (m)			Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION NAG			ARD Classification
	From	To	Interval											Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$	
GNC010	5.00	6.00	1.00	Conglomerate/Coal			HW			GNC010-5	5254	7.8	0.31	0.03	1	29	-28	31.37	6.9	0	0	NAF
GNC010	6.00	7.00	1.00	Conglomerate/Mudstone			HW			GNC010-6	5255	7.7	0.33	<0.01	0	9	-9	58.29	6.9	0	0	NAF
GNC010	7.00	10.00	3.00	Sandstone			FR/MW			GNC010-7	5256	8.0	0.42	<0.01	0	17	-17	110.73	7.8	0	0	NAF
GNC010	10.00	13.00	3.00	Sandstone			FR			GNC010-8	5257	6.7	0.39	0.02	1	38	-37	61.96	8.1	0	0	NAF
GNC010	13.00	14.00	1.00	Sandstone			FR			GNC010-9	5258	7.2	0.36	<0.01	0	15	-15	96.05	7.1	0	0	NAF
GNC010	14.00	16.00	2.00	Conglomerate			PW			GNC010-10	5259	6.8	0.32	0.01	0	36	-36	118.38	8.2	0	0	NAF

KEY

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity of 1:2 extract (dS/m)
MPA = Maximum Potential Acidity (kgH_2SO_4/t)
ANC = Acid Neutralising Capacity (kgH_2SO_4/t)
NAPP = Net Acid Producing Potential (kgH_2SO_4/t)

NAGpH = pH of NAG liquor
$NAG_{(pH4.5)}$ = Net Acid Generation capacity to pH 4.5 (kgH_2SO_4/t)
$NAG_{(pH7.0)}$ = Net Acid Generation capacity to pH 7.0 (kgH_2SO_4/t)

NAF = Non-Acid Forming
PAF = Potentially Acid Forming
PAF-LC = PAF Low Capacity
UC = Uncertain Classification
(expected classification in brackets)

Coal seam interval

Missing interval or sample not available

Table B2: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen North Pit extension area (2018 EGi Study).

Hole ID	Depth (m)			Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION ANG			ARD Classification
	From	To	Interval											Total %S	MPA	ANC	NAPP	ANC/ MPA	NAGpH	NAG(pH4.5)	NAG(pH7.0)	
SMC028	296.74	297.06	0.32	Coal	LAE	LAE	FR		QSMC028-78		11658			0.52	16							
SMC028	297.06	298.26	1.20	Sandstone/Mudstone			FR			31876	12025			0.01	0							NAF
SMC028	298.26	298.54	0.28	Mudstone			FR	Carbonaceous		31877	12026			0.05	2							NAF
SMC028	298.54	298.59	0.05	Coal	LAD	LAD	FR		QSMC028-79		11659			0.77	24							
SMC028	298.59	299.79	1.20	Mudstone			FR	Carbonaceous		31878	12027			0.03	1							NAF
SMC028	299.79	300.03	0.24	Coal	LAC	LAC	FR	M Carbonate	QSMC028-80		11660			0.56	17							
SMC028	300.03	300.24	0.21	Tuff/Siltstone			FR	Minor Coal, Carbonaceous	QSMC028-81		11661			0.07	2	18	-16	8.40	7.3	0	0	NAF
SMC028	300.24	300.43	0.19	Coal	LAB	LAB	FR		QSMC028-82		11662			0.52	16							
SMC028	300.43	300.76	0.33	Coal	LAA	LAA	FR		QSMC028-83		11663			0.65	20							
SMC028	300.76	301.68	0.92	Siltstone/Sandstone			FR			31879	12028			0.02	1							NAF
SMC028	301.68	301.93	0.25	Mudstone/Coal			FR	Carbonaceous		31880	12029			0.07	2							UC(NAF)
SMC028	301.93	302.18	0.25	Coal	PG3	PG3	FR	Carbonate	QSMC028-84		11664			0.61	19							
SMC028	302.18	302.19	0.01	Mudstone			FR			NS												
SMC028	302.19	303.96	1.77	Sandstone/Siltstone			FR	Geotech = 0.22m		31882	12030			0.02	1							NAF
SMC028	303.96	306.06	2.10	Sandstone			FR			31883	12031			0.01	0							NAF
SMC028	323.57	324.74	1.17	Sandstone			FR			31884	12032			0.01	0							NAF
SMC028	324.74	326.27	1.53	Sandstone			FR	Siderite		31885	12033			0.02	1							NAF
SMC028	326.27	326.62	0.35	Siltstone			FR	Carbonate		31886	12034			0.03	1							NAF
SMC028	326.62	327.05	0.43	Coal/Siltstone	PG2	PG2	FR		QSMC028-85		11665			0.26	8	7	1	0.88	4.2	1	7	UC(PAF-LC)
SMC028	327.05	328.53	1.48	Sandstone/Siltstone			FR			31887	12035			0.02	1							NAF
SMC028	328.53	328.87	0.34	Siltstone			FR	Pyrite		31888	12036			0.06	2							UC(NAF)
SMC028	328.87	329.12	0.25	Coal	PG1	PG1	FR		QSMC028-86		11666			0.59	18							
SMC028	329.12	329.57	0.45	Siltstone			FR		QSMC028-87		11667			0.05	2	10	-8	6.54	5.4	0	2	NAF
SMC028	329.57	330.29	0.72	Coal	ART3C	ART3C	FR		QSMC028-88		11668			0.57	17							
SMC028	330.29	331.15	0.86	Carb Mudstone/Siltstone			FR			31889	12037			0.06	2							UC(NAF)
SMC028	331.15	333.42	2.27	Sandstone			FR			31890	12038			0.01	0							NAF
SMC028	333.42	335.19	1.77	Siltstone			FR			31891	12039			0.02	1							NAF
SMC028	335.19	336.32	1.13	Sandstone/Siltstone			FR	Carbonaceous		31892	12040			0.08	2							UC(NAF)
SMC028	336.32	336.67	0.35	Coal	ART3A	ART3A	FR		QSMC028-89		11669			0.53	16							
SMC028	336.67	336.83	0.16	Carb Mudstone			FR		QSMC028-90		11670			0.20	6	10	-4	1.63	4.1	2	13	UC(PAF-LC)
SMC028	336.83	337.56	0.73	Coal	ART3	ART3	FR		QSMC028-91		11671			0.60	18							
SMC028	337.56	338.60	1.04	Sandstone			FR	Geotech = 0.2m, Carbonaceous		31893	12041	5.9	1.35	0.35	11	6	5	0.56	3.4	3	10	PAF-LC
SMC028	338.60	340.47	1.87	Sandstone			FR			31894	12042			0.02	1							NAF
SMC028	340.47	341.63	1.16	Siltstone			FR	Geotech = 0.24m		31895	12043			0.05	2							NAF
SMC028	341.63	341.75	0.12	Coal	ART2H	ART2H	FR		QSMC028-92		11672			0.54	17							
SMC028	341.75	342.15	0.40	Siltstone			FR			31896	12044			0.01	0							NAF
SMC028	342.15	343.12	0.97	Siltstone/Sandstone			FR	Carbonaceous		31897	12045			0.01	0							NAF
SMC028	343.12	343.99	0.87	Mudstone/Sandstone			FR	Carbonaceous		31898	12046			0.05	2							NAF
SMC028	351.11	354.03	2.92	Sandstone/Siltstone			FR	Geotech = 0.22m		31899	12047			0.01	0							NAF
SMC028	354.03	354.77	0.74	Sandstone/Siltstone			FR	Geotech = 0.17m		31900	12048			0.04	1							NAF
SMC028	354.77	355.72	0.95	Coal	ART2	ART2	FR		QSMC028-93		11673			0.65	20							
SMC028	355.72	356.30	0.58	Carb Mudstone/Sandstone			FR		QSMC028-94		11674			0.22	7	42	-35	6.24	7.6	0	0	NAF
SMC028	356.30	357.20	0.90	Coal	ART1	ART1	FR		QSMC028-95		11675			0.39	12							
SMC028	357.20	358.21	1.01	Siltstone/Sandstone			FR	Carbonaceous		31901	12049			0.04	1							NAF
SMC028	358.21	359.64	1.43	Siltstone			FR			31902	12050			0.02	1							NAF
SMC028	359.64	360.63	0.99	Sandstone			FR	Coal at base		31903	12051			0.06	2							UC(NAF)
SMC028	364.01	365.46	1.45	Sandstone			FR			31904	12052			0.01	0							NAF
SMC028	365.46	367.36	1.90	Sandstone			FR			31905	12053			0.02	1							NAF
SMC028	367.36	368.10	0.74	Siltstone			FR	Pyrite, Carbonate, Geotech = 0.16m		31906	12054	7.5	0.12	0.13	4	42	-38	10.56	7.7	0	0	NAF
SMC028	368.10	368.31	0.21	Carb Mudstone			FR			31907	12055	8.2	0.35	0.41	13	18	-5	1.43	6.9	0	0	NAF
SMC028	368.31	368.48	0.17	Coal			FR		QSMC028-96		11676			0.96	29	10	19	0.34	3.3	4	12	PAF-LC
SMC028	368.48	368.76	0.28	Coal	LID9	LID9	FR		QSMC028-97		11677			0.72	22							
SMC028	368.76	369.19	0.43	Coal	LID8	LID8	FR		QSMC028-98		11678			0.55	17							
SMC028	369.19	369.28	0.09	Mudstone			FR	Carbonate	QSMC028-99		11679			0.53	16	19	-3	1.17	3.5	2	8	UC(PAF-LC)
SMC028	369.28	370.03	0.75	Coal	LID7	LID7	FR	Carbonate	QSMC028-100		11680			0.48	15							
SMC028	370.03	370.41	0.38	Mudstone			FR		QSMC028-101		11681			0.04	1	40	-39	32.68	7.5	0	0	NAF
SMC028	370.41	371.45	1.04	Coal	LID6	LID6	FR		QSMC028-102		11682			0.46	14							
SMC028	371.45	371.71	0.26	Siltstone			FR	Pyrite		31908	12056			0.11	3	4	-1	1.19	4.2	1	7	UC(PAF-LC)
SMC028	371.71	372.59	0.88	Sandstone			FR	Geotech = 0.24m		31909	12057			0.03	1							NAF
SMC028	372.59	374.46	1.87	Sandstone			FR			31910	12058			0.01	0							NAF
SMC028	389.90	391.49	1.59	Siltstone/Sandstone			FR			31911	12059			0.04	1							NAF
SMC028	391.49	392.71	1.22	Siltstone/Sandstone			FR			31912	12060			0.02	1							NAF
SMC028	392.71	393.01	0.30	Siltstone			FR	Geotech = 0.15m, Carbonaceous		31913	12061			0.02	1							NAF
SMC028	393.01	393.16	0.15	Coal	LID5E	LID5E	FR		QSMC028-103		11683			0.53	16							
SMC028	393.16	393.47	0.31	Siltstone			FR		QSMC028-104		11684			0.07	2	9	-7	4.20	5.6	0	1	NAF
SMC028	393.47	394.02	0.55	Coal	LID5D	LID5D	FR		QSMC028-105		11685			0.71	22							
SMC028	394.02	394.69	0.67	Coal	LID5C	LID5C	FR		QSMC028-106		11686			1.16	35							

Table B2: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen North Pit extension area (2018 EGi Study).

Hole ID	Depth (m) From	Depth (m) To	Depth (m) Interval	Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS Total %S	MPA	ANC	NAPP	ANC/ MPA	SINGLE ADDITION ANG NAGpH	NAG(pH4.5)	NAG(pH7.0)	ARD Classification
SMC028	394.69	395.00	0.31	Mudstone/Coal			FR	Carbonate	QSMC028-107		11687			0.18	6	26	-20	4.72	7.6	0	0	NAF
SMC028	395.00	395.41	0.41	Siltstone			FR			31914	12062			0.04	1							NAF
SMC028	395.41	396.55	1.14	Sandstone			FR			31915	12063	8.7	0.37	0.31	9	72	-63	7.59	7.5	0	0	NAF
SMC028	396.55	398.50	1.95	Sandstone/Siltstone			FR			31916	12064			0.01	0							NAF
SMC028	401.53	404.52	2.99	Sandstone			FR			31917	12065			0.01	0							NAF
SMC028	404.52	406.75	2.23	Sandstone			FR	Carbonaceous		31918	12066			0.03	1							NAF
SMC028	406.75	407.28	0.53	Siltstone			FR	Pyrite, Geotech = 0.17m		31919	12067	8.9	0.28	0.38	12	11	1	0.95	4.2	0.4	6	PAF-LC
SMC028	407.28	408.01	0.73	Coal	LID5B	LID5B	FR		QSMC028-108		11688			0.62	19							
SMC028	408.01	408.08	0.07	Mudstone/Coal			FR		QSMC028-109		11689			0.13	4							UC(PAF)
SMC028	408.08	409.26	1.18	Coal	LID5A	LID5A	FR	Carbonate	QSMC028-110		11690			0.44	13							
SMC028	409.26	409.33	0.07	Mudstone			FR		QSMC028-111		11691			0.02	1	43	-42	70.26	7.8	0	0	NAF
SMC028	409.33	409.84	0.51	Coal	LID4	LID4	FR		QSMC028-112		11692			0.46	14							
SMC028	409.84	410.23	0.39	Sandstone			FR	Geotech = 0.25m		31920	12068			0.01	0							NAF
SMC028	410.23	410.76	0.53	Siltstone/Carb Mudstone			FR			31921	12069	8.6	0.29	0.15	5	7	-2	1.53	3.7	3	15	NAF
SMC028	410.76	411.11	0.35	Coal	LID4L	LID4L	FR		QSMC028-113		11693			0.64	20							
SMC028	411.11	411.20	0.09	Siltstone			FR			31922	12070			0.02	1							NAF
SMC028	411.20	412.95	1.75	Sandstone			FR			31923	12071			0.03	1							NAF
SMC028	412.95	414.35	1.40	Sandstone			FR	M pyrite		31924	12072			0.01	0							NAF
SMC028	432.91	435.05	2.14	Sandstone			FR			31925	12073			0.01	0							NAF
SMC028	435.05	436.59	1.54	Sandstone			FR			31926	12074			0.01	0							NAF
SMC028	436.59	437.96	1.37	Coal	LID1	LID1	FR		QSMC028-114		11694			0.48	15							
SMC028	437.96	438.29	0.33	Carb Mudstone			FR		QSMC028-115		11695			0.28	9	5	4	0.58	3.1	11	26	NAF
SMC028	438.29	438.85	0.56	Siltstone			FR	Geotech = 0.19m/Carbonaceous		31927	12075			0.04	1							NAF
SMC028	438.85	439.27	0.42	Sandstone			FR			31928	12076			0.01	0							NAF
SMC028	439.27	441.31	2.04	Siltstone			FR			31929	12077			0.01	0							NAF
SMC028	444.09	445.87	1.78	Sandstone			FR			31930	12078			0.01	0							NAF
SMC028	445.87	446.84	0.97	Sandstone			FR	Geotech = 0.18m, Carbonaceous		31931	12079			0.09	3							UC(NAF)
SMC028	446.84	447.03	0.19	Siltstone/Siderite			FR	Carbonaceous		31932	12080			0.08	2							UC(NAF)
SMC028	447.03	447.50	0.47	Coal	BAR3	BAR3	FR		QSMC028-116		11696			0.52	16							
SMC028	447.50	447.75	0.25	Coal/Tuff			FR		QSMC028-117		11697			2.39	73	30	43	0.41	2.4	26	32	PAF
SMC028	447.75	449.51	1.76	Coal	BAR2	BAR2	FR	Carbonate	QSMC028-118		11698			0.48	15							
SMC028	449.51	449.64	0.13	Carb Mudstone/Siltstone			FR	Carbonaceous	QSMC028-119		11699			0.28	9	7	2	0.82	6.4	0	1	UC(NAF)
SMC028	449.64	449.88	0.24	Coal	BAR1	BAR1	FR		QSMC028-120		11700			0.45	14							
SMC028	449.88	450.73	0.85	Carb Mudstone			FR			31933	12081			0.07	2							UC(NAF)
SMC028	450.73	453.41	2.68	Sandstone			FR			31934	12082			0.01	0							NAF
SMC028	453.41	454.73	1.32	Siltstone			FR	Carbonaceous		31935	12083			0.04	1							NAF
SMC028	471.10	472.08	0.98	Siltstone			FR			31936	12084			0.01	0							NAF
SMC028	472.08	473.12	1.04	Sandstone			FR			31937	12085			0.01	0							NAF
SMC028	473.12	474.34	1.22	Siltstone			FR	Geotech = 0.25m/Carbonaceous		31938	12086			0.02	1							NAF
SMC028	474.34	474.68	0.34	Siltstone			FR	Carbonaceous		31939	12087			0.04	1							NAF
SMC028	474.68	475.12	0.44	Coal			FR	Carbonate	QSMC028-121		11701			0.35	11	34	-23	3.17	7.5	0	0	NAF
SMC028	475.12	475.24	0.12	Tuff/Carb Mudstone			FR	Carbonate	QSMC028-122		11702			0.05	2	72	-70	47.06	7.6	0	0	NAF
SMC028	475.24	475.97	0.73	Coal	UH2	UH2	FR	Carbonate	QSMC028-123		11703			0.49	15							
SMC028	475.97	476.19	0.22	Tuff			FR	Carbonate	QSMC028-124		11704			0.03	1	46	-45	50.11	8.1	0	0	NAF
SMC028	476.19	477.90	1.71	Coal	UH1	UH1	FR		QSMC028-125		11705			0.40	12							
SMC028	477.90	478.19	0.29	Carb Mudstone			FR	Carbonaceous	QSMC028-126		11706			0.30	9	20	-11	2.18	7.2	0	0	NAF
SMC028	478.19	478.44	0.25	Siltstone			FR	Geotech = 0.13m		31940	12088			0.08	2							UC(NAF)
SMC028	478.44	480.17	1.73	Siltstone/Sandstone			FR	Carbonaceous		31941	12089			0.01	0							NAF
SMC028	480.17	481.62	1.45	Sandstone			FR	Carbonaceous		31942	12090			0.02	1							NAF
SMC028	488.00	490.38	2.38	Sandstone			FR			31943	12091			0.02	1							NAF
SMC028	490.38	491.84	1.46	Sandstone/Siltstone			FR	Carbonaceous		31944	12092			0.02	1							NAF
SMC028	491.84	492.59	0.75	Siltstone			FR	Carbonaceous, Siderite		31945	12093			0.07	2							UC(NAF)
SMC028	492.59	492.70	0.11	Coal/Tuff			FR	Carbonate	QSMC028-127		11707			0.71	22	20	2	0.92	4.6	0	6	UC(NAF)
SMC028	492.70	494.11	1.41	Coal	LHB	LHB	FR		QSMC028-128		11708			0.58	18							
SMC028	494.11	495.51	1.40	Sandstone			FR	Geotech = 0.23m		31946	12094			0.01	0							NAF
SMC028	495.51	495.99	0.48	Siltstone			FR	Carbonate, Carbonaceous		31947	12095			0.08	2							UC(NAF)
SMC028	495.99	496.95	0.96	Coal	H1/H2	H1/H2	FR	Siltstone at base	QSMC028-129		11709			0.28	9							
SMC028	496.95	497.75	0.80	Sandstone/Siltstone			FR	Carbonaceous		31948	12096			0.06	2							UC(NAF)
SMC028	497.75	497.98	0.23	Coal/Carb Mudstone			FR			31949	12097	8.8	0.30	0.27	8	12	-4	1.45	4.0	2	13	NAF
SMC028	497.98	499.32	1.34	Sandstone			FR			31950	12098			0.01	0							NAF
SMC032	171.34	171.55	0.21	Coal	LAD	LAD	FR		QSMC032-52		11710			0.53	16	8	8	0.49	4.0	2	11	UC(PAF-LC)
SMC032	171.55	171.75	0.20	Tuff/Coal			FR		QSMC032-53		11711			0.07	2	18	-16	8.40	6.9	0	0	NAF
SMC032	171.75	171.98	0.23	Coal	LAC	LAC	FR		QSMC032-54		11712			0.83	25	8	17	0.31	2.8	18	33	UC(PAF)
SMC032	171.98	172.21	0.23	Coal	LAB	LAB	FR		QSMC032-55		11713			1.85	57	0	57	0.00	2.5	17	20	PAF
SMC032	172.21	172.36	0.15	Siltstone/Carb Mudstone			FR			31801	12099			0.06	2							UC(NAF)
SMC032	172.36	173.80	1.44	Sandstone			FR	Carbonaceous, Geotech = 0.19m		31802	12100			0.05	2							NAF
SMC032	173.80	173.91	0.11	Carb Mudstone			FR		QSMC032-56		11714			0.52	16	7	9	0.44	2.9	13	32	PAF

Table B2: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen North Pit extension area (2018 EGi Study).

Hole ID	Depth (m)			Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION ANG			ARD Classification
	From	To	Interval											Total %S	MPA	ANC	NAPP	ANC/ MPA	NAGpH	NAG(pH4.5)	NAG(pH7.0)	
SMC032	173.91	174.25	0.34	Coal	LAA	LAA	FR		QSMC032-57		11715			0.96	29	3	26	0.10	2.4	29	46	PAF
SMC032	174.25	175.25	1.00	Sandstone			FR			31803	12101			0.04	1							NAF
SMC032	175.25	178.57	3.32	Sandstone			FR			31804	12102			0.01	0							NAF
SMC032	180.29	180.42	0.13	Core Loss			FR			NS												
SMC032	180.42	181.19	0.77	Sandstone/Siltstone			FR			31805	12103			0.01	0							NAF
SMC032	181.19	182.42	1.23	Sandstone			FR	Carbonaceous		31806	12104	9.1	0.39	0.01	0							NAF
SMC032	182.42	182.57	0.15	Siltstone/Coal			FR	Carbonaceous		31807	12105	9.3	0.41	0.30	9	9	0	0.98	3.6	5	16	NAF
SMC032	182.57	183.36	0.79	Sandstone/Siltstone			FR			31808	12106			0.01	0							NAF
SMC032	183.36	185.57	2.21	Sandstone			FR			31809	12107	8.4	0.37	0.01	0							NAF
SMC032	193.61	197.00	3.39	Sandstone			FR			31810	12108			0.01	0							NAF
SMC032	197.00	198.02	1.02	Sandstone/Siltstone			FR			31811	12109	7.9	0.40	0.01	0							NAF
SMC032	198.02	198.51	0.49	Coal	PG3	PG3	FR		QSMC032-58		11716			0.54	17	10	7	0.61	3.1	9	20	NAF
SMC032	198.51	199.50	0.99	Sandstone			FR	Carbonaceous		31812	12110			0.05	2							NAF
SMC032	199.50	202.00	2.50	Sandstone			FR	Carbonaceous		31813	12111			0.01	0							NAF
SMC032	202.00	202.74	0.74	Siltstone			FR	Carbonaceous		31814	12112	7.8	0.39	0.04	1							NAF
SMC032	202.74	203.00	0.26	Coal	PG2	PG2	FR		QSMC032-59		11717			0.67	21	15	6	0.73	4.0	3	11	UC(PAF-LC)
SMC032	203.00	203.28	0.28	Siltstone/Carb Mudstone			FR		QSMC032-60		11718			0.14	4	10	-6	2.33	4.6	0	5	NAF
SMC032	203.28	204.04	0.76	Coal	PG1	PG1	FR		QSMC032-61		11719			0.56	17	3	14	0.18	2.5	29	48	UC(PAF)
SMC032	204.04	204.34	0.30	Siltstone			FR			NS												
SMC032	204.34	207.00	2.66	Sandstone/Siltstone			FR	Carbonaceous, Geotech = 0.31m		31816	12113	8.7	0.28	0.01	0							NAF
SMC032	207.00	210.34	3.34	Sandstone/Siltstone			FR			31817	12114			0.01	0							NAF
SMC032	210.34	211.34	1.00	Sandstone/Siltstone			FR	Carbonaceous		31818	12115			0.02	1							NAF
SMC032	211.34	211.67	0.33	Siltstone/Tuff			FR	Carbonaceous		31819	12116			0.09	3							UC(NAF)
SMC032	211.67	211.79	0.12	Coal	ART3C	ART3C	FR		QSMC032-62		11720			0.65	20	8	12	0.40	2.3	46	70	UC(PAF)
SMC032	211.79	212.13	0.34	Siltstone			FR		QSMC032-63		11721			0.26	8	11	-3	1.38	4.1	1	5	UC(PAF-LC)
SMC032	212.13	212.54	0.41	Coal	ART3A	ART3A	FR		QSMC032-64		11722			0.58	18	9	9	0.51	2.8	18	35	UC(PAF)
SMC032	212.54	212.77	0.23	Carb Mudstone			FR	Pyrite	QSMC032-65		11723			0.87	27	10	17	0.38	3.0	7	15	PAF
SMC032	212.77	213.54	0.77	Coal	ART3	ART3	FR		QSMC032-66		11724			0.85	26	8	18	0.31	3.7	4	11	UC(PAF-LC)
SMC032	213.54	214.97	1.43	Sandstone			FR	Pyrite		31820	12117	8.8	0.25	0.06	2							UC(NAF)
SMC032	214.97	217.42	2.45	Sandstone			FR			31821	12118			0.02	1							NAF
SMC032	217.42	217.97	0.55	Siltstone			FR	Pyrite		31822	12119	7.8	0.28	0.20	6	11	-5	1.80	4.8	0	3	NAF
SMC032	217.97	218.23	0.26	Coal	ART2H	ART2H	FR	Carbonate	QSMC032-67		11725			0.45	14	43	-29	3.12	7.4	0	0	NAF
SMC032	218.23	219.25	1.02	Sandstone/Carb Mudstone			FR	Carbonaceous, Geotech = 0.19m		31823	12120			0.04	1							NAF
SMC032	219.25	219.52	0.27	Carb Mudstone/Coal			FR	Carbonate		31824	12121	8.5	0.29	0.13	4	11	-7	2.77	4.6	0	7	NAF
SMC032	219.52	220.86	1.34	Sandstone			FR	Minor Carb Mudstone		31825	12122			0.03	1							NAF
SMC032	220.86	223.41	2.55	Sandstone			FR			31826	12123			0.01	0							NAF
SMC032	223.41	224.41	1.00	Sandstone/Coal			FR			31827	12124			0.10	3							UC(NAF)
SMC032	224.41	224.73	0.32	Tuff			FR	Carbonate		31828	12125			0.01	0							NAF
SMC032	224.73	226.02	1.29	Coal	ART2	ART2	FR	Core Loss at base (0.23m)	QSMC032-68		11726			0.39	12	34	-22	2.85	7.1	0	0	NAF
SMC032	226.02	226.50	0.48	No Record			FR		QSMC032-69		11727			0.05	2	42	-40	27.45	7.8	0	0	NAF
SMC032	226.50	227.57	1.07	Coal	ART1	ART1	FR		QSMC032-70		11728			0.29	9	31	-22	3.49	7.3	0	0	NAF
SMC032	227.57	228.60	1.03	Sandstone			FR	Geotech = 0.17m		31829	12126	8.3	0.34	0.05	2							NAF
SMC032	228.60	232.77	4.17	Sandstone			FR			31830	12127			0.02	1							NAF
SMC032	239.90	241.84	1.94	Sandstone			FR	Geotech = 0.27m		31831	12128			0.02	1							NAF
SMC032	241.84	242.66	0.82	Siltstone			FR	Minor Coal		31832	12129			0.09	3							UC(NAF)
SMC032	242.66	242.80	0.14	Coal	LID9	LID9	FR		QSMC032-71		11729			1.58	48	13	35	0.27	3.0	7	14	PAF
SMC032	242.80	242.85	0.05	Mudstone			FR	Carbonaceous	QSMC032-72		11730			0.28	9	10	-1	1.17	2.8	20	39	UC(PAF)
SMC032	242.85	243.35	0.50	Coal	LID8	LID8	FR		QSMC032-73		11731			0.59	18	9	9	0.50	3.3	8	19	UC(PAF)
SMC032	243.35	243.53	0.18	Siltstone			FR	Carbonaceous	QSMC032-74		11732			0.04	1	12	-11	9.80	6.9	0	0	NAF
SMC032	243.53	244.90	1.37	Coal	LID7	LID7	FR		QSMC032-75		11733			0.48	15	27	-12	1.84	7.1	0	0	NAF
SMC032	244.90	245.52	0.62	Sandstone/Core Loss			FR		QSMC032-76		11734			0.04	1	14	-13	11.44	5.9	0	1	NAF
SMC032	245.52	246.35	0.83	Coal	LID6	LID6	FR		QSMC032-77		11735			0.40	12	19	-7	1.55	7.2	0	0	NAF
SMC032	246.35	247.42	1.07	Sandstone/Siltstone			FR	Carbonaceous		31833	12130			0.02	1							NAF
SMC032	247.42	249.45	2.03	Sandstone			FR			31834	12131			0.01	0							NAF
SMC032	259.79	261.26	1.47	Sandstone			FR	Carbonaceous		31835	12132			0.01	0							NAF
SMC032	261.26	261.76	0.50	Siltstone/Coal			FR	Carbonaceous		31836	12133			0.10	3							UC(NAF)
SMC032	261.76	264.26	2.50	Sandstone/Siltstone			FR			31837	12134	7.8	0.42	0.01	0							NAF
SMC032	264.26	264.90	0.64	Siltstone			FR	Carbonaceous, Geotech = 0.2m		31838	12135			0.08	2							UC(NAF)
SMC032	264.90	265.09	0.19	Coal	LID5D	LID5D	FR		QSMC032-78		11736			0.57	17	2	15	0.11	2.4	28	47	PAF
SMC032	265.09	265.12	0.03	Carb Mudstone			FR		QSMC032-79		11737			0.27	8	8	0	0.97	2.5	34	61	UC(PAF)
SMC032	265.12	265.76	0.64	Coal	LID5C	LID5C	FR		QSMC032-80		11738			0.53	16	4	12	0.25	2.6	18	33	UC(PAF)
SMC032	265.90	266.11	0.21	Siltstone			FR	Carbonaceous		31839	12136	5.9	1.03	0.28	9	5	4	0.58	3.7	2	12	UC(PAF-LC)
SMC032	266.61	266.90	0.29	Sandstone/Siltstone			FR	Carbonaceous, Geotech = 0.23m, Pyrite		31840	12137	8.7	0.37	0.13	4	13	-9	3.27	4.5	0	5	NAF
SMC032	266.90	268.84	1.94	Sandstone			FR			31841	12138			0.02	1							NAF
SMC032	268.84	269.30	0.46	Siltstone/Coal/Siderite			FR	Pyrite		31842	12139	9.2	0.35	0.21	6	51	-45	7.94	7.8	0	0	NAF
SMC032	269.30	270.29	0.99	Sandstone			FR			31843	12140			0.01	0							NAF
SMC032	276.15	279.63	3.48	Sandstone/Siltstone			FR	Carbonaceous		31844	12141	8.6	0.30	0.02	1							NAF

Table B2: Acid forming characteristics of overburden/interburden and coal samples from the Mount Owen North Pit extension area (2018 EGi Study).

Hole ID	Depth (m)			Lithology	Seam Name	Seam Group	Weathering	Comments	Coal Quality Sample No	Overburden/ Interburden Sample No	EGi Sample Number	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					SINGLE ADDITION ANG			ARD Classification
	From	To	Interval											Total %S	MPA	ANC	NAPP	ANC/ MPA	NAGpH	NAG(pH4.5)	NAG(pH7.0)	
SMC032	279.63	280.57	0.94	Siltstone/Sandstone			FR	Carbonaceous		31845	12142			0.02	1							NAF
SMC032	280.57	281.19	0.62	Coal	LID5B	LID5B	FR	Geotech = 0.19m	QSMC032-81		11739			0.60	18	2	16	0.11	2.7	17	33	UC(PAF-LC)
SMC032	281.19	281.25	0.06	Tuff			FR	Carbonaceous	QSMC032-82		11740			0.02	1	49	-48	80.07	7.8	0	0	NAF
SMC032	281.25	282.44	1.19	Coal	LID5A	LID5A	FR		QSMC032-83		11741			0.47	14	21	-7	1.46	7.1	0	0	NAF
SMC032	282.44	282.52	0.08	Coal/Mudstone			FR			NS												
SMC032	282.52	282.58	0.06	Tuff			FR	Carbonaceous	QSMC032-84		11742			0.15	5	33	-28	7.19	7.6	0	0	NAF
SMC032	282.58	282.95	0.37	Coal	LID4	LID4	FR		QSMC032-85		11743			0.61	19	7	12	0.38	2.9	14	27	UC(PAF)
SMC032	282.95	283.10	0.15	Siltstone			FR	Pyrite		31847	12143			0.01	0							NAF
SMC032	283.10	284.61	1.51	Sandstone			FR	Carbonaceous, Geotech = 0.25m		31848	12144			0.02	1							NAF
SMC032	284.61	285.06	0.45	Siltstone/Mudstone			FR	Carbonaceous		31849	12145			0.08	2							UC(NAF)
SMC032	285.06	285.54	0.48	Coal	LID4L	LID4L	FR		QSMC032-86		11744			0.87	27	13	14	0.49	3.5	3	11	PAF-LC
SMC032	285.54	286.05	0.51	Siltstone			FR			31850	12146	8.5	0.29	0.01	0							NAF
SMC032	286.05	288.14	2.09	Sandstone/Siltstone			FR	Carbonaceous		31851	12147			0.01	0							NAF
SMC032	300.89	304.11	3.22	Sandstone			FR			31852	12148			0.01	0							NAF
SMC032	304.11	304.75	0.64	Siltstone/Sandstone			FR	Carbonaceous, Siderite		31853	12149			0.02	1							NAF
SMC032	304.75	305.38	0.63	Siltstone/Carb Mudstone			FR	Pyrite		31854	12150	7.9	0.33	0.16	5	11	-6	2.25	6.0	0	1	NAF
SMC032	305.98	306.13	0.15	Tuff/Carb Mudstone			FR	Geotech = 0m		NS												
SMC032	306.13	307.46	1.33	Coal	LID1	LID1	FR		QSMC032-87		11745			0.46	14	2	12	0.14	2.6	17	34	UC(PAF-LC)
SMC032	307.46	307.74	0.28	Carb Mudstone			FR		QSMC032-88		11746			0.22	7	6	1	0.89	3.9	2	14	PAF-LC
SMC032	307.74	307.99	0.25	Mudstone			FR	Carbonaceous		31855	12151			0.03	1							NAF
SMC032	307.99	309.00	1.01	Sandstone			FR			31856	12152			0.01	0							NAF
SMC032	320.36	320.80	0.44	Siltstone			FR			31857	12153			0.02	1							NAF
SMC032	320.80	320.99	0.19	Mudstone			FR	Carbonaceous		31858	12154			0.02	1							NAF
SMC032	320.99	321.88	0.89	Siltstone			FR	Carbonaceous, Geotech = 0.2m		31859	12155			0.03	1							NAF
SMC032	321.88	322.10	0.22	Coal	BAR3	BAR3	FR		QSMC032-89		11747			0.57	17	1	16	0.06	2.4	27	46	UC(PAF)
SMC032	322.10	322.40	0.30	Tuff/Carb Mudstone			FR	Carbonate, Carbonaceous	QSMC032-90		11748			0.40	12	57	-45	4.66	7.9	0	0	NAF
SMC032	322.40	324.63	2.23	Coal	BAR2	BAR2	FR		QSMC032-91		11749			0.47	14	13	1	0.90	6.4	0	2	NAF
SMC032	324.63	324.99	0.36	Coal/Siltstone	BAR1	BAR1	FR		QSMC032-92		11750			0.23	7	5	2	0.71	3.5	4	17	UC(PAF-LC)
SMC032	324.99	325.72	0.73	Siltstone/Carb Mudstone			FR			31860	12156	9.4	0.42	0.07	2							UC(NAF)
SMC032	325.72	327.19	1.47	Siltstone/Sandstone			FR	Carbonaceous		31861	12157			0.02	1							NAF
SMC032	327.19	328.63	1.44	Sandstone			FR			31862	12158			0.01	0							NAF
SMC032	348.29	351.66	3.37	Sandstone			FR	Siderite		31863	12159	8.5	0.32	0.01	0							NAF
SMC032	351.66	352.67	1.01	Siltstone			FR	Carbonaceous		31864	12160			0.03	1							NAF
SMC032	352.67	352.84	0.17	Siltstone			FR	Carbonaceous, Geotech = 0.21m		NS												
SMC032	352.84	353.20	0.36	Coal			FR	Carbonate	QSMC032-93		11751			0.21	6	30	-24	4.67	7.8	0	0	NAF
SMC032	353.20	353.76	0.56	Coal	UH2	UH2	FR		QSMC032-94		11752			0.33	10	31	-21	3.07	7.4	0	0	NAF
SMC032	353.76	353.84	0.08	Tuff	UH2	UH2	FR	Carbonaceous	QSMC032-95		11753			0.02	1	37	-36	60.46	8.1	0	0	NAF
SMC032	353.84	354.55	0.71	Coal	UH2	UH2	FR		QSMC032-96		11754			0.46	14	18	-4	1.28	7.2	0	0	NAF
SMC032	354.55	354.78	0.23	Tuff			FR	Carbonaceous	QSMC032-97		11755			0.03	1	32	-31	34.86	7.8	0	0	NAF
SMC032	354.78	356.48	1.70	Coal	UH1	UH1	FR	Carbonate	QSMC032-98		11756			0.40	12	19	-7	1.55	7.3	0	0	NAF
SMC032	356.48	356.88	0.40	Carb Mudstone/Siltstone			FR	Carbonaceous	QSMC032-99		11757			0.10	3	19	-16	6.21	7.7	0	0	NAF
SMC032	356.88	358.25	1.37	Siltstone			FR	Carbonaceous, Geotech = 0.21m		31865	12161			0.04	1							NAF
SMC032	358.25	358.66	0.41	Carb Mudstone/Siltstone			FR	Carbonaceous		31866	12162	8.8	0.38	0.33	10	21	-11	2.08	6.9	0	0	NAF
SMC032	358.66	360.63	1.97	Sandstone/Siltstone			FR	Carbonaceous		31867	12163	7.9	0.45	0.08	2							UC(NAF)
SMC032	360.63	361.70	1.07	Siltstone			FR			31868	12164			0.01	0							NAF
SMC032	361.70	362.53	0.83	Sandstone			FR	Carbonaceous/Pyrite		31869	12165			0.01	0							NAF
SMC032	362.53	364.51	1.98	Siltstone			FR	Siderite		31870	12166			0.06	2							UC(NAF)
SMC032	364.51	364.85	0.34	Siltstone			FR	Carbonaceous		31871	12167			0.06	2							UC(NAF)
SMC032	364.85	366.31	1.46	Coal	LHB	LHB	FR	Carbonate	QSMC032-100		11758			0.49	15	15	0	1.00	6.9	0	0	NAF
SMC032	366.31	367.11	0.80	Sandstone/Siltstone			FR			31872	12168	9.1	0.35	0.02	1							NAF
SMC032	367.11	370.35	3.24	Sandstone			FR			31873	12169			0.01	0							NAF
SMC032	370.35	371.10	0.75	Sandstone/Siltstone			FR	Carbonaceous, Siderite		31874	12170			0.01	0							NAF
SMC032	371.10	372.44	1.34	Siltstone/Coal			FR	Carbonate		31875	12171	9.6	0.50	0.32	10	22	-12	2.25	7.6	0	0	NAF

KEY

$pH_{1:2}$ = pH of 1:2 extract
$EC_{1:2}$ = Electrical Conductivity of 1:2 extract (dS/m)
MPA = Maximum Potential Acidity (kgH_2SO_4/t)
ANC = Acid Neutralising Capacity (kgH_2SO_4/t)
NAPP = Net Acid Producing Potential (kgH_2SO_4/t)

NAGpH = pH of NAG liquor
$NAG_{(pH4.5)}$ = Net Acid Generation capacity to pH 4.5 (kgH_2SO_4/t)
$NAG_{(pH7.0)}$ = Net Acid Generation capacity to pH 7.0 (kgH_2SO_4/t)

NAF = Non-Acid Forming
PAF = Potentially Acid Forming
PAF-LC = PAF Low Capacity
UC = Uncertain Classification
(expected classification in brackets)

Coal seam interval

Missing interval or sample not available

Table B3: Extended boil and calculated NAG test results for selected overburden/interburden and coal samples.

EGi Code	Lithology	Seam Name	ACID-BASE ANALYSIS					STANDARD NAG TEST			Extended Boil NAGpH	Calculated NAG
			Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$		
5286	Coal	RVU	0.42	13	2	11	0.13	2.2	73	106	5.7	6
5287	Coal	RVL	0.45	14	2	12	0.11	2.2	88	124	5.6	6
3813	Coal	BAND	0.23	7	38	-31	5.43	4.4	3	19	7.6	-19
5289	Coal	RS	0.57	17	1	16	0.07	2.3	133	184	5.7	10
5290	Coal	RNU	0.71	22	20	1	0.94	2.9	25	43	7.4	-10
5291	Coal	RLU/RLL	0.48	15	7	8	0.48	2.5	30	46	7.1	1
5292	Coal	BAY1	0.44	13	2	12	0.14	2.3	39	60	6.9	5
5296	Coal	BAY5U/BAY5	0.75	23	1	22	0.06	2.5	70	102	4.9	10
5324	Coal	BY3/BY4U2/BY4U1	0.48	15	10	5	0.66	3.3	9	28	5.6	-3
5330	Coal	BY5U1/BY5	0.69	21	9	12	0.44	2.8	25	56	5.8	3
3882	Carb Claystone		0.32	10	9	1	0.89	3.1	20	44	7.1	1
5333	Coal	LEE	1.25	38	13	25	0.33	3.5	5	16	3.9	15
5336	Coal	LED/C/B/A/AL	0.70	22	8	14	0.35	3.1	7	21	6.3	3
5338	Sandstone		0.16	5	9	-4	1.84	3.7	2	8	7.1	-2
5311	Coal	LDJ	0.58	18	2	16	0.11	2.3	66	94	5.4	7
5312	Coal	LDB	0.47	14	3	11	0.24	2.2	69	103	5.9	6
3907	Claystone		0.09	3	11	-9	4.16	4.2	1	9	6.9	1
3954	Sandstone		0.62	19	7	12	0.38	3.5	4	12	4.2	6
5298	Coal	LBG	1.39	43	9	34	0.21	3.0	10	23	3.5	11
3996	Coal	PG3	0.41	13	29	-16	2.27	2.8	14	37	4.1	2
4056	Carb Siltstone		0.06	2	9	-7	4.82	3.6	5	17	7.1	-5
4078	Carb Claystone		0.75	23	7	16	0.32	3.1	6	21	3.6	9
4080	Siltstone		1.26	39	10	28	0.26	2.6	16	27	3.0	18
11676	Coal		0.96	29	10	19	0.34	3.3	4	12	4.2	7
12069	Siltstone/Carb Mudstone		0.15	5	7	-2	1.53	3.7	3	15	7.2	0
11695	Carb Mudstone		0.28	9	5	4	0.58	3.1	11	26	7.1	-2
12097	Coal/Carb Mudstone		0.27	8	12	-4	1.45	4.0	2	13	7.4	-6
12105	Carb Siltstone		0.30	9	9	0	0.98	3.6	5	16	7.4	-4
11716	Coal	PG3	0.54	17	10	7	0.61	3.1	9	20	7.3	-2
11723	Carb Mudstone		0.87	27	10	17	0.38	3.0	7	15	3.7	12
11729	Coal	LID9	1.58	48	13	35	0.27	3.0	7	14	3.8	12
12136	Carb Siltstone		0.28	9	5	4	0.58	3.7	2	12	6.0	2
11739	Coal	LID5B	0.60	18	2	16	0.11	2.7	17	33	6.9	1
11745	Coal	LID1	0.46	14	2	12	0.14	2.6	17	34	6.2	1

KEY

MPA = Maximum Potential Acidity (kgH_2SO_4/t)

ANC = Acid Neutralising Capacity (kgH_2SO_4/t)

NAPP = Net Acid Producing Potential (kgH_2SO_4/t)

NAGpH = pH of NAG liquor

$NAG_{(pH4.5)}$ = Net Acid Generation capacity to pH 4.5 (kgH_2SO_4/t)

$NAG_{(pH7.0)}$ = Net Acid Generation capacity to pH 7.0 (kgH_2SO_4/t)

Extended Boil NAGpH = pH of NAG liquor after extended heating

Calculated NAG = The net acid potential based on assay of anions and cations released to the NAG solution (kgH_2SO_4/t)

Table B4: Sulphur speciation results for selected overburden/interburden and coal samples.

EGi Sample Number	Rock Type	Seam Name	Total %S	Pyritic S (%)	Acid Sulphate %S	Total Acid Generating S (%)	Non-Acid Sulphate %S	Other S Forms (%)	Proportion Total Acid Generating to Total S
3882	Carb Claystone		0.32	0.13	0.00	0.13	0.04	0.15	41%
3883	Coal	LEF	0.55	0.41	0.00	0.41	0.07	0.07	75%
5333	Coal	LEE	1.25	0.77	0.00	0.77	0.09	0.39	62%
5297	Coal	LCA	0.77	0.31	0.00	0.31	0.40	0.06	40%
3954	Sandstone		0.62	0.40	0.00	0.40	0.22	0.00	65%
5299	Coal	PG2U	1.50	0.46	0.00	0.46	0.53	0.51	31%
5301	Coal	ART4	0.81	0.11	0.00	0.11	0.06	0.64	14%
4025	Sandstone		0.86	0.77	0.00	0.77	0.08	0.01	90%
5307	Coal	BAR13/12	0.46	0.03	0.00	0.03	0.01	0.42	7%
4078	Carb Claystone		0.75	0.43	0.00	0.43	0.11	0.21	57%
4079	Sandstone		0.96	0.74	0.00	0.74	0.22	0.00	77%
4080	Siltstone		1.26	0.90	0.00	0.90	0.36	0.00	71%
5321	Coal	BAR3U/3/2/1/1L	0.47	0.10	0.00	0.10	0.02	0.35	21%
11697	Coal/Tuff		2.70	1.98	0.00	1.98	0.00	0.72	73%
11716	Coal	PG3	0.59	0.03	0.00	0.03	0.01	0.55	5%
11723	Carb Mudstone		0.94	0.48	0.00	0.48	0.02	0.44	51%
11729	Coal	LID9	1.56	0.52	0.00	0.52	0.05	0.99	33%
11739	Coal	LID5B	0.58	0.03	0.00	0.03	0.00	0.55	5%
11745	Coal	LID1	0.42	0.00	0.00	0.03	0.01	0.55	0%
12041	Sandstone		0.31	0.26	0.00	0.26	0.02	0.03	84%
12056	Siltstone		0.12	0.07	0.00	0.07	0.02	0.03	58%
12069	Siltstone/Carb Mudstone		0.15	0.06	0.00	0.06	0.01	0.08	40%
12105	Carb Siltstone		0.31	0.02	0.00	0.02	0.00	0.29	6%
12136	Carb Siltstone		0.26	0.08	0.00	0.08	0.03	0.15	31%

Pyritic S (%) = CRS (%)

Acid Sulphate S = KCl Acid Sulphate S

Total Acid Generating S = Pyritic S + Acid Sulphate S

Non-Acid Sulphate S = KCl S – KCl Acid Sulphate S

Other S Forms = Total S - (CRS + KCl S)

Table B5: Multi-element composition of sample solids (mg/kg except where shown).

Lithology	Sample No	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	F	Fe	Ga	Ge	Hf	Hg	In	K
		Element																					
Tuff	3778	0.10	9.28%	3	20	100	2.0	0.69	0.66%	0.13	60	2	6	9.0	6	720	1.63%	27	0.31	5.8	0.02	0.07	2.03%
Sandstone	3831	0.06	8.45%	8	10	430	1.7	0.25	1.03%	0.11	57	11	58	6.3	20	330	3.47%	20	0.21	3.4	0.02	0.07	1.89%
Sandstone	3833	0.05	7.82%	6	10	370	1.5	0.22	2.20%	0.09	54	10	59	5.6	18	330	3.31%	20	0.19	3.4	0.01	0.06	1.70%
Siltstone	3850	0.12	8.50%	5	10	280	2.4	0.40	2.34%	0.13	62	14	39	9.2	32	390	8.14%	22	0.16	3.7	0.03	0.07	1.66%
Sandstone	3852	0.06	7.51%	10	10	420	1.5	0.20	3.57%	0.09	52	11	57	4.7	16	270	3.41%	17	0.15	3.0	0.02	0.05	1.63%
Carb Siltstone	3859	0.09	9.77%	8	20	330	1.9	0.49	0.47%	0.18	72	11	45	12.2	40	350	2.26%	26	0.20	4.2	0.02	0.09	1.97%
Weathered Zone	5216	0.04	8.42%	9	40	1090	2.0	0.38	0.29%	0.16	52	15	41	10.0	31	760	3.13%	23	0.22	4.0	0.05	0.08	2.03%
Weathered Zone	5221	0.08	6.33%	6	30	500	1.2	0.14	2.04%	0.09	47	8	65	3.2	10	410	2.14%	15	0.19	3.2	0.01	0.05	1.83%
Sandstone	3880	0.04	7.20%	19	10	500	1.8	0.20	0.35%	0.10	61	10	114	5.5	14	270	1.94%	18	0.21	3.4	0.07	0.06	2.18%
Sandstone	3886	0.04	7.11%	4	10	350	1.2	0.19	3.60%	0.08	44	9	51	4.2	13	270	2.32%	16	0.20	2.9	0.01	0.05	1.34%
Weathered Zone	5232	0.09	6.50%	9	30	690	1.3	0.15	0.19%	0.04	56	6	82	2.7	10	440	1.57%	16	0.19	3.6	0.01	0.05	2.15%
Conglomerate	3900	0.04	6.41%	13	10	520	1.4	0.15	0.96%	0.06	54	7	88	3.0	9	260	1.58%	16	0.21	3.7	0.01	0.05	2.00%
Claystone	3911	0.08	8.81%	15	20	300	2.0	0.26	0.44%	0.10	63	19	82	6.2	37	330	3.81%	24	0.28	4.9	0.04	0.09	1.39%
Sandstone	3954	0.10	9.98%	37	10	420	2.2	0.39	0.35%	0.16	91	28	99	9.5	47	680	2.83%	26	0.28	5.0	0.11	0.08	1.74%
Claystone	3962	0.07	8.51%	4	10	350	1.7	0.46	0.68%	0.14	61	16	36	11.8	36	870	3.17%	24	0.25	4.0	0.03	0.09	2.22%
Conglomerate	3978	0.04	6.21%	21	10	580	1.3	0.17	0.59%	0.05	57	7	90	2.6	9	400	2.06%	16	0.24	3.2	0.02	0.05	1.63%
Sandstone	4025	0.04	6.87%	301	10	620	1.2	0.14	0.38%	0.06	57	15	94	2.7	7	360	1.68%	16	0.18	3.2	0.07	0.04	2.02%
Siltstone	4057	0.08	8.74%	11	10	290	1.7	0.43	0.71%	0.18	66	10	34	10.6	35	700	3.24%	23	0.25	3.8	0.03	0.08	1.71%
Sandstone	4079	0.06	8.03%	32	20	310	1.8	0.20	1.96%	0.13	45	13	35	5.4	16	570	3.79%	19	0.21	3.4	0.12	0.06	1.47%
Siltstone	4080	0.09	9.38%	23	30	330	2.0	0.34	0.47%	0.21	63	14	43	7.3	29	700	4.05%	23	0.22	4.7	0.09	0.08	1.77%
Carb Claystone	4479	0.08	8.97%	18	30	330	1.9	0.42	0.32%	0.18	61	15	34	11.0	62	860	3.05%	25	0.22	4.1	0.03	0.09	1.98%
Sandstone	4480	0.08	8.20%	10	30	380	1.6	0.35	0.51%	0.14	56	13	45	9.1	27	800	4.56%	21	0.25	3.3	0.02	0.07	1.88%
Sandstone	4483	0.03	6.86%	5	20	510	1.0	0.14	2.87%	0.05	46	7	78	2.7	9	360	1.73%	16	0.22	2.6	0.01	0.04	1.71%
Siltstone	4547	0.11	7.79%	15	40	390	2.0	0.39	0.73%	0.15	62	17	34	9.2	30	700	8.62%	21	0.27	3.2	0.02	0.07	1.81%
Weathered Zone	5240	0.10	6.65%	5	20	490	1.1	0.15	4.06%	0.08	39	6	65	2.8	9	480	1.69%	16	0.26	2.6	0.01	0.04	1.91%
Sandstone	12041	0.10	7.45%	154	10	413	1.4	0.20	0.28%	0.10		18	61	4.7	13		2.09%	17	1.10	2.8	0.07	0.05	2.04%
Sandstone	12108	0.10	8.05%	7	10	333	1.8	0.29	1.45%	0.12		9	35	6.9	20		3.66%	18	1.10	3.1	0.05	0.05	1.94%
Carb Siltstone	12112	0.10	8.34%	6	10	297	2.1	0.45	0.23%	0.18		11	33	10.2	28		3.54%	20	1.20	3.3	0.07	0.05	2.26%
Sandstone	12114	0.10	7.86%	8	10	325	1.6	0.28	1.63%	0.11		15	34	6.4	18		3.77%	18	1.10	3.0	0.05	0.05	1.76%
Sandstone	12118	0.10	7.13%	7	10	472	1.2	0.15	1.22%	0.08		9	38	3.3	9		1.53%	15	1.20	2.5	0.05	0.05	1.97%
Sandstone	12134	0.10	8.36%	10	10	465	1.6	0.25	0.55%	0.13		9	33	6.1	18		2.32%	19	1.10	3.1	0.05	0.05	2.01%
Carb Siltstone	12136	0.10	7.83%	22	10	366	2.0	0.51	0.17%	0.20		18	34	10.8	31		2.54%	20	1.70	3.4	0.06	0.05	1.83%
Siltstone	12150	0.10	7.15%	48	10	384	2.7	0.36	0.41%	0.17		11	26	8.2	20		2.15%	18	2.10	4.5	0.07	0.05	1.96%
Sandstone	12159	0.10	7.83%	9	10	400	1.7	0.25	1.37%	0.13		11	30	6.4	22		3.55%	18	1.30	3.2	0.05	0.05	1.92%
Sandstone	12163	0.10	6.94%	12	10	369	1.5	0.19	2.10%	0.09		11	32	4.5	14		5.35%	16	0.90	2.8	0.05	0.05	1.53%
Siltstone	12166	0.10	6.62%	11	10	318	1.8	0.27	2.30%	0.13		11	23	6.2	22		10.66%	16	0.50	2.7	0.05	0.05	1.52%
Median Soil Abundance*		0.05	7.10%	6	20	500	0.3	0.2	1.50%	0.4	50	8	70	4	30	200	4.00%	20	1	6	0.06	1	1.40%
Detection Limit		*0.01*	*0.01%*	*0.2*	*10*	*10*	*0.05*	*0.01*	*0.01%*	*0.02*	*0.01*	*0.1*	*1.0*	*0.05*	*0.2*	*20*	*0.01%*	*0.05*	*0.05*	*0.005*	*0.005*	*0.005*	*0.010%*

Lithology	Sample No	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr
Tuff	3778	25	11	1.17%	45	2.78	0.26%	8.8	4	120	36	80	0.002	<0.01%	0.73	5	2	5.6	234	1.01	0.05	18	0.07%	0.58	5.0	13	0.6	30	72	137
Sandstone	3831	28	32	0.73%	618	0.81	1.46%	6.5	15	410	14	96	0.002	<0.01%	0.83	16	2	2.1	292	0.54	0.05	9	0.42%	0.49	2.4	98	1.3	23	79	107
Sandstone	3833	27	30	0.69%	560	0.76	1.50%	6.6	13	450	13	81	0.002	<0.01%	0.75	15	2	2.1	307	0.56	0.05	9	0.45%	0.42	2.3	101	1.3	22	74	109
Siltstone	3850	30	38	0.93%	1730	1.04	0.77%	7.1	20	800	18	97	0.004	<0.01%	1.12	19	3	2.5	232	0.59	0.1	12	0.41%	0.53	3.1	118	1.6	31	98	120
Sandstone	3852	25	26	0.81%	587	0.79	1.30%	5.7	13	460	13	81	0.002	<0.01%	0.68	13	2	1.8	321	0.47	0.05	8	0.35%	0.40	2.0	81	1.7	22	65	98
Carb Siltstone	3859	34	36	0.70%	184	0.89	0.30%	8.1	21	310	22	121	0.003	0.02%	1.27	22	2	3.0	123	0.72	0.1	13	0.47%	0.59	3.5	141	1.8	29	98	132
Weathered Zone	5216	23	36	0.77%	211	0.89	1.02%	7.7	21	260	17	117	0.004	0.04%	1.35	18	2	2.6	167	0.64	0.09	10	0.44%	0.71	3.1	118	1.8	25	94	128
Weathered Zone	5221	23	18	0.45%	365	0.92	1.51%	6.2	11	310	11	75	0.003	<0.01%	0.75	10	2	1.8	177	0.52	0.05	7	0.38%	0.42	1.8	72	2.3	19	52	105
Sandstone	3880	30	18	0.38%	177	1.11	0.80%	7.5	14	250	14	108	0.003	0.22%	1.00	13	2	2.0	138	0.55	0.05	9	0.36%	0.68	2.1	132	1.3	20	69	111
Sandstone	3886	21	21	0.78%	421	1.17	1.63%	5.3	10	360	13	61	0.002	<0.01%	0.58	12	1	1.6	538	0.48	0.05	7	0.33%	0.30	1.9	70	1.2	17	65	88
Weathered Zone	5232	28	15	0.26%	440	1.64	1.61%	6.9	11	270	11	88	0.002	<0.01%	0.87	10	2	2.2	103.5	0.58	0.05	10	0.30%	0.46	2.0	54	14.0	22	46	112
Conglomerate	3900	27	18	0.38%	287	1.20	1.99%	6.4	9	410	11	86	0.004	<0.01%	0.69	10	2	1.9	204	0.54	0.05	9	0.27%	0.49	2.1	50	1.2	23	50	113
Claystone	3911	30	36	0.76%	749	0.85	0.69%	8.3	48	520	17	77	0.003	0.03%	0.50	23	3	2.5	229	0.62	0.05	9	0.58%	0.39	2.3	143	1.2	29	91	185
Sandstone	3954	42	40	0.67%	79	1.82	0.77%	10.5	73	540	21	112	0.005	0.62%	0.80	23	3	3.3	404	0.83	0.06	13	0.57%	0.93	2.8	172	1.8	28	121	177
Claystone	3962	29	30	0.94%	357	0.93	0.81%	7.8	24	480	17	135	0.002	0.03%	0.87	20	3	2.8	178	0.70	0.11	12	0.43%	0.55	3.2	125	1.9	26	100	121
Conglomerate	3978	29	21	0.44%	411	1.62	1.44%	6.6	11	380	11	71	0.002	0.35%	0.88	10	2	1.9	142.5	0.55	0.05	9	0.26%	0.63	2.1	50	1.3	22	44	100
Sandstone	4025	29	18	0.27%	107	1.46	1.50%	5.5	15	310	19	81	0.002	0.86%	1.55	7	2	1.7	201	0.50	0.05	9	0.24%	1.23	2.0	54	1.1	19	50	100
Siltstone	4057	31	33	0.85%	515	0.67	0.89%	7.5	17	450	18	107	0.003	0.01%	0.89	21	2	2.8	410	0.63	0.07	12	0.44%	0.56	3.1	120	1.7	26	105	119
Sandstone	4079	21	28	0.47%	756	0.81	1.40%	6.0	14	370	13	74	0.003	0.96%	0.65	14	2	2.0	238	0.49	0.05	8	0.38%	1.26	2.0	82	1.2	22	73	112
Siltstone	4080	32	31	0.61%	359	1.49	1.38%	7.5	18	470	19	99	0.004	1.26%	1.25	18	2	2.5	243	0.63	0.08	11	0.47%	1.75	3.1	113	1.5	26	90	149
Carb Claystone	4479	28	39	0.92%	209	0.93	0.89%	7.2	19	470	18	114	0.004	0.17%	1.17	19	2	2.7	214	0.62	0.1	11	0.47%	0.62	3.1	130	1.7	26	110	120
Sandstone	4480	27	32	0.90%	863	0.94	1.16%	6.5	17	430	16	103	0.002	0.11%	0.97	17	2	2.3	206	0.56	0.05	10	0.40%	0.51	2.9	109	1.5	25	93	108
Sandstone	4483	23	17	0.44%	503	1.21	1.93%	5.1	7	340	11	73	0.002	<0.01%	0.59	10	1	1.6	258	0.42	0.05	7	0.30%	0.33	1.7	67	1.0	18	49	87
Siltstone	4547	29	28	0.61%	1700	0.79	1.11%	6.8	18	570	17	102	0.002	<0.01%	1.02	17	3	2.4	246	0.56	0.07	11	0.38%	0.56	3.0	109	1.5	27	92	106
Weathered Zone	5240	18	17	0.42%	541	0.88	1.71%	5.1	7	340	11	75	0.002	0.03%	0.54	9	1	1.5	179.5	0.41	0.05	7	0.30%	0.38	1.7	69	1.9	17	50	88
Sandstone	12041		24	0.56%	124	2.00	1.49%	5.7	19	349	14	90	0.050	0.32%	1.90	11	2	1.7	184.2	0.46	0.1	8	0.38%	1.46	2.3	117	1.1	17	79	95
Sandstone	12108		28	0.76%	625	0.60	1.42%	6.0	11	453	12	97	0.050	0.02%	0.70	14	2	2.1	274.5	0.48	0.1	9	0.38%	0.47	2.5	100	1.3	20	89	100
Carb Siltstone	12112		30	0.87%	531	0.50	0.87%	6.6	16	430	18	125	0.050	0.04%	0.80	17	2	2.7	257.5	0.55	0.1	11	0.39%	0.64	3.1	123	1.6	22	100	104
Sandstone	12114		27	0.80%	659	0.90	1.35%	5.6	14	431	12	89	0.050	0.02%	0.90	13	2	2.0	298.8	0.45	0.1	9	0.34%	0.46	2.4	94	1.2	20	86	95
Sandstone	12118		21	0.53%	223	0.80	1.58%	4.8	10	308	10	81	0.050	0.04%	0.70	9	2	1.5	217.9	0.39	0.1	8	0.28%	0.47	1.9	77	0.9	14	59	86
Sandstone	12134		28	0.72%	278	0.80	1.65%	5.9	9	400	14	96	0.050	0.03%	0.70	13	2	2.1	319.7	0.46	0.1	9	0.38%	0.49	2.6	94	1.2	20	87	103
Carb Siltstone	12136		32	0.81%	154	1.80	0.68%	6.2	21	285	22	111	0.050	0.25%	1.40	18	2	2.6	298.8	0.53	0.1	12	0.35%	0.71	3.8	132	1.5	26	108	105
Siltstone	12150		21	0.69%	180	2.30	1.03%	9.0	12	582	17	104	0.050	0.20%	1.50	12	2	2.3	308.2	0.57	0.1	11	0.33%	0.90	3.1	79	1.8	29	105	175
Sandstone	12159		23	0.75%	622	0.70	1.50%	5.6	11	497	13	97	0.050	0.03%	0.80	14	2	1.9	325.8	0.44	0.1	8	0.38%	0.49	2.4	100	1.2	22	88	105
Sandstone	12163		23	0.62%	1085	0.60	1.38%	5.7	9	349	10	72	0.050	0.09%	0.80	11	2	1.8	247.8	0.43	0.1	8	0.41%	0.47	2.1	92	1.0	17	77	94
Siltstone	12166		22	0.77%	1965	0.60	1.11%	4.9	7	1269	12	80	0.050	0.10%	0.70	13	2	1.8	257.9	0.39	0.1	8	0.31%	0.48	2.3	91	1.1	24	76	87
Median Soil Abundance*		40	25	0.50%	1000	1.2	0.50%	10	50	800	35	150	-	0.07%	1	7	0.40	4.0	250	2	-	9.0	0.50%	0.20	2	90	1.5	40	90	400
Detection Limit		*0.5*	*0.2*	*0.01%*	*5*	*0.05*	*0.01%*	*0.1*	*0.2*	*10*	*1*	*0.1*	*0.002*	*0.01%*	*0.05*	*0.1*	*1*	*0.2*	*0.2*	*0.05*	*0.05*	*0.2*	*0.005%*	*0.02*	*0.1*	*1*	*0.10*	*0.1*	*2*	*0.5*

< element at or below analytical detection limit. **Bowen H.J.M.(1979) Environmental Chemistry of the Elements.*

Table B6: Geochemical abundance indices (GAI) of sample solids.

Lithology	Sample No	Element																																																
		Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	F	Fe	Ga	Ge	Hf	Hg	In	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr
Tuff	3778	0	0	0	0	0	2	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	1	0	0	0	0	0
Sandstone	3831	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	3833	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	0	0	0	0	0	0	0
Siltstone	3850	1	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	3852	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	0	0	0	0	0	0	0
Carb Siltstone	3859	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Weathered Zone	5216	0	0	0	0	1	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Weathered Zone	5221	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	0	0	0	0	0	0	0
Sandstone	3880	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	3886	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	1	0	1	0		0	0	0	0	0	0	0	0	0
Weathered Zone	5232	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	0	0	3	0	0	0
Conglomerate	3900	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0
Claystone	3911	0	0	1	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	1	2	0	0	0		0	0	0	0	0	0	0	0	0
Sandstone	3954	0	0	2	0	0	2	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		3	0	1	2	0	0	0		0	0	2	0	0	0	0	0	0
Claystone	3962	0	0	0	0	0	2	1	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Conglomerate	3978	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		2	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	4025	0	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		3	0	0	2	0	0	0		0	0	2	0	0	0	0	0	0
Siltstone	4057	0	0	0	0	0	2	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	4079	0	0	2	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		3	0	0	2	0	0	0		0	0	2	0	0	0	0	0	0
Siltstone	4080	0	0	1	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		4	0	1	2	0	0	0		0	0	3	0	0	0	0	0	0
Carb Claystone	4479	0	0	1	0	0	2	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	4480	0	0	0	0	0	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	4483	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0
Siltstone	4547	1	0	1	0	0	2	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Weathered Zone	5240	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0
Sandstone	12041	0	0	4	0	0	2	0	0	0		1	0	0	0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0		2	0	0	2	0	0	0		0	0	2	0	0	0	0	0	0
Sandstone	12108	0	0	0	0	0	2	0	0	0		0	0	0	0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0
Carb Siltstone	12112	0	0	0	0	0	2	1	0	0		0	0	1	0		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	12114	0	0	0	0	0	2	0	0	0		0	0	0	0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	12118	0	0	0	0	0	1	0	0	0		0	0	0	0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	12134	0	0	0	0	0	2	0	0	0		0	0	0	0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0
Carb Siltstone	12136	0	0	1	0	0	2	1	0	0		1	0	1	0		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0		1	0	1	2	0	0	0		0	0	1	0	0	0	0	0	0
Siltstone	12150	0	0	2	0	0	3	0	0	0		0	0	0	0		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0		1	0	0	2	0	0	0		0	0	2	0	0	0	0	0	0
Sandstone	12159	0	0	0	0	0	2	0	0	0		0	0	0	0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0
Sandstone	12163	0	0	0	0	0	2	0	0	0		0	0	0	0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0
Siltstone	12166	0	0	0	0	0	2	0	0	0		0	0	0	0		1	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0		0	0	0	2	0	0	0		0	0	1	0	0	0	0	0	0

Table B7: Multi-element composition of water extracts for selected samples.

Lithology	Total S in Solid (%)	Sample No	Element																																	
			pH	EC	Ag	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Si	Sn	SO_4	Sr	Th	Tl	U	Zn
				dS/m	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l		mg/l	mg/l
Tuff	<0.01	3778	7.9	0.35	<0.010	<0.10	0.084	0.91	0.012	<0.010	1	<0.0010	47	<0.010	<0.010	<0.010	1.0	<0.50	<0.0010	3	1	0.400	0.385	119	<0.010	<1	<0.010	0.010	<0.10	75.7	<0.010	69	0.129	<0.010		<0.010	<0.050
Sandstone	<0.01	3831	8.5	0.24	<0.001	0.28	0.066	0.12	0.050	<0.001	<1	<0.0001	8	<0.001	0.001	<0.001	0.9	<0.05	<0.0001	2	<1	0.035	0.033	53	<0.001	<1	<0.001	0.006	0.01	4.1	<0.001	17	0.034	0.001		<0.001	<0.005
Sandstone	<0.01	3833	8.6	0.29	<0.001	0.14	0.030	0.10	0.066	<0.001	1	<0.0001	10	<0.001	<0.001	<0.001	0.7	<0.05	<0.0001	3	<1	0.036	0.032	50	<0.001	<1	<0.001	0.004	<0.01	3.7	<0.001	14	0.068	<0.001		<0.001	<0.005
Siltstone	<0.01	3850	8.7	0.48	<0.001	0.30	0.020	0.08	0.064	<0.001	<1	<0.0001	6	<0.001	<0.001	<0.001	0.7	0.05	<0.0001	3	<1	0.030	0.046	39	<0.001	<1	<0.001	0.005	0.03	3.7	<0.001	19	0.053	<0.001		<0.001	<0.005
Sandstone	<0.01	3852	8.5	0.41	<0.001	0.12	0.044	0.07	0.104	<0.001	2	<0.0001	9	<0.001	<0.001	<0.001	0.8	<0.05	<0.0001	3	<1	0.037	0.029	32	<0.001	<1	<0.001	0.004	0.01	3.8	<0.001	21	0.098	<0.001		<0.001	<0.005
Carb Siltstone	0.02	3859	8.6	0.65	<0.001	0.05	0.017	0.06	0.250	<0.001	4	<0.0001	11	<0.001	<0.001	<0.001	1.0	<0.05	<0.0001	4	2	0.093	0.031	30	<0.001	<1	<0.001	0.001	0.02	2.9	<0.001	59	0.172	<0.001		<0.001	<0.005
Weathered Zone	0.04	5216	7.2	0.28	<0.001	0.02	<0.001	<0.05	<0.001	<0.001	<1	<0.0001	72	<0.001	<0.001	<0.001	0.8	<0.05	<0.0001	<1	<1	<0.001	<0.001	9	<0.001	<1	<0.001	<0.001	<0.01	148.2	<0.001	181	<0.001	<0.001		<0.001	<0.005
Weathered Zone	<0.01	5221	8.5	0.23	<0.001	0.06	0.002	0.06	0.212	<0.001	2	<0.0001	11	<0.001	<0.001	<0.001	0.5	<0.05	<0.0001	<1	<1	<0.001	0.002	34	<0.001	<1	<0.001	<0.001	<0.01	4.6	<0.001	4	0.030	<0.001		<0.001	<0.005
Sandstone	0.22	3880	8.0	0.45	<0.001	<0.01	0.004	0.06	0.426	<0.001	24	<0.0001	10	<0.001	<0.001	<0.001	0.5	<0.05	<0.0001	11	14	0.367	0.009	39	<0.001	<1	<0.001	<0.001	<0.01	2.9	<0.001	217	1.490	<0.001		<0.001	<0.005
Sandstone	<0.01	3886	8.2	0.33	<0.001	0.06	0.007	0.06	0.105	<0.001	2	<0.0001	7	<0.001	<0.001	<0.001	0.6	<0.05	<0.0001	3	1	0.017	0.046	28	<0.001	<1	<0.001	0.004	<0.01	3.6	<0.001	23	0.200	<0.001		<0.001	<0.005
Weathered Zone	<0.01	5232	8.3	0.25	<0.001	0.29	0.002	0.10	0.096	<0.001	<1	<0.0001	40	<0.001	0.001	<0.001	1.0	0.09	<0.0001	<1	<1	0.004	0.006	38	<0.001	<1	<0.001	<0.001	<0.01	6.1	<0.001	9	0.004	<0.001		<0.001	<0.005
Conglomerate	<0.01	3900	8.1	0.43	<0.001	0.03	0.003	0.06	0.288	<0.001	17	<0.0001	8	<0.001	<0.001	<0.001	0.4	<0.05	<0.0001	7	8	0.054	0.004	30	<0.001	<1	<0.001	<0.001	<0.01	2.2	<0.001	134	1.420	<0.001		<0.001	<0.005
Claystone	0.03	3911	8.7	0.50	<0.010	<0.10	<0.010	<0.50	0.063	<0.010	3	<0.0010	15	<0.010	<0.010	<0.010	0.7	<0.50	<0.0010	4	3	0.024	0.016	97	<0.010	<1	<0.010	<0.010	<0.10	48.6	<0.010	140	0.237	<0.010		<0.010	<0.050
Sandstone	0.62	3954	5.5	0.99	<0.001	<0.01	<0.001	0.11	0.080	<0.001	8	0.0002	5	0.069	<0.001	<0.001	0.1	0.08	<0.0001	6	9	0.033	0.001	126	0.122	<1	<0.001	<0.001	0.04	4.1	<0.001	363	1.790	<0.001		<0.001	0.163
Claystone	0.03	3962	8.2	0.45	<0.001	0.62	0.006	0.10	0.065	<0.001	<1	<0.0001	8	0.001	0.001	<0.001	0.8	0.09	<0.0001	3	<1	<0.001	0.049	43	0.002	<1	<0.001	0.005	0.03	6.0	<0.001	43	0.039	<0.001		<0.001	<0.005
Conglomerate	0.35	3978	7.8	0.68	<0.001	0.02	<0.001	<0.05	0.280	<0.001	14	<0.0001	7	0.003	<0.001	<0.001	0.4	<0.05	<0.0001	4	8	0.074	0.006	16	0.006	<1	<0.001	<0.001	<0.01	2.1	<0.001	87	0.550	<0.001		<0.001	0.011
Sandstone	0.86	4025	7.2	0.69	<0.001	<0.10	0.046	<0.50	1.400	<0.010	18	<0.0010	41	0.127	<0.010	<0.010	0.3	<0.50	<0.0001	4	9	0.731	0.075	68	0.086	<1	<0.010	0.017	<0.10	1.9	<0.010	177	1.970	<0.001		<0.001	0.102
Siltstone	0.01	4057	8.9	0.42	<0.001	0.04	0.021	<0.05	0.001	<0.001	1	<0.0001	11	<0.001	<0.001	<0.001	0.3	<0.05	<0.0010	4	<1	<0.001	0.005	82	<0.001	<1	<0.001	<0.001	<0.01	48.6	<0.001	117	0.018	<0.001		<0.001	<0.005
Sandstone	0.96	4079	7.8	0.33	<0.001	<0.01	0.002	0.10	0.078	<0.001	107	<0.0001	7	0.005	<0.001	<0.001	0.6	<0.05	<0.0001	13	9	0.468	0.005	289	0.006	<1	<0.001	<0.001	<0.01	2.8	<0.001	906	4.190	<0.001		<0.001	0.017
Siltstone	1.26	4080	4.9	1.96	<0.001	0.35	0.002	0.12	0.103	0.002	68	0.0020	4	0.293	<0.001	0.004	0.3	5.85	<0.0001	3	24	4.150	<0.001	278	0.258	<1	<0.001	<0.001	<0.01	4.9	<0.001	952	5.280	<0.001		<0.001	0.467
Carb Claystone	0.17	4479	8.4	0.34	<0.010	0.11	0.010	<0.50	<0.010	<0.010	<1	<0.0010	11	<0.010	<0.010	<0.010	0.8	<0.50	<0.0010	3	<1	<0.010	0.013	72	<0.010	<1	<0.010	<0.010	<0.10	44.6	<0.010	163	0.022	<0.010		<0.010	<0.050
Sandstone	0.11	4480	8.2	0.25	<0.010	0.26	0.015	<0.50	<0.010	<0.010	<1	<0.0010	17	<0.010	<0.010	<0.010	0.6	<0.50	<0.0010	3	<1	<0.010	0.016	91	<0.010	<1	<0.010	<0.010	<0.10	42.0	<0.010	156	0.023	<0.010		<0.010	<0.050
Sandstone	<0.01	4483	8.5	0.28	<0.001	0.15	0.017	0.07	0.233	<0.001	2	<0.0001	13	<0.001	<0.001	<0.001	0.6	<0.05	<0.0001	4	<1	0.012	0.008	50	<0.001	<1	<0.001	0.003	<0.01	3.4	<0.001	32	0.104	<0.001		<0.001	<0.005
Siltstone	<0.01	4547	8.4	0.17	<0.010	0.73	0.106	<0.50	<0.010	<0.010	<1	<0.0010	<10	<0.010	<0.010	<0.010	0.6	<0.50	<0.0010	2	<1	<0.010	0.026	113	<0.010	<1	<0.010	0.012	0.10	125.3	<0.010	117	0.027	<0.010		<0.010	<0.050
Weathered Zone	0.03	5240	8.7	0.32	<0.001	0.08	0.002	0.06	0.169	<0.001	1	<0.0001	14	<0.001	<0.001	<0.001	1.0	<0.05	<0.0001	<1	<1	<0.001	0.002	42	<0.001	<1	<0.001	<0.001	<0.01	4.4	<0.001	2	0.011	<0.001		<0.001	<0.005
Sandstone	0.35	12041	6.0	1.28	<0.01*	<0.10*	0.01*	<0.1*	0.1*	<0.01*	24*	<0.005*	18	0.06*	<0.01*	<0.01*	0.1	9.3*	IS	9*	6*	0.82*	<0.01*	173*	0.03*	<1	<0.01*	0.01*	0.03*	3.97	<0.01*	422	2.5*	IS	<0.01*	IS	0.16*
Sandstone	0.01	12108	9.8	0.58	<0.001	0.27	0.040	0.15	0.341	<0.001	5	<0.0001	18	<0.001	<0.001	<0.001	1.0	<0.05	<0.0001	3	<1	0.002	0.023	109	<0.001	<1	<0.001	0.003	0.01	4.77	<0.001	111	0.348	<0.001	<0.001	<0.001	<0.005
Carb Siltstone	0.04	12112	8.5	0.42	<0.010	0.23	0.007	0.12	0.043	<0.001	2	<0.0001	14	<0.001	0.001	0.001	0.4	<0.05	<0.0001	5	<1	0.009	0.017	126	<0.001	<1	<0.001	0.003	0.03	10.80	<0.001	173	0.359	<0.010	<0.001	<0.010	<0.005
Sandstone	0.01	12114	9.8	0.54	<0.001	3.86	0.073	0.12	0.157	<0.001	<1	<0.0001	15	0.001	0.003	<0.001	0.7	0.58	<0.0001	4	<1	0.003	0.033	103	<0.001	<1	<0.001	0.003	0.02	8.37	<0.001	54	0.137	<0.001	<0.001	<0.001	<0.005
Sandstone	0.02	12118	9.7	0.44	<0.001	1.70	0.041	0.07	0.236	<0.001	<1	<0.0001	24	<0.001	0.002	<0.001	0.5	0.20	<0.0001	3	<1	<0.001	0.037	81	<0.001	<1	<0.001	0.001	<0.01	4.67	<0.001	33	0.081	<0.001	<0.001	<0.001	<0.005
Sandstone	0.01	12134	8.8	0.33	<0.001	10.50	0.031	0.13	0.233	<0.001	<1	<0.0001	15	<0.001	0.007	0.002	0.6	1.44	<0.0001	4	<1	0.005	0.026	54	<0.001	<1	0.001	<0.001	<0.01	37.21	<0.001	24	0.080	<0.001	<0.001	<0.001	0.009
Carb Siltstone	0.28	12136	6.9	0.85	<0.001	0.08	<0.001	0.07	0.068	<0.001	23	0.0003	6	0.057	<0.001	0.003	0.1	<0.05	<0.0001	4	4	0.070	<0.001	145	0.060	<1	<0.001	<0.001	0.03	2.85	<0.001	357	2.390	<0.001	<0.001	<0.001	0.082
Siltstone	0.16	12150	8.2	0.54	<0.001	0.29	0.023	0.12	0.060	<0.001	8	<0.0001	15	0.006	<0.001	<0.001	0.5	<0.05	<0.0001	4	1	0.020	0.044	139	0.008	<1	<0.001	0.002	0.02	7.57	<0.001	251	0.734	<0.001	<0.001	<0.001	0.010
Sandstone	0.01	12159	8.9	0.50	<0.001	1.50	0.072	0.15	1.060	<0.001	6	<0.0001	335	0.007	<0.001	0.012	0.9	3.28	<0.0001	4	1	0.139	0.012	87	0.008	<1	0.003	0.002	<0.01	5.98	<0.001	19	0.463	<0.001	<0.001	<0.001	0.046
Sandstone	0.08	12163	9.1	0.53	<0.001	4.24	0.071	0.22	0.192	<0.001	1	<0.0001	14	<0.001	0.003	<0.001	1.5	0.56	<0.0001	3	<1	0.009	0.041	119	<0.001	<1	<0.001	0.006	0.01	21.27	<0.001	37	0.068	<0.001	<0.001	<0.001	<0.005
Siltstone	0.06	12166	9.7	0.68	<0.001	2.52	0.034	0.17	0.105	<0.001	1	<0.0001	13	<0.001	0.002	<0.001	1.3	0.37	<0.0001	3	<1	0.006	0.036	117	<0.001	<1	<0.001	0.003	0.01	14.07	<0.001	62	0.074	<0.001	<0.001	<0.001	<0.005
Detection Limit				*0.001*	*0.001*	*0.01*	*0.001*	*0.05*	*0.001*	*0.001*	*1*	*0.0001*	*1*	*0.001*	*0.001*	*0.001*	*0.1*	*0.05*	*0.0001*	*1*	*1*	*0.001*	*0.001*	*1*	*0.001*	*1*	*0.001*	*0.001*	*0.01*	*0.05*	*0.001*	*1*	*0.001*	*0.001*	*0.001*	*0.001*	*0.005*

< element at or below analytical detection limit.

Table B8: Total S results for CHPP discharged rejects releavnt to the Project.

Date	Time	Seam	Seam Group	Raw Coal Total S (%)	Coarse Rejects Total S (%)	Fine Rejects Total S (%)
5/10/12	7:00am	Upper Hebden	Hebden	0.47	0.09	4.45
6/10/12	7:00am	Lem B	Lemington	0.68	1.39	3.81
7/10/12	7:00am	Upper Liddell/Upper Hebden	Liddell/Hebden	0.58	1.04	3.13
8/10/12	7:00am	AUL/RAV F	Arties/Ravensworth	0.47	0.03	0.54
9/10/12	7:00am	AUL	Arties	0.58	0.04	
10/10/12	7:00am	AUL/RAV F	Arties/Ravensworth			2.45
11/10/12	7:00am	Upper Hebden	Hebden	0.46	0.23	4.57
12/10/12	7:00am	Lem B	Lemington	0.71		0.58
14/10/12	7:00am	Lem B	Lemington	0.88	0.36	4.14
22/10/12	7:00am	Lem B	Lemington	0.46	0.47	0.18
23/10/12	7:00am	LLD/Rav H	Liddell/Ravensworth	0.37	0.04	1.39
27/10/12	7:00am	LLD/Rav F	Liddell/Ravensworth	0.59	0.25	1.77
28/10/12	7:00am	LLD	Liddell	0.60	1.04	0.93
29/10/12	7:00am	ULD	Liddell	0.74	1.06	0.95
30/10/12	7:00am	LLD/Rav F	Liddell/Ravensworth	0.43	0.03	1.13
31/10/12	7:00am	Lem B	Lemington	0.57	0.42	1.99
11/11/12	7:00am	AUL/RAV F	Arties/Ravensworth	0.47	0.05	0.65
12/11/12	7:00am	AUL/RAV F	Arties/Ravensworth	0.42	0.04	3.27
13/11/12	7:00am	AUL/RAV F	Arties/Ravensworth	0.46		2.27
14/11/12	7:00am	AUL/RAV F	Arties/Ravensworth	0.73	0.23	1.49
19/11/12	7:00am	ULD	Liddell	0.70		1.35
20/11/12	7:00am	Barrett/Rav F	Barrett/Ravensworth	0.52	0.06	1.58
21/11/12	7:00am	ULD/Upper Hebden	Liddell/Hebden	0.70	0.24	4.26
22/11/12	7:00am	Lem A	Lemington	0.51	0.23	0.23
23/11/12	0.50	Lem A, Arties	Lemington	0.46	0.05	0.41
24/11/12	7:00am	Lem A	Lemington	0.53	0.31	1.04
25/11/12	7:00am	Lem A	Lemington	0.38	0.84	1.20
26/11/12	7:00am	LLD	Liddell	0.49	0.05	1.11
27/11/12	7:00am	Lem B	Lemington	0.47	0.23	
28/11/12	7:00am	Lem B	Lemington	0.70	0.20	
30/11/12	7:00am	Lower Hebden	Hebden	0.48	0.24	
1/12/12	7:00am	Lower Hebden	Hebden		0.39	
3/12/12	0.58	AUL	Arties		0.66	0.87
4/12/12	7:00am	Lem A	Lemington	0.58	0.64	4.57
5/12/12	7:00am	Lem B	Lemington		0.06	1.14
6/12/12	7:00am	Lower Hebden	Hebden	0.75	0.07	
7/12/12	7:00am	MLD-B	Liddell	0.56	0.16	
8/12/12	7:00am	AUL	Arties	0.37	0.21	
9/12/12	7:00am	MLD-B	Liddell	0.51	0.23	
10/12/12	7:00am	MLA	Liddell	0.54	0.17	
12/12/12	7:00am	Lem A	Lemington	0.69	0.47	1.13
14/12/12	7:00am	MLA/Upper Hebden	Liddell/Hebden	0.65	0.21	1.57
17/12/12	7:00am	AUL/Barrett	Arties/Barrett	0.63	0.21	0.62
18/12/12	7:00am	ULD	Liddell	0.66	0.52	0.87
19/12/12	7:00am	ULD	Liddell	0.66	0.62	0.84
20/12/12	7:00am	LLD	Liddell	0.44	0.06	0.55
21/12/12	7:00am	LLD	Liddell	0.56	0.20	0.55
23/12/12	7:00am	Barrett/LLD	Barrett/Liddell	0.33	0.23	0.73
28/12/12	7:00am	AUL	Arties	0.39	0.21	0.84
29/12/12	7:00am	AUL	Arties	0.49	0.12	0.62
30/12/12	7:00am	Pikes Gully	Pikes Gully	0.74	0.20	0.65

Table B8: Total S results for CHPP discharged rejects releavnt to the Project.

Date	Time	Seam	Seam Group	Raw Coal Total S (%)	Coarse Rejects Total S (%)	Fine Rejects Total S (%)
4/1/13	7:00am	AUL	Arties	0.38	0.08	0.52
5/1/13	7:00am	Upper Hebden	Hebden	0.58	0.35	1.04
6/1/13	7:00am	Upper Hebden	Hebden	0.53	0.45	1.89
7/1/13	12:30pm	ULA	Liddell	0.72	0.78	0.68
9/1/12	7:00am	AUL	Arties	0.46	0.52	
14/1/13	7:00am	Barrett	Barrett	0.53	0.42	0.52
16/1/13	12:00md	Lem B	Lemington	0.53	0.21	0.40
17/1/13	7:00am	Barrett	Barrett	0.41	0.34	0.63
18/1/13	7:00am	Barrett	Barrett	0.53	0.36	0.66
19/1/13	7:00am	Upper Hebden	Hebden	0.57	0.68	0.80
20/1/13	12:30pm	MLA	Liddell	0.55	0.55	0.89
21/1/13	7:00am	MLA	Liddell	0.57	0.39	0.26
22/1/13	12:00md	Pikes Gully	Pikes Gully	0.52	0.16	0.26
23/1/13	7:00am	Barrett	Barrett	0.49	0.29	0.84
25/1/13	7:00am	Lower Hebden	Hebden	0.52	0.20	0.42
27/1/13	7:00am	Barrett	Barrett	0.64	0.23	0.42
1/2/13	12:00pm	Arties 3	Arties	0.42	0.04	0.13
2/2/13	7:00am	Arties 3	Arties	0.38	0.03	0.23
5/2/13	7:00am	LMA	Lemington	0.52	0.51	0.24
6/2/13	7:00am	MLA/MLB	Liddell	0.65	0.25	1.49
11/2/13	7:00am	Barrett	Barrett	0.62	0.36	0.68
12/2/13	7:00am	MLT	Liddell	0.63	0.15	0.34
15/2/13	3:40pm	LMA	Lemington	0.52	0.22	0.41
16/2/12	1:40pm	LMA	Lemington	0.52	0.15	0.38
17/2/12	7:00pm	LMA	Lemington	0.56	0.22	0.32
18/2/12	7:00am	LMA	Lemington	0.59	0.24	0.27
19/2/12	7:00am	AUL	Arties		0.13	1.27
25/2/13	7:00am	AUL/Arties 3	Arties	0.80	0.57	1.26
26/2/13	7:00am	Arties 3	Arties	0.35	0.21	1.15
27/2/13	7:00am	MLA	Liddell	0.54	0.88	0.69
28/2/13	7:00am	ULD	Liddell	0.71	0.72	0.72
1/3/13	7:00am	AUL/Arties 3	Arties	0.56	0.03	0.78
4/3/13	7:00am	MLA	Liddell	0.63	1.07	0.58
5/3/13	7:00am	MLA/UHB	Liddell/Hebden	0.52	0.32	0.93
6/3/13	7:00am	MLT	Liddell	0.60	0.06	0.65
8/3/13	2:10pm	Lem B/Bay 3-4	Lemington/Bayswater	0.38	0.13	0.93
9/3/13	7:00am	Lem B/Bay 3-4	Lemington/Bayswater	0.57	0.15	0.32
10/3/13	7:00am	AUL	Arties	0.39	0.05	0.30
11/3/13	7:00am	UHB/MLA	Hebden/Liddell	0.48	0.59	0.79
12/3/13	7:00am	Lem B	Lemington	0.54	0.29	0.52
13/3/13	7:00am	AUL	Arties	0.45	0.14	0.54
14/3/13	7:00am	AUL	Arties	0.43	0.18	0.55
15/3/13	7:00am	LLD/AUL	Liddell/Arties	0.46	0.04	0.39
16/3/13	7:00am	LLD/AUL	Liddell/Arties	0.43	0.11	0.38
18/3/13	7:00am	PKG/BAYS	Pikes Gully/Bayswater		0.18	0.32
19/3/13	7:00am	ULD/MLB	Liddell	0.48	0.09	0.36
20/3/13	7:00am	MLB	Liddell	0.38	0.10	0.27

Table B9: Acid forming characteristics of CHPP discharged rejects relevant to the project.

Date	Time	Seam	Seam Group	Material Type	Raw Coal Total S (%)	EGi Sample No	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					STANDARD NAG TEST			Extended Boil NAGpH	Calculated NAG	ARD Classification
									Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$			
27/10/12	7:00am	LLD/Rav F	Liddell/Ravensworth	Coarse Rejects	0.59	6125			0.25	8	24	-16	3.13	7.6	0	0			NAF
28/10/12	7:00am	LLD	Liddell	Coarse Rejects	0.60	6126			1.07	33	13	20	0.39	3.7	1	14	4.2	10	PAF
31/10/12	7:00am	Lem B	Lemington	Coarse Rejects	0.57	6127			0.42	13	26	-13	1.99	6.9	0	0			NAF
11/11/12	7:00am	AUL/RAV F	Arties/Ravensworth	Coarse Rejects	0.47	6129			0.05	2	33	-32	21.78	7.6	0	0			NAF
12/11/12	7:00am	AUL/RAV F	Arties/Ravensworth	Coarse Rejects	0.42	6130			0.04	1	35	-34	28.65	7.7	0	0			NAF
12/12/12	7:00am	Lem A	Lemington	Coarse Rejects	0.69	6131	9.1	0.33	0.47	14	39	-25	2.72	7.8	0	0			NAF
21/12/12	7:00am	LLD	Liddell	Coarse Rejects	0.56	6132	8.4	0.35	0.20	6	22	-16	3.58	7.5	0	0			NAF
29/12/12	7:00am	AUL	Arties	Coarse Rejects	0.49	6133			0.12	4	42	-38	11.38	7.6	0	0			NAF
30/12/12	7:00am	Pikes Gully	Pikes Gully	Coarse Rejects	0.74	6134	8.6	0.28	0.20	6	27	-21	4.43	7.8	0	0			NAF
5/1/13	7:00am	Upper Hebden	Hebden	Coarse Rejects	0.58	6135	8.5	0.28	0.35	11	31	-20	2.86	7.3	0	0			NAF
16/1/13	12:00md	Lem B	Lemington	Coarse Rejects	0.53	6136	9.1	0.37	0.21	6	31	-25	4.87	7.7	0	0			NAF
18/1/13	7:00am	Barrett	Barrett	Coarse Rejects	0.53	6137	8.9	0.29	0.36	11	30	-19	2.70	7.9	0	0			NAF
22/1/13	12:00md	Pikes Gully	Pikes Gully	Coarse Rejects	0.52	6138	8.8	0.35	0.16	5	27	-22	5.53	7.8	0	0			NAF
25/1/13	7:00am	Lower Hebden	Hebden	Coarse Rejects	0.52	6139	8.7	0.30	0.20	6	30	-24	4.93	7.6	0	0			NAF
6/2/13	7:00am	MLA/MLB	Liddell	Coarse Rejects	0.65	6141	7.8	0.37	0.25	8	31	-23	4.01	7.3	0	0			NAF
11/2/13	7:00am	Barrett	Barrett	Coarse Rejects	0.62	6142	8.2	0.29	0.36	11	25	-14	2.29	7.5	0	0			NAF
25/2/13	7:00am	AUL/Arties 3	Arties	Coarse Rejects	0.80	6143	8.4	0.38	0.78	24	32	-8	1.32	7.6	0	0			NAF
26/2/13	7:00am	Arties 3	Arties	Coarse Rejects	0.35	6144	8.7	0.40	0.21	6	22	-15	3.35	7.8	0	0			NAF
4/3/13	7:00am	MLA	Liddell	Coarse Rejects	0.63	6145	9.0	0.45	0.93	28	31	-3	1.09	4.1	0.1	4	5.2	2	PAF-LC
8/3/13	2:10pm	Lem B/Bay 3-4	Lemington/Bayswater	Coarse Rejects	0.38	6146	8.6	0.43	0.13	4	41	-37	10.23	7.6	0	0			NAF
10/3/13	7:00am	AUL	Arties	Coarse Rejects	0.39	6147	8.8	0.41	0.05	2	38	-37	25.13	7.7	0	0			NAF
27/10/12	7:00am	LLD/Rav F	Liddell/Ravensworth	Fine Rejects	0.59	6148			3.21	98	48	50	0.49	3.5	2	9	4.0	5	PAF-LC
28/10/12	7:00am	LLD	Liddell	Fine Rejects	0.60	6149			0.93	28	48	-19	1.67	7.3	0	0			NAF
31/10/12	7:00am	Lem B	Lemington	Fine Rejects	0.57	6150			2.72	83	88	-5	1.06	7.6	0	0			NAF
11/11/12	7:00am	AUL/RAV F	Arties/Ravensworth	Fine Rejects	0.47	6152			0.65	20	84	-64	4.21	7.7	0	0			NAF
12/11/12	7:00am	AUL/RAV F	Arties/Ravensworth	Fine Rejects	0.42	6153			4.21	129	140	-11	1.09	7.4	0	0			NAF
12/12/12	7:00am	Lem A	Lemington	Fine Rejects	0.69	6154			1.13	35	44	-10	1.28	7.6	0	0			NAF
21/12/12	7:00am	LLD	Liddell	Fine Rejects	0.56	6155			0.50	15	29	-13	1.88	7.5	0	0			NAF
29/12/12	7:00am	AUL	Arties	Fine Rejects	0.49	6156	8.2	0.35	0.62	19	117	-98	6.17	7.9	0	0			NAF
30/12/12	7:00am	Pikes Gully	Pikes Gully	Fine Rejects	0.74	6157	7.8	0.32	0.65	20	61	-41	3.06	7.9	0	0			NAF
5/1/13	7:00am	Upper Hebden	Hebden	Fine Rejects	0.58	6158	8.8	0.32	1.45	44	49	-4	1.10	3.8	1	8	4.1	2	PAF-LC
16/1/13	12:00md	Lem B	Lemington	Fine Rejects	0.53	6159	8.3	0.31	0.40	12	57	-45	4.69	7.3	0	0			NAF
18/1/13	7:00am	Barrett	Barrett	Fine Rejects	0.53	6160	7.8	0.30	0.57	17	19	-2	1.11	7.6	0	0			NAF
22/1/13	12:00md	Pikes Gully	Pikes Gully	Fine Rejects	0.52	6161	7.9	0.29	0.26	8	18	-10	2.29	7.5	0	0			NAF
25/1/13	7:00am	Lower Hebden	Hebden	Fine Rejects	0.52	6162	8.4	0.41	0.42	13	47	-34	3.63	7.7	0	0			NAF
6/2/13	7:00am	MLA/MLB	Liddell	Fine Rejects	0.65	6164	8.5	0.43	1.61	49	51	-2	1.04	6.0	0	1			PAF
11/2/13	7:00am	Barrett	Barrett	Fine Rejects	0.62	6165	8.6	0.35	0.68	21	47	-26	2.27	7.1	0	0			NAF
25/2/13	7:00am	AUL/Arties 3	Arties	Fine Rejects	0.80	6166	8.7	0.48	1.26	39	51	-12	1.32	7.1	0	0			NAF
26/2/13	7:00am	Arties 3	Arties	Fine Rejects	0.35	6568	8.9	0.23	1.04	32	49	-17	1.54	7.2	0	0			NAF
4/3/13	7:00am	MLA	Liddell	Fine Rejects	0.63	6569	9.0	0.32	0.58	18	22	-4	1.22	7.3	0	0			NAF
8/3/13	7:00am	Lem B/Bay 3-4	Arties	Fine Rejects	0.38	6570	9.1	0.38	0.93	28	100	-72	3.52	7.4	0	0			NAF
10/3/13	7:00am	AUL	Arties	Fine Rejects	0.39	6571	9.4	0.21	0.30	9	78	-69	8.55	7.5	0	0			NAF

KEY

$pH_{1:2}$ = pH of 1:2 extract

$EC_{1:2}$ = Electrical Conductivity of 1:2 extract (dS/m)

MPA = Maximum Potential Acidity (kgH_2SO_4/t)

ANC = Acid Neutralising Capacity (kgH_2SO_4/t)

NAPP = Net Acid Producing Potential (kgH_2SO_4/t)

NAGpH = pH of NAG liquor

$NAG_{(pH4.5)}$ = Net Acid Generation capacity to pH 4.5 (kgH_2SO_4/t)

$NAG_{(pH7.0)}$ = Net Acid Generation capacity to pH 7.0 (kgH_2SO_4/t)

Extended Boil NAGpH = pH of NAG liquor after extended heating

Calculated NAG = The net acid potential based on assay of anions and cations released to the NAG solution (kgH_2SO_4/t)

Standard NAG results overestimate acid potential due to organic acid effects

NAF = Non-Acid Forming

PAF = Potentially Acid Forming

PAF-LC = PAF Low Capacity

UC = Uncertain Classification

(expected classification in brackets)

Table B10: Sulphur speciation results for selected rejects samples.

EGi Sample Number	Material Type	Seam Group	Total %S	Pyritic S (%)	Acid Sulphate %S	Total Acid Generating S (%)	Non-Acid Sulphate %S	Other S Forms (%)	Proportion Total Acid Generating to Total S	Original NAPP* (kg H_2SO_4/t)	Readily Available ANC** (kg H_2SO_4/t)	Re-calculated NAPP*** (kg H_2SO_4/t)
6126	Coarse Rejects	Liddell	1.07	0.70	0.00	0.70	0.06	0.31	65%	20	10	12
6143	Coarse Rejects	Arties	0.78	0.60	0.00	0.60	0.05	0.13	77%	-8	29	-11
6145	Coarse Rejects	Liddell	0.93	0.66	0.00	0.66	0.03	0.24	71%	-3	20	0
6148	Fine Rejects	Liddell/Ravensworth	3.21	1.77	0.00	1.77	0.42	1.02	55%	50	49	6
6150	Fine Rejects	Lemington	2.72	2.03	0.00	2.03	0.12	0.57	75%	-5	93	-31
6153	Fine Rejects	Arties/Ravensworth	4.21	2.82	0.00	2.82	0.23	1.16	67%	-11	99	-13
6155	Fine Rejects	Liddell	0.50	0.27	0.00	0.27	0.04	0.19	54%	-13	29	-21
6158	Fine Rejects	Hebden	1.45	1.03	0.00	1.03	0.04	0.38	71%	-4	30	1
6160	Fine Rejects	Barrett	0.57	0.41	0.00	0.41	0.04	0.12	72%	-2	23	-10
6164	Fine Rejects	Liddell	1.61	1.34	0.00	1.34	0.08	0.19	83%	-2	31	10
6568	Fine Rejects	Arties	1.04	0.85	0.00	0.85	0.04	0.15	82%	-3	52	-26

Pyritic S (%) = CRS (%)

Acid Sulphate S = KCl Acid Sulphate S

Total Acid Generating S = Pyritic S + Acid Sulphate S

Non-Acid Sulphate S = KCl S – KCl Acid Sulphate S

Other S Forms = Total S - (CRS + KCl S)

* standard NAPP value based on total S and standard ANC values

** estimated from ABCC testing

***based on acid generating S (pyrite and acid sulphate S) and readily available ANC

Table B11: Multi-element composition of selected rejects sample solids (mg/kg except where shown).

Element	Detection Limit	Rejects Type/Seam Group/Sample Number									
		Coarse Rejects					Fine Rejects				
		Hebden	Lemington	Liddell	Arties	Liddell	Hebden	Lemington	Liddell	Arties	Liddell
		6135	6136	6141	6144	6145	6158	6159	6164	6568	6569
Ag	0.01	0.10	0.10	0.11	0.11	0.11	0.05	0.06	0.06	0.09	0.08
Al	0.01%	6.54%	5.14%	6.98%	7.15%	5.71%	4.82%	3.72%	4.49%	5.03%	4.95%
As	0.2	13.13	16.49	15.52	7.77	40.70	9.52	9.91	15.94	9.10	11.38
B	10	20	31	22	18	21	16	31	10	16	21
Ba	10	7526	241	461	257	251	296	430	542	311	572
Be	0.05	1.34	1.26	1.37	1.34	1.34	1.11	1.22	0.99	1.11	1.36
Bi	0.01	0.40	0.37	0.44	0.43	0.44	0.29	0.29	0.29	0.35	0.41
Ca	0.01%	0.64%	0.64%	0.62%	0.54%	0.37%	1.64%	1.81%	1.15%	1.55%	0.77%
Cd	0.02	0.19	0.17	0.20	0.12	0.21	0.12	0.10	0.12	0.10	0.11
Ce	0.01	23.2	27.1	36.2	52.4	24.5	22.8	19.7	22.7	28.7	33.7
Co	0.1	8.4	10.9	10.3	6.6	10.2	6.6	10.2	8.3	7.7	7.7
Cr	1	32	33	36	39	27	28	19	29	33	40
Cs	0.05	6.91	4.17	7.26	7.85	6.47	4.10	2.83	4.07	5.87	7.57
Cu	0.2	41.2	52.5	61.4	47.0	65.1	29.2	31.1	24.4	34.5	36.0
F	20	430	470	525	435	460	315	280	300	260	225
Fe	0.01%	2.25%	1.50%	2.58%	1.88%	2.99%	2.81%	1.58%	4.99%	2.15%	1.63%
Ga	0.05	21.2	21.5	23.4	21.0	20.7	14.7	13.3	12.6	15.1	16.1
Ge	0.05	0.08	0.20	0.14	0.10	0.19	0.08	0.22	0.08	0.14	0.18
Hf	0.01	3.4	4.3	3.6	4.2	3.2	2.5	2.9	2.3	2.4	2.7
Hg	0.005	0.07	0.08	0.10	0.05	0.35	0.06	0.04	0.16	0.06	0.05
In	0.005	0.08	0.08	0.08	0.08	0.08	0.05	0.05	0.05	0.06	0.06
K	0.01%	1.60%	1.13%	1.53%	1.36%	1.37%	0.98%	0.66%	0.83%	0.97%	1.23%
La	0.5	9.3	11.0	14.6	23.4	9.3	9.5	8.0	9.4	12.3	14.6
Li	0.2	28.6	40.5	38.4	33.5	36.5	23.4	23.4	19.6	21.7	25.9
Mg	0.01%	0.50%	0.40%	0.53%	0.50%	0.40%	0.42%	0.30%	0.45%	0.41%	0.46%
Mn	5	253	129	416	192	408	261	135	684	198	153
Mo	0.05	2.33	2.45	2.75	2.67	3.35	2.05	2.38	2.87	2.79	2.61
Na	0.01%	0.60%	0.63%	0.43%	0.38%	0.40%	0.33%	0.29%	0.22%	0.17%	0.35%
Nb	0.1	7.0	8.2	6.9	6.8	6.0	4.5	4.8	3.8	4.8	5.0
Ni	0.2	16.6	25.8	20.6	20.6	17.5	14.8	15.2	38.1	19.3	24.0
P	10	460	434	841	560	574	343	205	431	380	450
Pb	0.5	18.9	20.3	21.9	18.3	23.3	13.4	12.9	12.4	11.2	13.7
Rb	0.1	46.4	36.8	65.3	73.3	53.6	27.6	13.3	27.1	35.3	61.4
Re	0.002	0.007	0.004	0.006	0.004	0.005	0.002	0.004	0.003	0.004	0.005
S	0.01%	0.35%	0.21%	0.25%	0.21%	0.93%	1.45%	0.40%	1.61%	1.04%	0.58%
Sb	0.05	0.97	0.72	1.00	0.58	1.20	1.18	0.92	0.96	0.83	1.03
Sc	0.1	11.5	8.1	11.9	12.4	8.8	8.7	7.1	8.2	10.7	10.5
Se	1	1.7	1.6	1.6	1.6	1.6	1.2	1.0	1.1	1.2	1.2
Sn	0.2	2.6	3.3	3.3	3.5	2.9	1.7	1.9	1.5	2.1	2.3
Sr	0.2	840	231	293	169	215	271	290	260	242	232
Ta	0.05	0.56	0.72	0.60	0.72	0.60	0.38	0.38	0.33	0.40	0.46
Te	0.05	0.10	0.08	0.11	0.12	0.17	0.08	0.09	0.07	0.07	0.09
Th	0.2	4.9	5.2	7.4	10.0	5.3	4.4	3.4	4.4	5.5	6.4
Ti	0.005%	0.47%	0.51%	0.51%	0.40%	0.40%	0.31%	0.26%	0.25%	0.27%	0.27%
Tl	0.02	0.77	0.64	0.99	0.57	2.19	0.89	0.45	0.99	0.64	0.74
U	0.1	2.8	2.9	3.4	3.2	3.0	1.8	1.2	1.6	1.6	2.2
V	1	98	88	91	75	80	69	68	60	77	77
W	0.1	1.4	3.4	2.4	2.7	2.6	1.0	2.2	0.9	3.4	5.4
Y	0.1	11.9	10.2	14.7	19.4	9.2	10.9	11.0	11.6	13.6	13.4
Zn	2	100	72	103	80	96	59	53	52	56	60
Zr	0.5	104.9	125.5	104.3	126.3	88.4	76.3	90.1	68.1	77.1	84.2

< element at or below analytical detection limit.

Table B12: Geochemical abundance indices (GAI) of selected rejects sample solids. Values 3 and over are highlighted in yellow.

Element	Median Soil Abundance *	Rejects Type/Seam Group/Sample Number									
		Coarse Rejects					Fine Rejects				
		Hebden	Lemington	Liddell	Arties	Liddell	Hebden	Lemington	Liddell	Arties	Liddell
		6135	6136	6141	6144	6145	6158	6159	6164	6568	6569
Ag	0.05	-	-	-	1	1	-	-	-	-	-
Al	7.1%	-	-	-	-	-	-	-	-	-	-
As	6	1	1	1	-	2	-	-	1	-	-
B	20	-	-	-	-	-	-	-	-	-	-
Ba	500	3	-	-	-	-	-	-	-	-	-
Be	0.3	2	1	2	2	2	1	1	1	1	2
Bi	0.2	-	-	1	1	1	-	-	-	-	-
Ca	1.5%	-	-	-	-	-	-	-	-	-	-
Cd	0.35	-	-	-	-	-	-	-	-	-	-
Ce	50	-	-	-	-	-	-	-	-	-	-
Co	8	-	-	-	-	-	-	-	-	-	-
Cr	70	-	-	-	-	-	-	-	-	-	-
Cs	4	-	-	-	-	-	-	-	-	-	-
Cu	30	-	-	-	-	1	-	-	-	-	-
F	200	1	1	1	1	1	-	-	-	-	-
Fe	4.0%	-	-	-	-	-	-	-	-	-	-
Ga	20	-	-	-	-	-	-	-	-	-	-
Ge	1	-	-	-	-	-	-	-	-	-	-
Hf	6	-	-	-	-	-	-	-	-	-	-
Hg	0.06	-	-	-	-	2	-	-	1	-	-
In	1	-	-	-	-	-	-	-	-	-	-
K	1.4%	-	-	-	-	-	-	-	-	-	-
La	40	-	-	-	-	-	-	-	-	-	-
Li	25	-	-	-	-	-	-	-	-	-	-
Mg	0.5%	-	-	-	-	-	-	-	-	-	-
Mn	1000	-	-	-	-	-	-	-	-	-	-
Mo	1.2	-	-	1	1	1	-	-	1	1	1
Na	0.5%	-	-	-	-	-	-	-	-	-	-
Nb	10	-	-	-	-	-	-	-	-	-	-
Ni	50	-	-	-	-	-	-	-	-	-	-
P	800	-	-	-	-	-	-	-	-	-	-
Pb	35	-	-	-	-	-	-	-	-	-	-
Rb	150	-	-	-	-	-	-	-	-	-	-
Re											
S	0.07%	2	1	1	1	3	4	2	4	3	2
Sb	1	-	-	-	-	-	-	-	-	-	-
Sc	7	-	-	-	-	-	-	-	-	-	-
Se	0.4	1	1	1	1	1	1	1	1	1	1
Sn	4	-	-	-	-	-	-	-	-	-	-
Sr	250	1	-	-	-	-	-	-	-	-	-
Ta	2	-	-	-	-	-	-	-	-	-	-
Te											
Th	9	-	-	-	-	-	-	-	-	-	-
Ti	0.50%	-	-	-	-	-	-	-	-	-	-
Tl	0.2	1	1	2	1	3	2	1	2	1	1
U	2	-	-	-	-	-	-	-	-	-	-
V	90	-	-	-	-	-	-	-	-	-	-
W	1.5	-	1	-	-	-	-	-	-	1	1
Y	40	-	-	-	-	-	-	-	-	-	-
Zn	90	-	-	-	-	-	-	-	-	-	-
Zr	400	-	-	-	-	-	-	-	-	-	-

*Bowen H.J.M.(1979) Environmental Chemistry of the Elements.

Table B13: Chemical composition of water extracts from selected rejects samples.

Parameter		Detection Limit	Rejects Type/Seam Group/Sample Number									
			Coarse Rejects					Fine Rejects				
			Hebden	Lemington	Liddell	Arties	Liddell	Hebden	Lemington	Liddell	Arties	Liddell
			6135	6136	6141	6144	6145	6158	6159	6164	6568	6569
pH		0.1	8.8	9.3	8.7	9.2	9.4	9.1	8.7	9.0	8.9	8.8
EC	dS/m	0.001	0.44	0.51	0.41	0.35	0.46	0.48	0.52	0.62	0.45	0.34
Ag	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Al	mg/l	0.01	0.22	0.78	0.32	0.29	0.32	0.22	0.39	0.06	0.05	0.12
As	mg/l	0.001	0.072	0.301	0.042	0.079	0.033	0.019	0.03	0.008	0.013	0.003
B	mg/l	0.05	0.1	0.32	0.18	0.11	0.15	0.18	0.29	0.1	0.11	0.06
Ba	mg/l	0.001	0.172	0.173	0.093	0.109	0.09	0.446	0.467	0.655	1.03	0.471
Be	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ca	mg/l	1	<1	<1	<1	1	<1	2	1	2	3	5
Cd	mg/l	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cl	mg/l	1	26	30	15	18	17	34	53	46	30	10
Co	mg/l	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr	mg/l	0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001
Cu	mg/l	0.001	<0.001	0.005	0.001	0.002	<0.001	0.002	0.004	0.004	0.005	0.003
F	mg/l	0.1	0.6	1.0	0.6	1.3	0.9	0.6	1.0	0.6	1.1	1.1
Fe	mg/l	0.05	<0.05	0.23	0.06	<0.05	0.05	<0.05	0.06	<0.05	<0.05	<0.05
Hg	mg/l	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
K	mg/l	1	3	3	2	2	2	3	3	3	4	3
Mg	mg/l	1	<1	<1	<1	<1	<1	<1	<1	2	3	2
Mn	mg/l	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003
Mo	mg/l	0.001	0.08	0.15	0.07	0.09	0.09	0.04	0.06	0.04	0.04	0.04
Na	mg/l	1	83	129	84	60	122	97	121	111	90	54
Ni	mg/l	0.001	<0.001	0.004	<0.001	0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001
P	mg/l	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Pb	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sb	mg/l	0.001	0.004	0.004	0.004	0.002	0.005	0.003	0.003	0.002	0.001	0.001
Se	mg/l	0.01	0.02	0.03	0.02	0.01	0.02	0.01	0.02	0.01	0.01	<0.01
Si	mg/l	0.1	5.3	27.0	6.4	3.0	4.7	2.2	2.8	1.6	1.3	1.2
Sn	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
SO4	mg/l	1	63	88	85	43	135	100	93	124	118	70
Sr	mg/l	0.001	0.147	0.094	0.117	0.078	0.045	0.285	0.192	0.435	0.286	0.255
Th	mg/l	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001
U	mg/l	0.001	<0.001	0.002	<0.001	0.001	0.002	<0.001	0.001	<0.001	<0.001	<0.001
Zn	mg/l	0.005	<0.005	0.006	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

< element at or below analytical detection limit.

APPENDIX C

Kinetic NAG and ABCC Plots

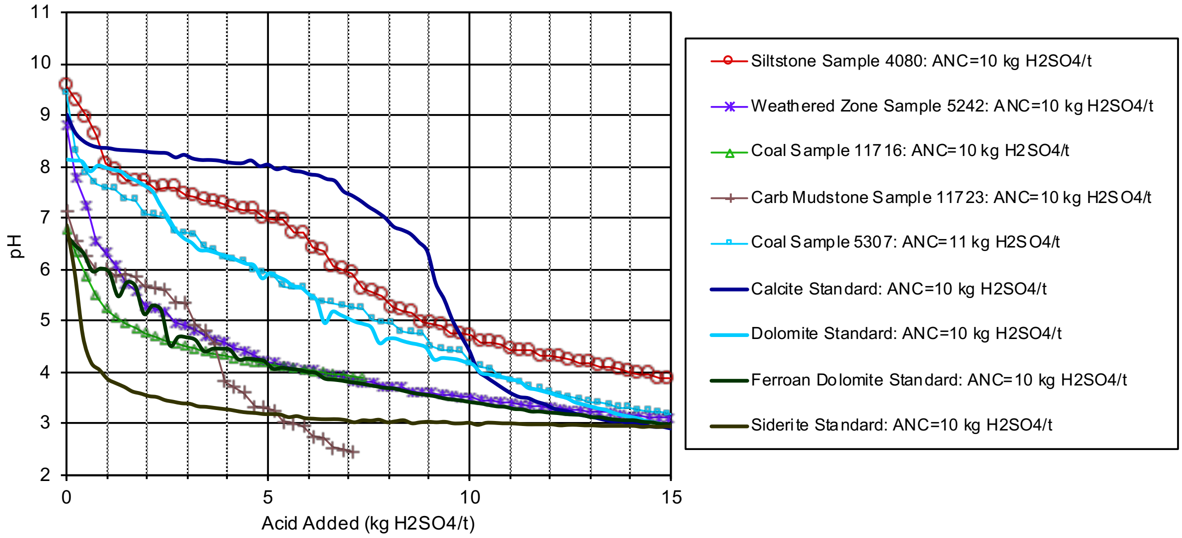


Figure C1: ABCC profile for samples with an ANC value close to 10 kg H_2SO_4/t. Carbonate standard curves are included for reference.

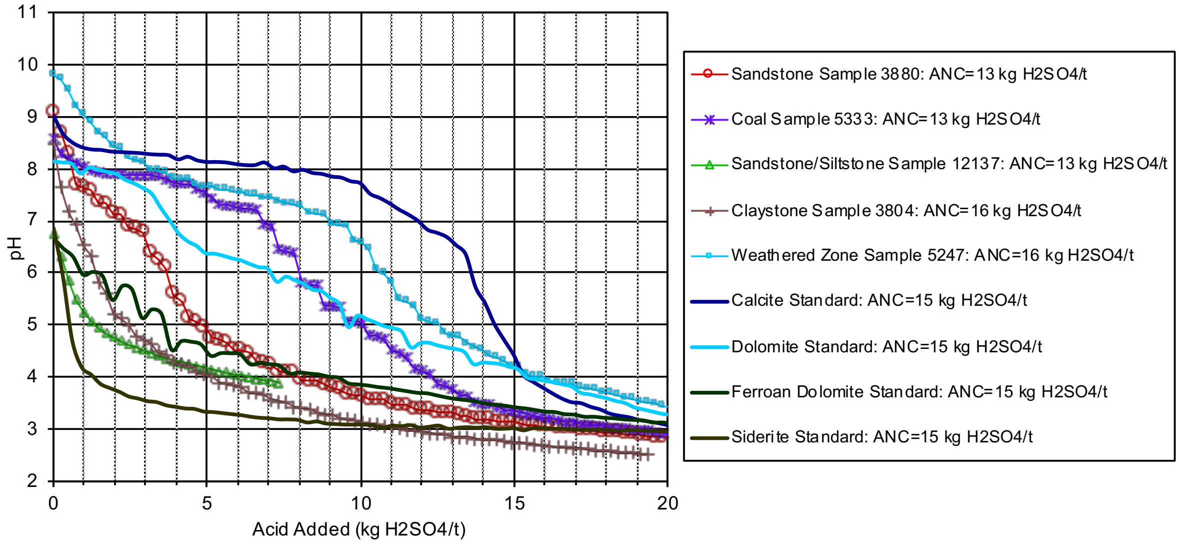


Figure C2: ABCC profile for samples with an ANC value close to 15 kg H_2SO_4/t. Carbonate standard curves are included for reference.

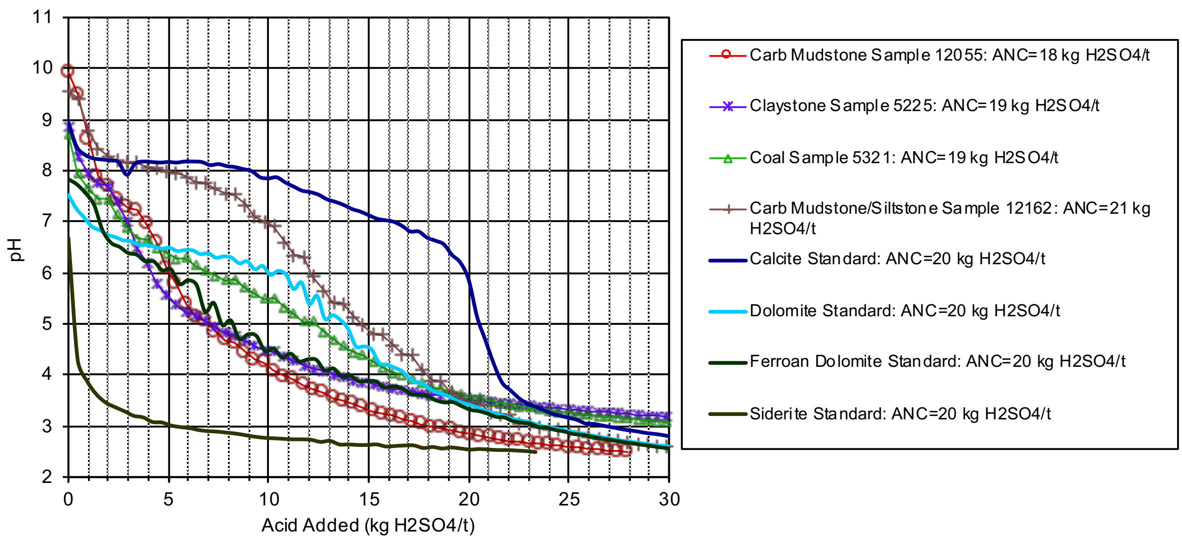


Figure C3: ABCC profile for samples with an ANC value close to 20 kg H_2SO_4/t. Carbonate standard curves are included for reference.

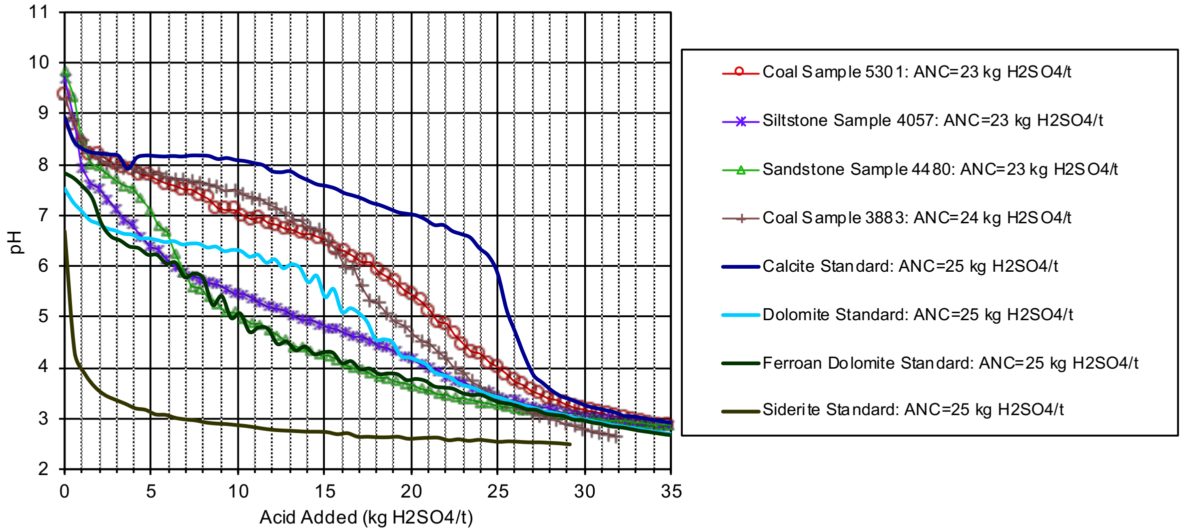


Figure C4: ABCC profile for samples with an ANC value close to 25 kg H_2SO_4/t. Carbonate standard curves are included for reference.

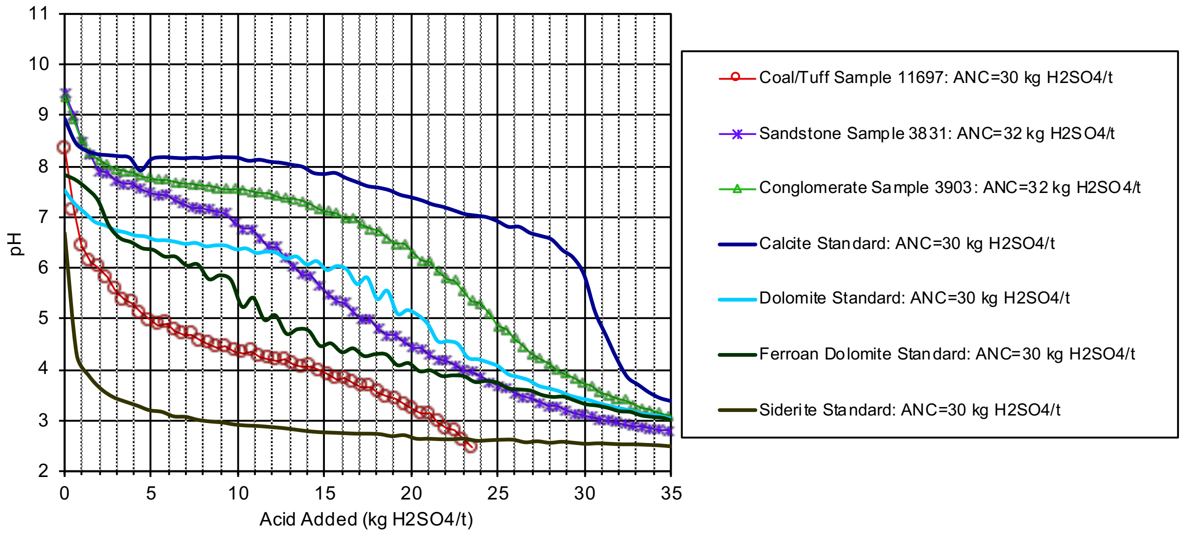


Figure C5: ABCC profile for samples with an ANC value close to 30 kg H_2SO_4/t. Carbonate standard curves are included for reference.

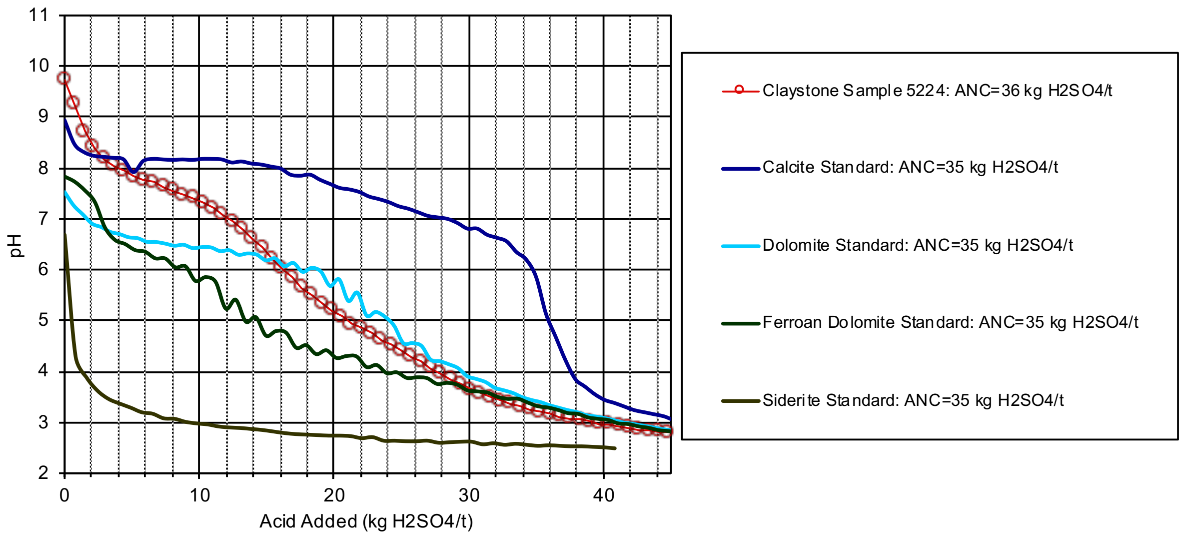


Figure C6: ABCC profile for sample 5224 with an ANC value close to 35 kg H_2SO_4/t. Carbonate standard curves are included for reference.

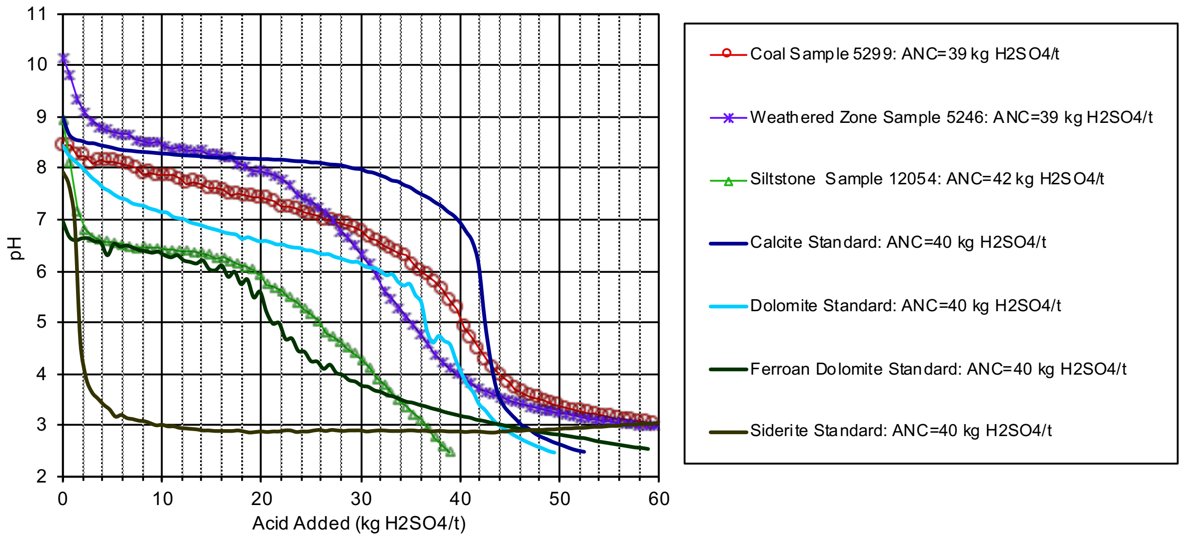


Figure C7: ABCC profile for samples with an ANC value close to 40 kg H_2SO_4/t. Carbonate standard curves are included for reference.

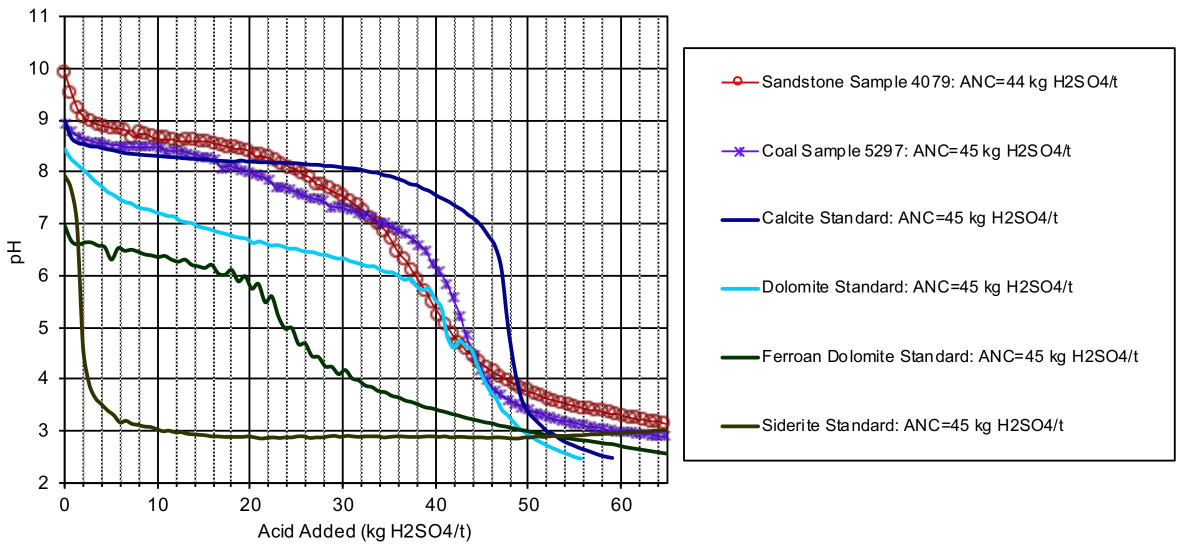


Figure C8: ABCC profile for sample 4079 with an ANC value close to 45 kg H_2SO_4/t. Carbonate standard curves are included for reference.

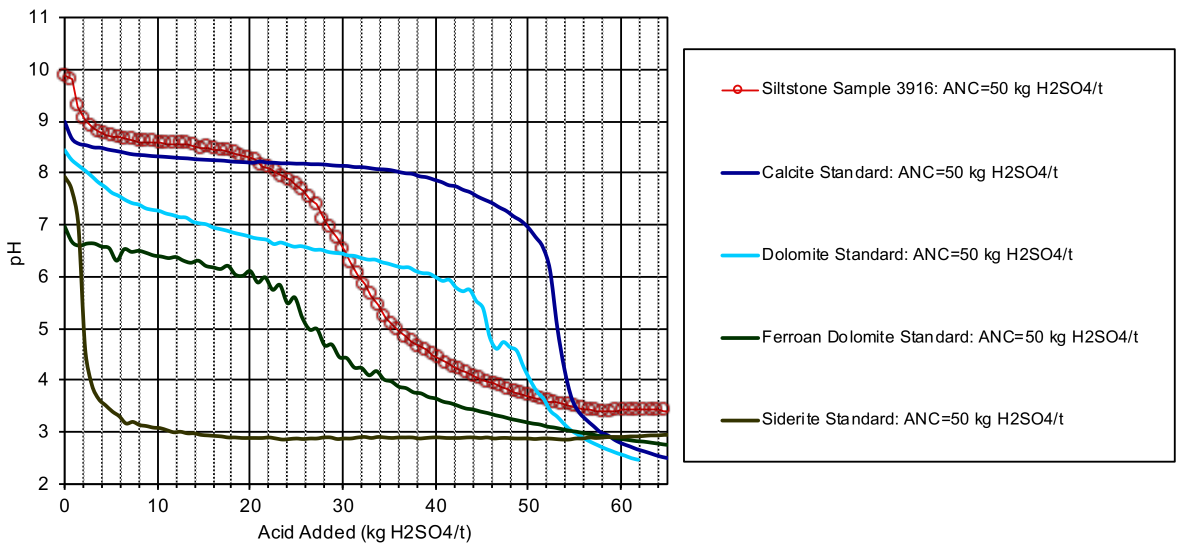


Figure C9: ABCC profile for sample 3916 with an ANC value of 50 kg H_2SO_4/t. Carbonate standard curves are included for reference.

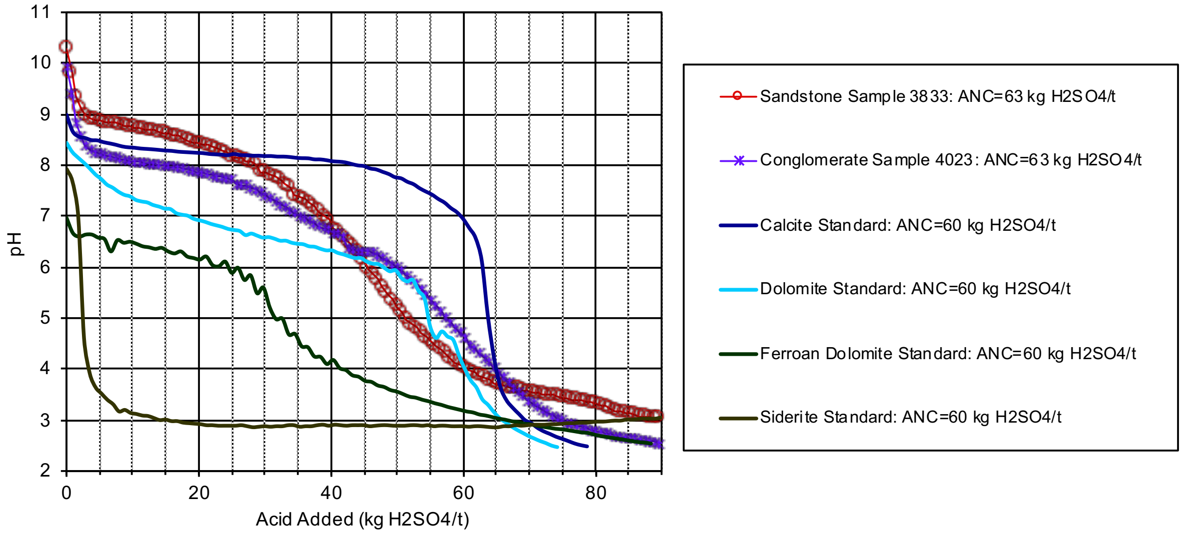


Figure C10: ABCC profile for samples with an ANC value close to 60 kg H_2SO_4/t. Carbonate standard curves are included for reference.

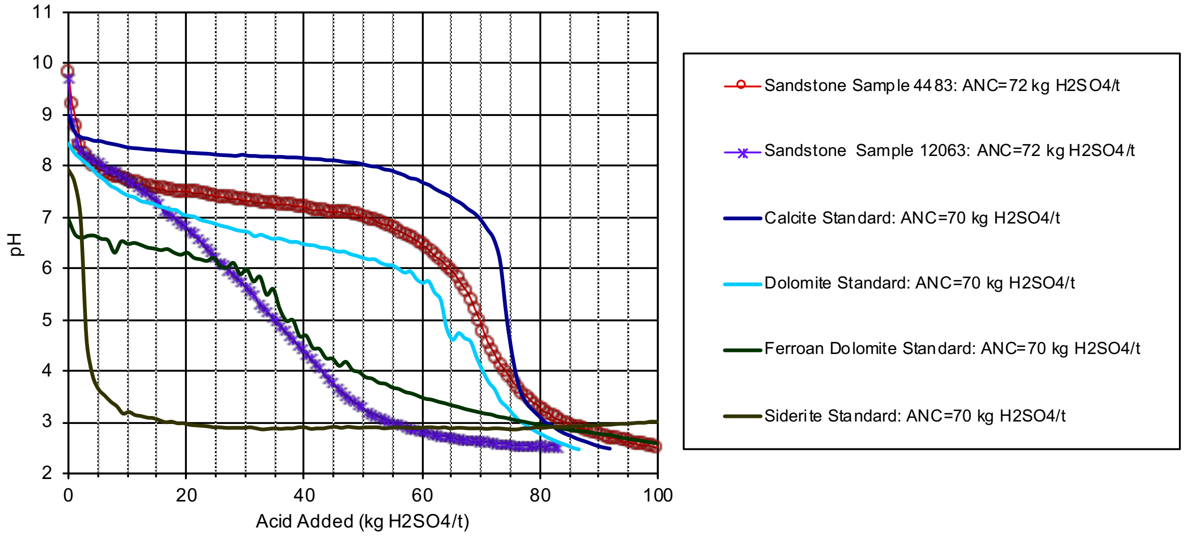


Figure C11: ABCC profile for samples with an ANC value close to 70 kg H_2SO_4/t. Carbonate standard curves are included for reference.

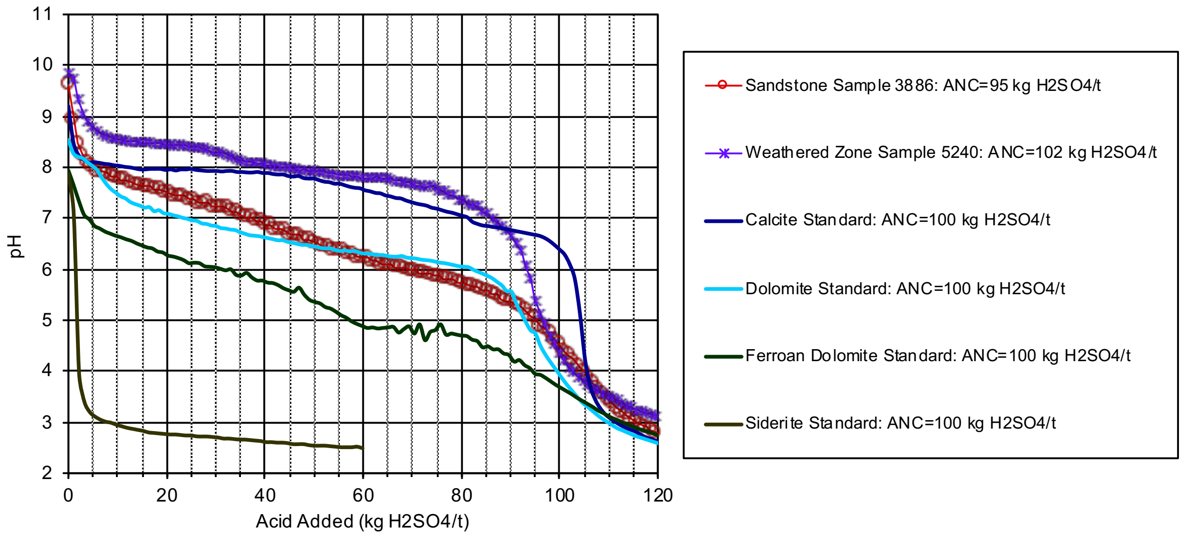


Figure C12: ABCC profile for samples with an ANC value close to 100 kg H_2SO_4/t. Carbonate standard curves are included for reference.

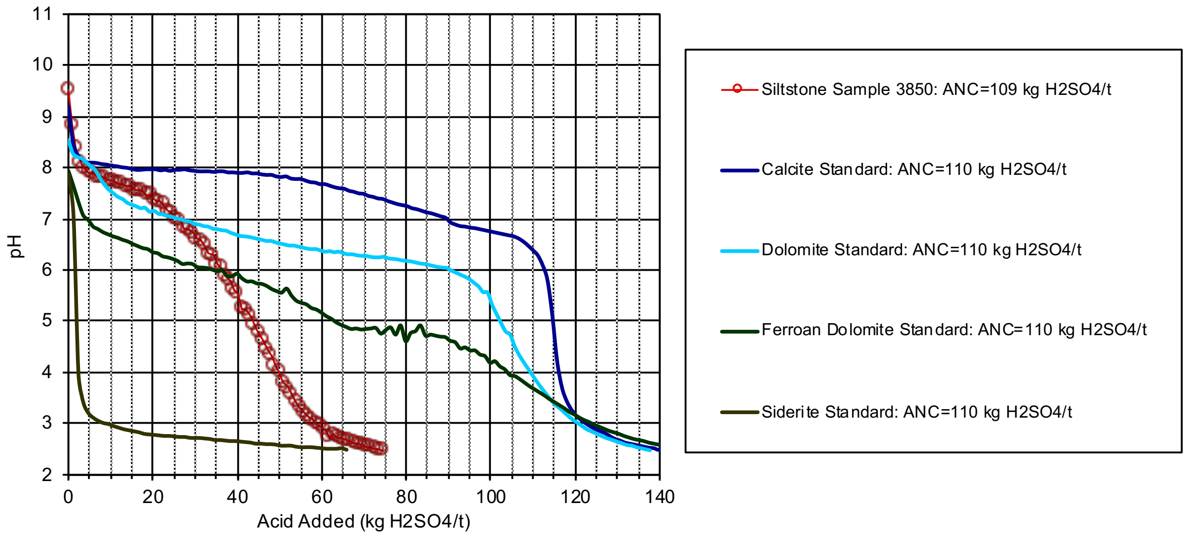


Figure C13: ABCC profile for sample 3850 with an ANC value close to 110 kg H_2SO_4/t. Carbonate standard curves are included for reference.

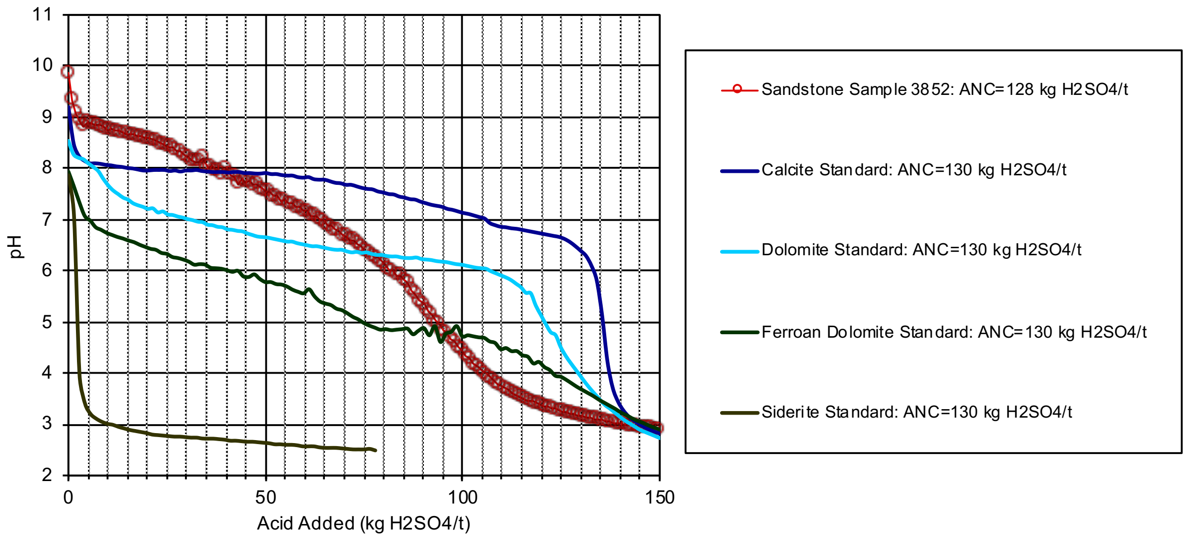


Figure C14: ABCC profile for sample 3850 with an ANC value close to 130 kg H_2SO_4/t. Carbonate standard curves are included for reference.

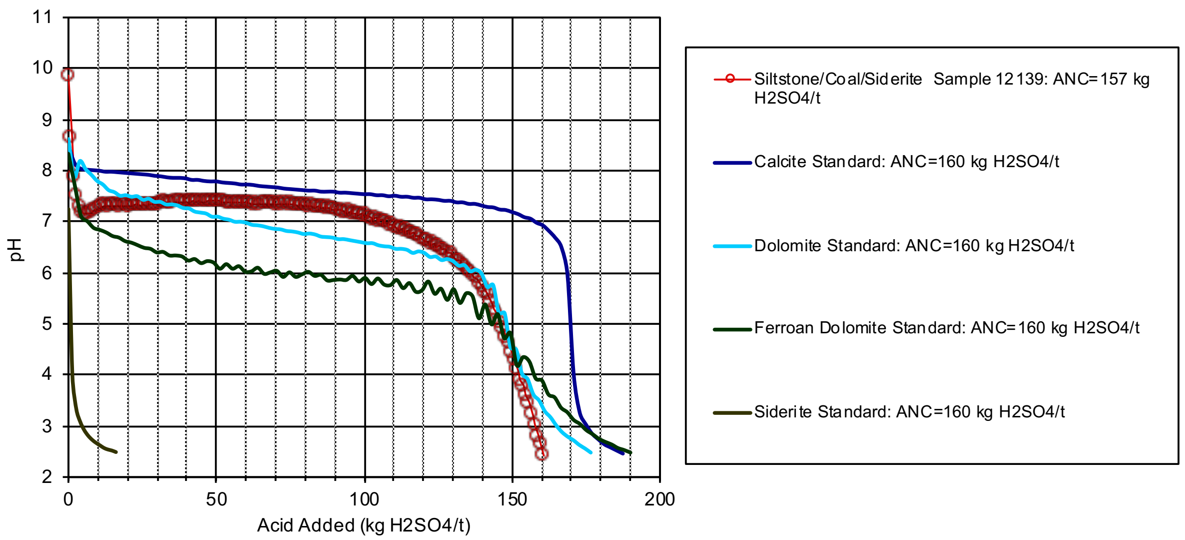
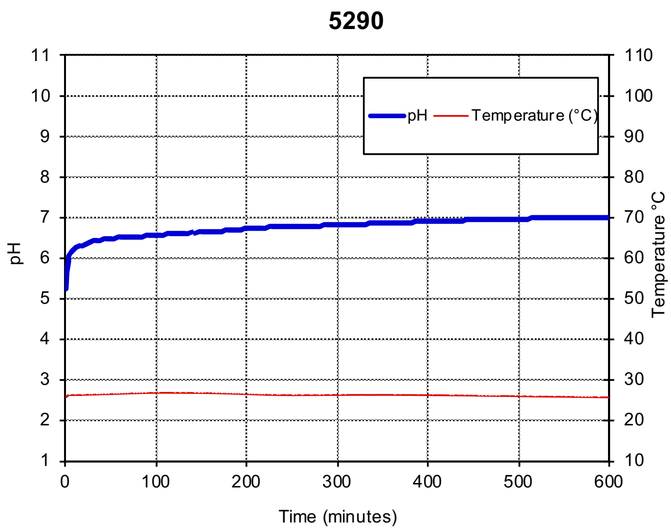
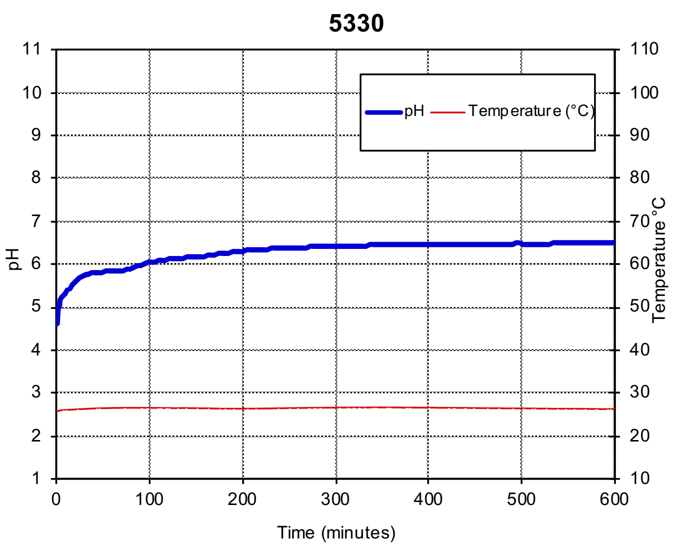


Figure C15: ABCC profile for sample 12139 with an ANC value close to 160 kg H_2SO_4/t. Carbonate standard curves are included for reference.



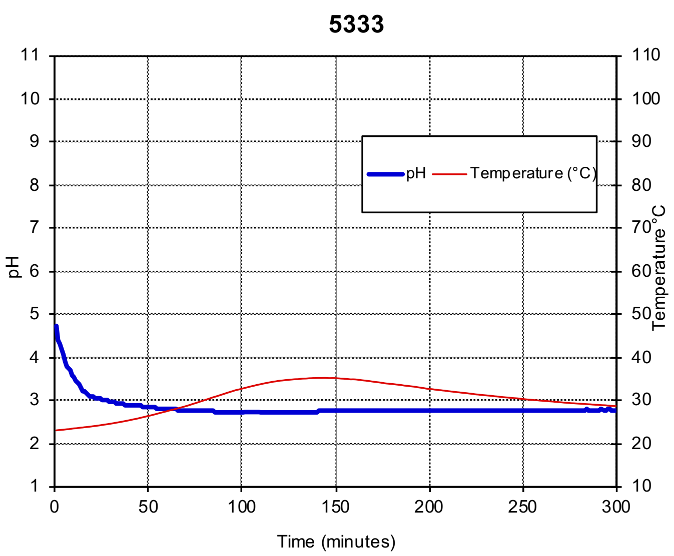
Sample Characteristics
%S = 0.71
ANC = 20 kg H2SO4/t
NAPP = 1 kg H2SO4/t
NAGpH = 2.9

Figure C16: Kinetic NAG graph for coal sample 5290.



Sample Characteristics
%S = 0.69
ANC = 9 kg H2SO4/t
NAPP = 12 kg H2SO4/t
NAGpH = 2.8

Figure C17: Kinetic NAG graph for coal sample 5330.



Sample Characteristics
%S = 1.25
ANC = 13 kg H2SO4/t
NAPP = 25 kg H2SO4/t
NAGpH = 3.5

Figure C18: Kinetic NAG graph for coal sample 5333.

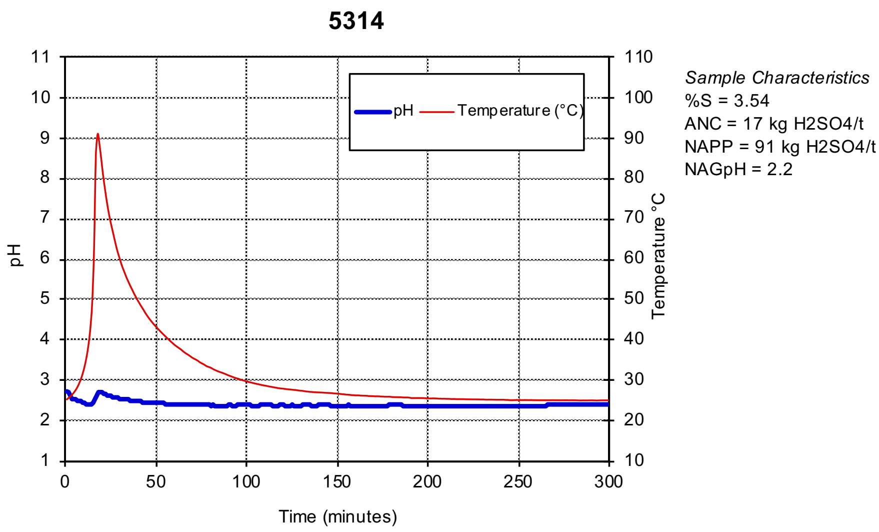


Figure C19: Kinetic NAG graph for coal sample 5314.

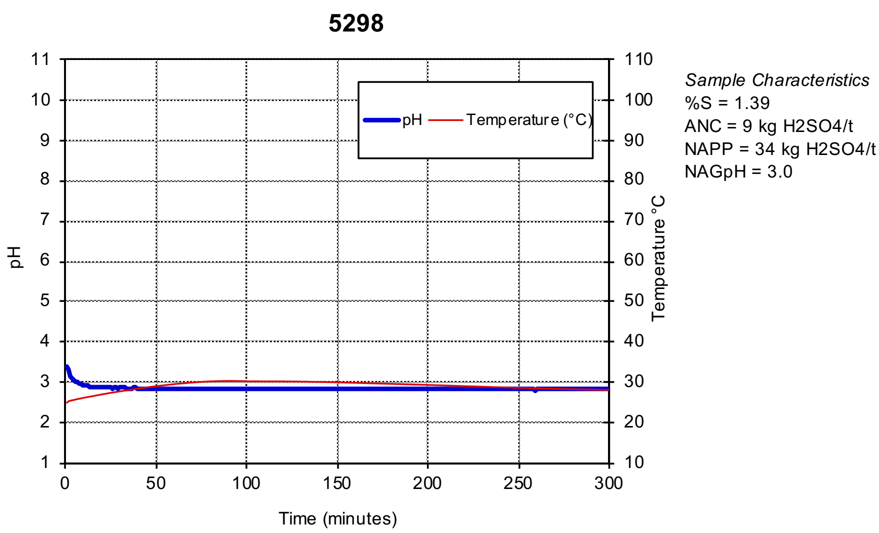


Figure C20: Kinetic NAG graph for coal sample 5298.

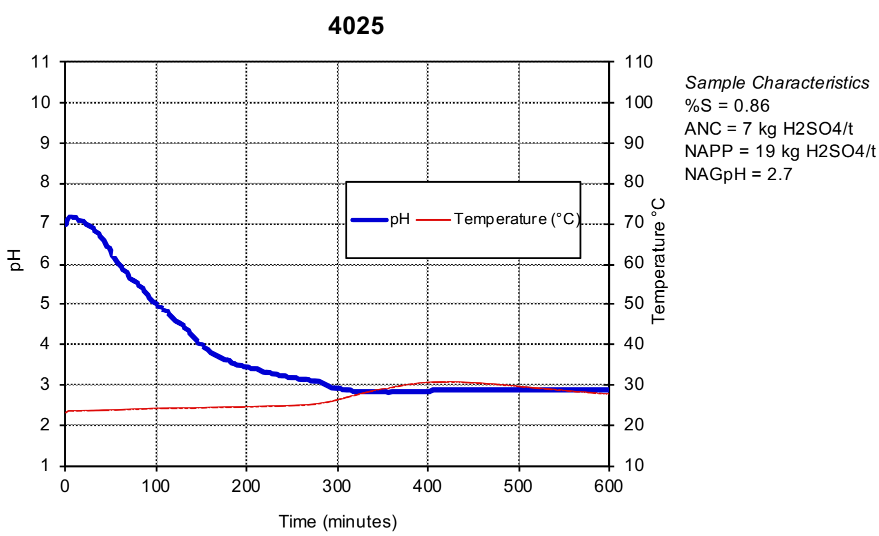


Figure C21: Kinetic NAG graph for sandstone sample 4025.

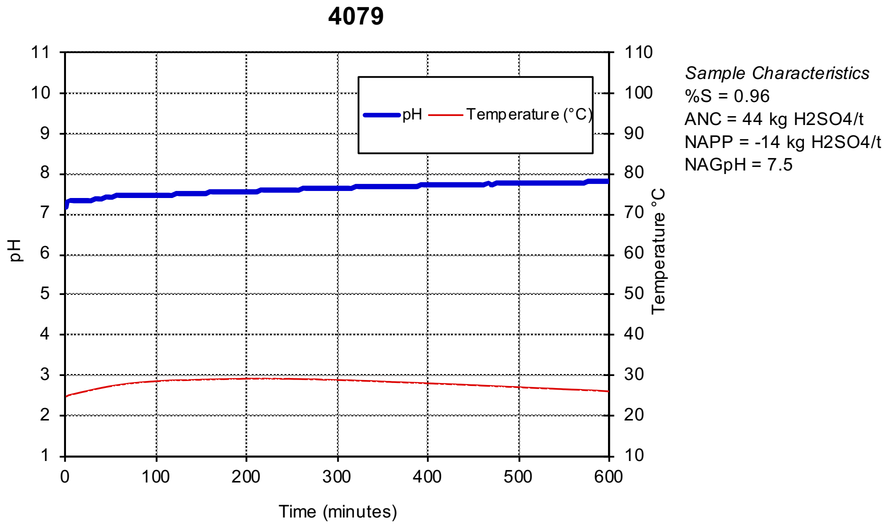


Figure C22: Kinetic NAG graph for sandstone sample 4079.

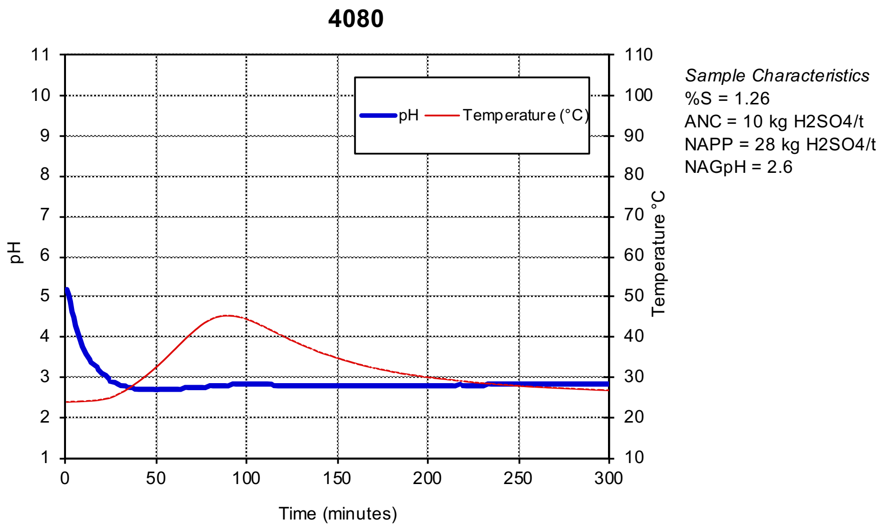


Figure C23: Kinetic NAG graph for siltstone sample 4080.

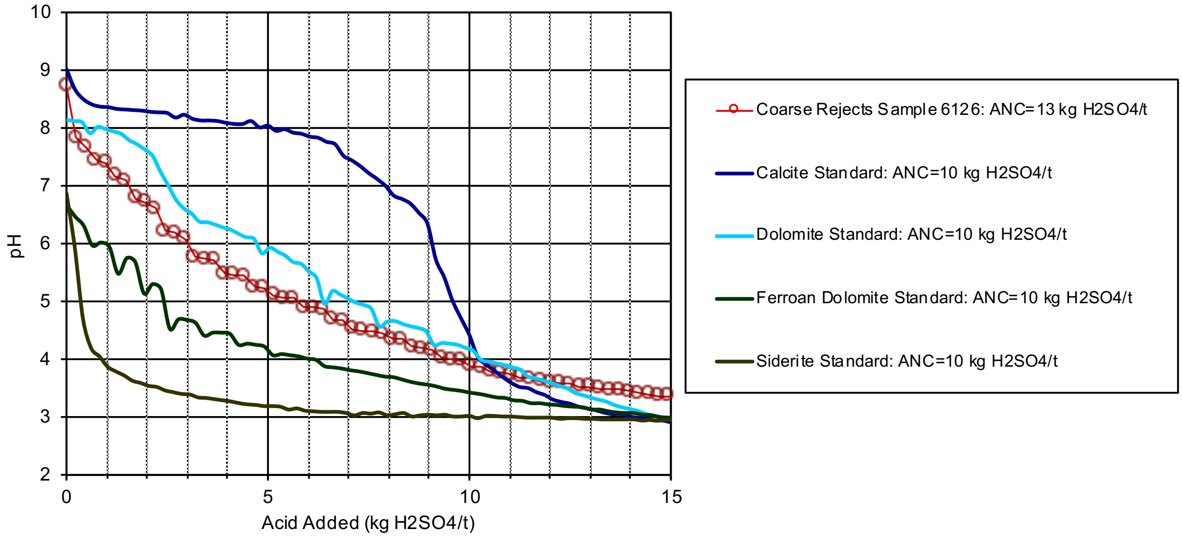


Figure C24: ABCC profile for rejects sample 6126 with an ANC value close to 10 kg H_2SO_4/t. Carbonate standard curves are included for reference.

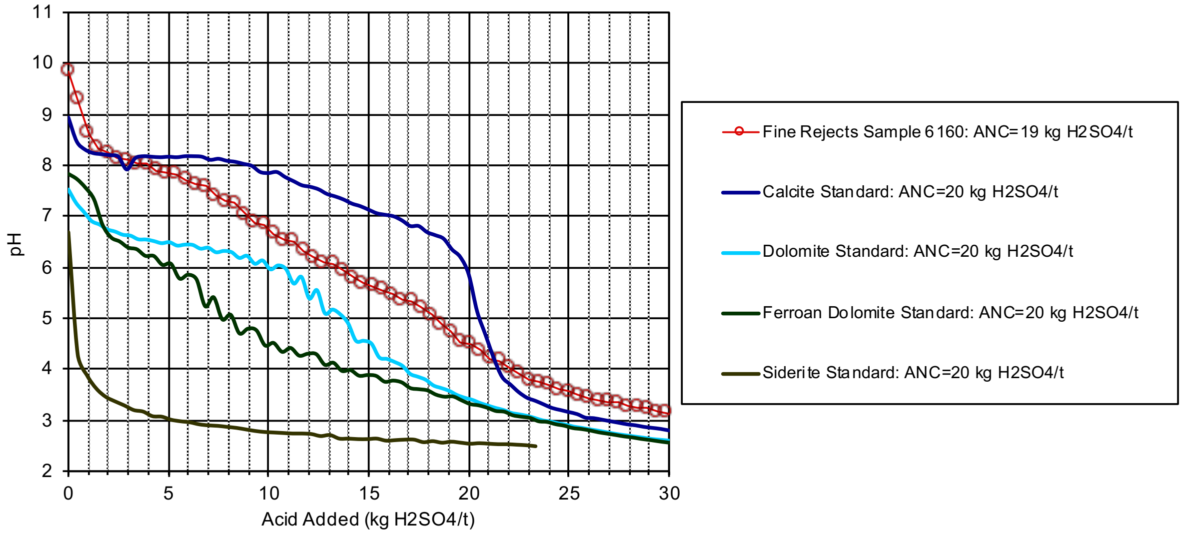


Figure C25: ABCC profile for rejects sample 6160 with an ANC value close to 20 kg H_2SO_4/t. Carbonate standard curves are included for reference.

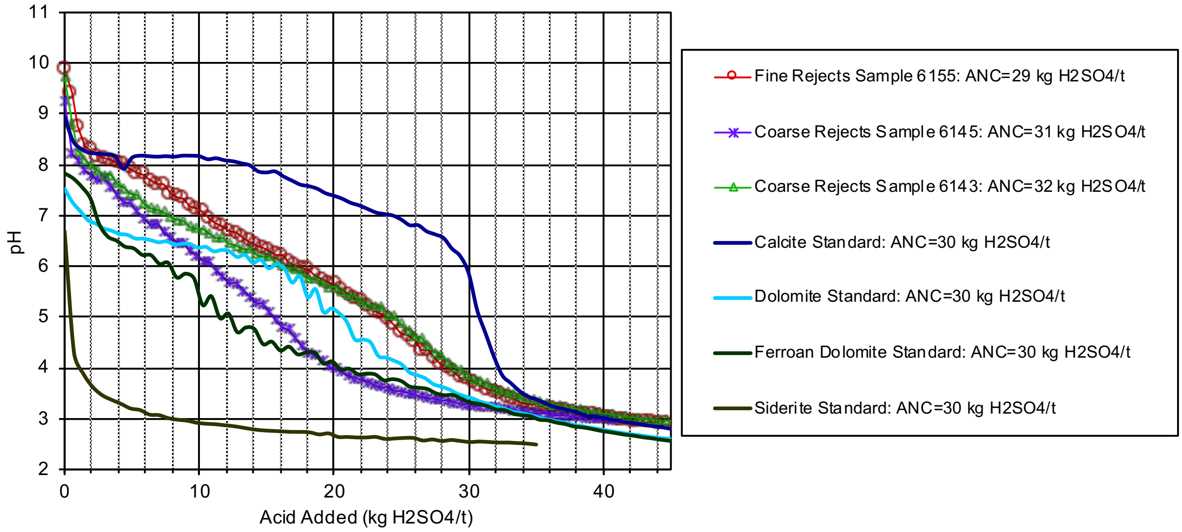


Figure C26: ABCC profile for rejects samples with an ANC value close to 30 kg H_2SO_4/t. Carbonate standard curves are included for reference.

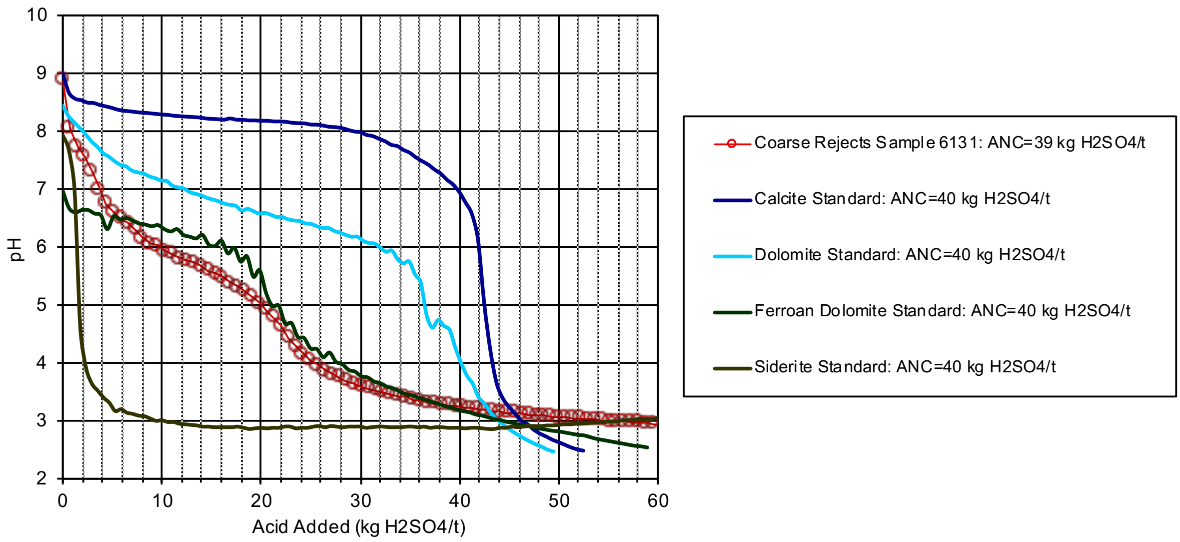


Figure C27: ABCC profile for rejects sample 6131 with an ANC value close to 40 kg H_2SO_4/t. Carbonate standard curves are included for reference.

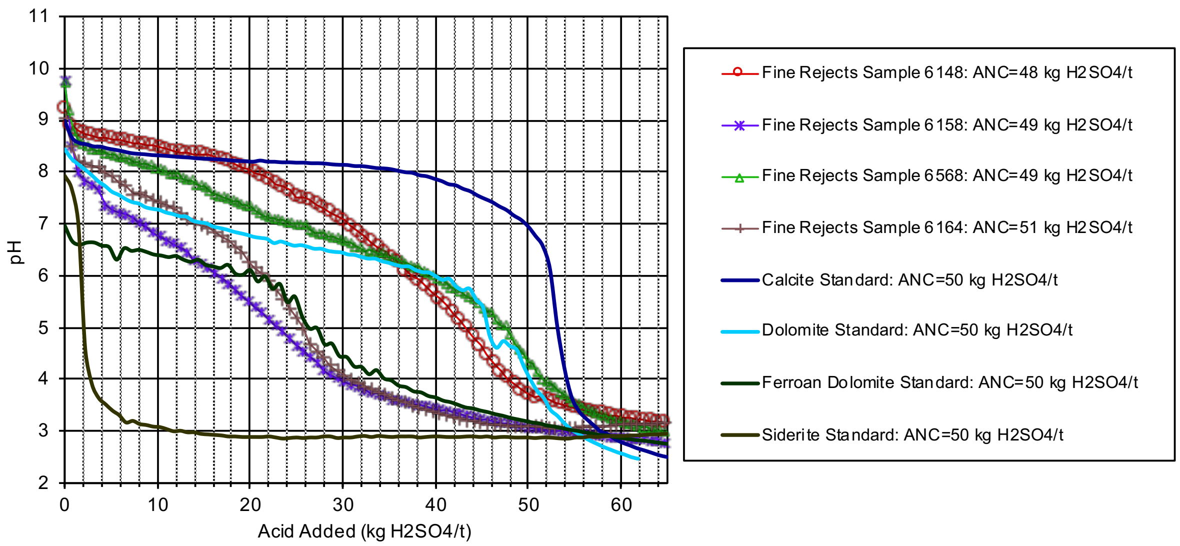


Figure C28: ABCC profile for rejects samples with an ANC value close to 50 kg H_2SO_4/t. Carbonate standard curves are included for reference.

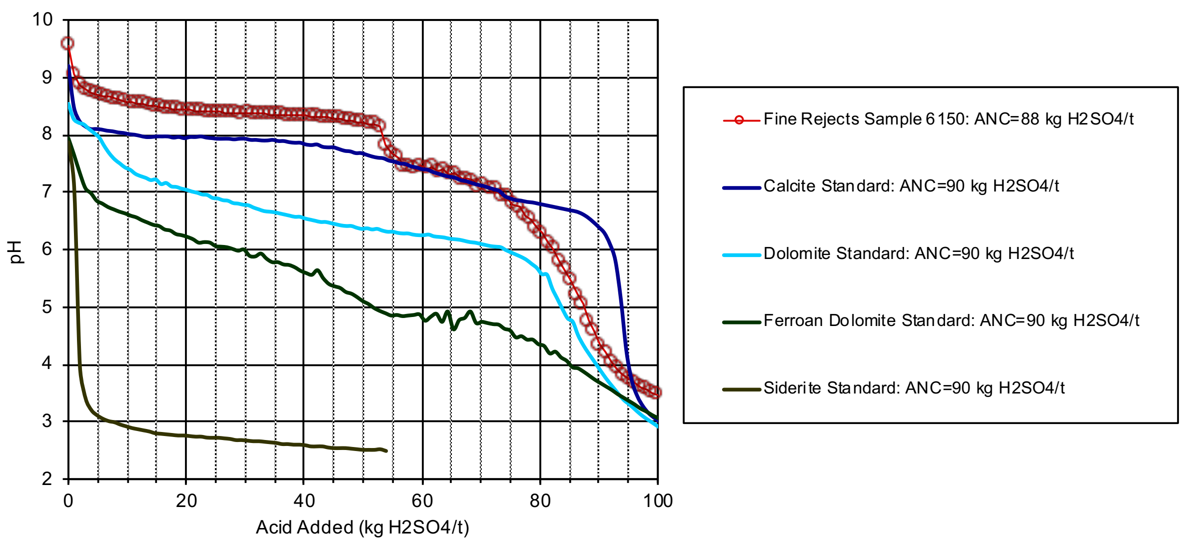


Figure 29: ABCC profile for rejects sample 6150 with an ANC value close to 90 kg H_2SO_4/t. Carbonate standard curves are included for reference.

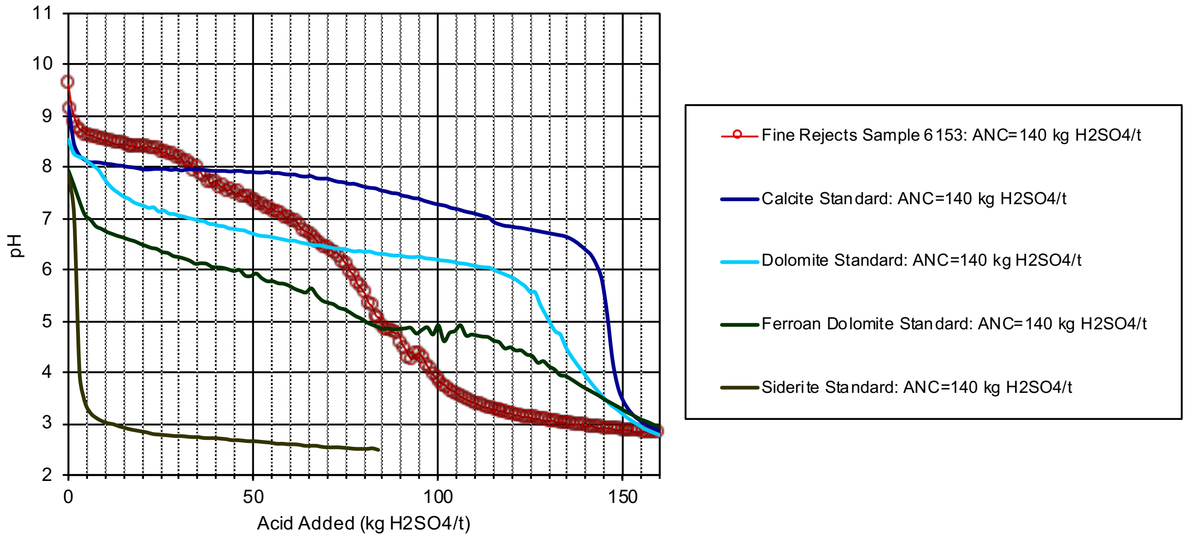
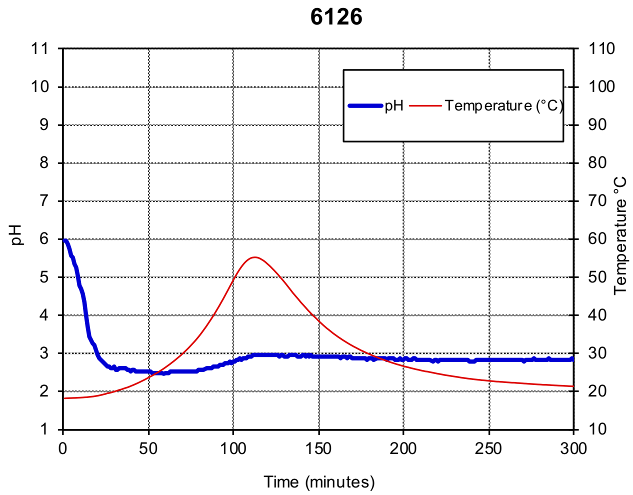
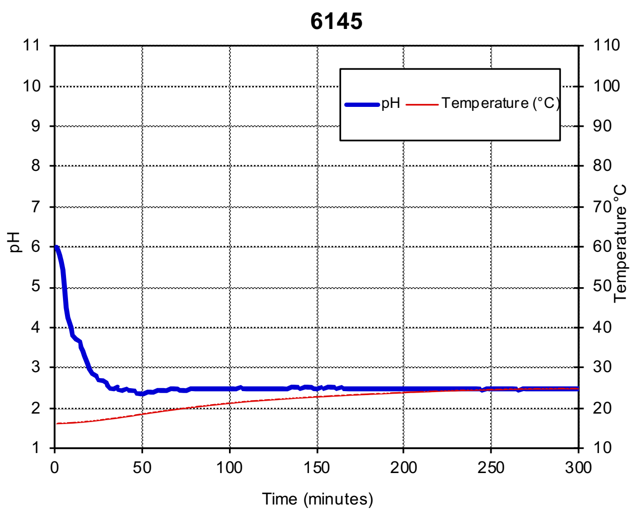


Figure C30: ABCC profile for rejects sample 6153 with an ANC value close to 140 kg H_2SO_4/t. Carbonate standard curves are included for reference.



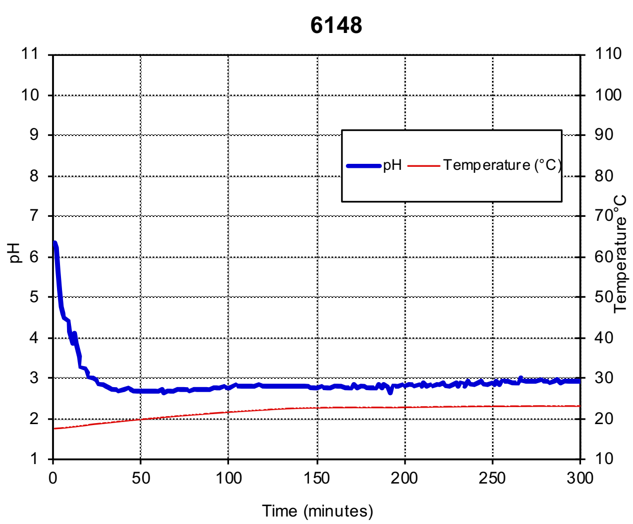
Sample Characteristics
%S = 1.07
ANC = 13 kg H2SO4/t
NAPP = 20 kg H2SO4/t
NAGpH = 3.7

Figure C31: Kinetic NAG graph for coarse rejects sample 6126.



Sample Characteristics
%S = 0.93
ANC = 31 kg H2SO4/t
NAPP = -3 kg H2SO4/t
NAGpH = 4.1

Figure C32: Kinetic NAG graph for coarse rejects sample 6145.



Sample Characteristics
%S = 3.21
ANC = 48 kg H2SO4/t
NAPP = 50 kg H2SO4/t
NAGpH = 3.5

Figure C33: Kinetic NAG graph for fine rejects sample 6148.

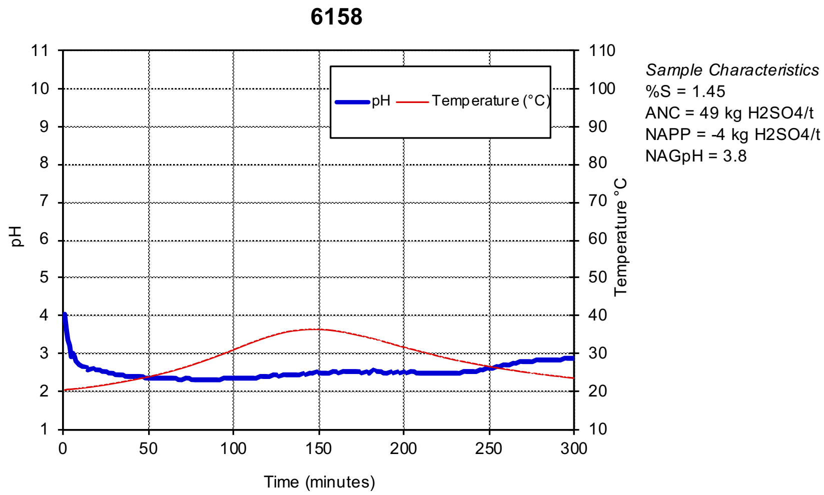


Figure C34: Kinetic NAG graph for fine rejects sample 6158.