HANCOCK PROSPECTING PTY LTD

Alpha Coal Project Supplementary Environmental Impact Statement

S | Coal Mine – Interim Geochemical Report

Geochemical Assessment of Overburden, Coal and Coal Reject Materials: Alpha Project

Interim report prepared for:

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14 March 2011

RGS-Terrenus Interim Report Number 101108

Geochemical Assessment of Overburden, Coal and Coal Reject Materials: Alpha Project

Dear Paul,

1.0 BACKGROUND

The Alpha Coal Project (the Project) is a proposed large-scale open-cut coal mine owned by Hancock Coal Pty Ltd (HCPL) and located in the Galilee Basin of Queensland. An Environmental Impact Statement (EIS) for the Alpha Coal Project was completed by HCPL and submitted to the Queensland Government for assessment and approval in September 2010 (HPPL, 2010). Following receipt of stakeholder submissions arising from public advertising of the EIS, HCPL is preparing a response to these submissions, which is being coordinated by URS Australia Pty Ltd (URS). HCPL has also recently commenced the Alpha Bulk Sample Project and has State Government approval to proceed with the Alpha Bulk Sample Project subject to conditions outlined in the Environmental Authority for MDL285 (DERM, 2010). Geochemical aspects of both the Alpha Coal Project and the Alpha Bulk Sample Project have previously been investigated by SRK Consulting Pty Ltd (SRK) (SRK, 2010a,b) with the Alpha Bulk Sample Project being managed by RGS on behalf of HCPL/URS.

The Alpha Bulk Sample Project presents an opportunity to gather key geochemical data on mining waste materials representative of the Alpha deposit (HCPL, 2010). It also provides an opportunity to fill knowledge gaps and trial methods for fulfilling specific commitments made in the recent EIS document submission to the Queensland Government (HPPL, 2010), albeit at a smaller scale.

This Interim Report describes the geochemical assessment work completed by RGS-Terrenus to date on overburden[1], coal and coal reject materials from the Alpha Coal Project. The work program presented in this report describes the interim findings of the on-going geochemical work program described in RGS-Terrenus Proposal 101108 (Rev 3) provided to HCPL on 12 October 2010 (RGS-Terrenus, 2010a). Specifically, the on-going work program:

1. Builds upon existing knowledge of the geochemical characteristics of overburden and potential coal rejects at the Alpha Coal Project (HPPL, 2010; DERM, 2010; SRK, 2010a,b);
2. Allows for knowledge gaps associated with specific commitments made in the recent EIS document submission to the Queensland Government (HPPL, 2010) to be addressed as part of the Supplementary EIS for the Alpha Coal Project;
3. Addresses specific compliance issues described in conditions F15 to F22 of the approved Environmental Authority for the Alpha Bulk Sample Project on MDL285 (DERM, 2010); and
4. Addresses the geochemical components of the Monitoring Program for the Alpha Bulk Sample Project (HCPL, 2010).

RGS-Terrenus is completing the on-going geochemical work program as a sub-contractor to URS Australia Pty Ltd (URS), which is managing the Supplementary EIS for the Alpha Coal Project as well as the environmental compliance and monitoring components of the Alpha Bulk Sample Project.

The agreed scope of work was targeted towards:

- Improving the working knowledge of the likely geochemical characteristics of the overburden, coal and coal reject materials;

[1] For the purposes of this Interim Report, overburden and interburden materials are collectively termed overburden.

- Understanding and managing potential environmental geochemical risks associated with overburden, coal and coal reject materials;
- Working closely with HCPL/URS to fill knowledge gaps and address EIS commitments for the Alpha Coal Project; and
- Optimising the proposed management and monitoring strategy for mining waste materials at the Alpha Bulk Sample Project.

2.0 SCOPE OF WORK AND METHODOLOGY

RGS-Terrenus is currently completing the scope of work described in Tasks 1 to 6 for HCPL.

Task 1: Fill Knowledge Gaps and Address EIS Commitments – Static Tests

C Upper Coal Seam Samples: The original geochemical sampling program for the Alpha Coal Project EIS (SRK, 2010b) did not include representative samples from the 'C Upper' coal seam, which has been assessed by HCPL to be uneconomic. It is now likely that any uneconomic coal material from the C upper coal seam will report, along with overburden, to short-term out-of-pit and long-term in-pit emplacement facilities. The C Upper coal seam could represent a relatively large volume of material at the Project. Given that the EIS has committed HCPL to selectively handling and storing any Potentially Acid Forming (PAF) overburden material in a similar fashion to PAF coarse reject materials (*ie.* paddock dumping, compaction, potential dosing with alkaline material, clay capping and covering with at least 10 m of Non-Acid Forming (NAF) spoil material), additional sampling and geochemical characterisation of C Upper coal seam material is warranted.

In response to this requirement, RGS-Terrenus has worked closely with HCPL geological and contract drilling personnel (Salva Resources Pty Ltd) to select representative drill-core samples of C Upper coal seam materials from nine of the 15 ('3x5') existing geotechnical drill-holes at the Alpha Coal Project area. Three samples of drill-core were intended to be collected of C Upper coal seam material from each of the nine drill-holes to represent specific parts of the C Upper coal seam profile (top, middle and bottom). In practice, a total of 24 samples of C Upper coal seam material were collected from the nine drill-holes.

Coal and Coal Reject Samples: The geochemical sampling program for the Alpha Coal Project EIS generated a limited number of coal and coal reject samples (25 samples from two drill-holes including raw coal, washed coal, coal seam roof and floor, coarse coal reject and tailings). Some of these materials were indicated to be PAF and since these materials have specific EIS management commitments, this represented a potential knowledge gap.

In order to fill this knowledge gap, RGS-Terrenus obtained 32 representative drill-core samples of coal materials for C and D coal seams (through Salva Resources Pty Ltd) from eight of the 15 ('3x5') geotechnical drill-holes described above. The C coal seam sample contain typical roof and floor dilution (approximately 50 mm of roof and 100 mm of floor) and the two D seam ply samples representing the top and bottom parts of the seam with similar roof and floor dilutions, respectively. These samples were sent to Bureau Veritas laboratory in Brisbane and sorted by coal seam and drill-hole location. The 32 individual coal samples were used to generate 11 composite coal samples, which were prepared at Bureau Veritas using a simulated coal washing process to generate a total of 44 samples of raw coal, washed coal, coarse coal reject and fine reject (tailing) samples, which were then sent to ALS Brisbane for geochemical characterisation.

Geochemical Characterisation: All individual samples described above were subjected to a series of 'standard' geochemical screening tests at ALS Brisbane including: pH, electrical conductivity (EC), total sulfur and Acid Neutralising Capacity (ANC). Selected individual samples were also subjected to more specialised geochemical tests such as Chromium Reducible Sulfur (S_{CR}) and Acid Buffering Characterisation Curve (ABCC) tests. Additional composite samples were also prepared and subjected to multi-element analysis on solids and distilled water extracts.

Task 2: Fill Knowledge Gaps and Address EIS Commitments – Kinetic Tests

Static testing (Task 1) provides an indication of the geochemical characteristics of coal and mining waste materials, but does not provide information on the reaction kinetics, such as the time preceding acid generation, duration, or the rates at which a material may leach acid, metals and salts when subjected to day-to-day weather conditions (rain and sunshine).

There is a commitment in the EIS for the Alpha Coal Project to potentially treat PAF coarse coal rejects and fine rejects (tailings) with an alkaline material based on the results of kinetic leach column (KLC) test results. KLC tests (five tests) on coal, coal seam roof and floor, coarse coal reject and tailings samples commenced in August 2010 at ALS Brisbane and are being managed for HCPL by SRK consulting[2] using

[2] The composite coal reject samples were generated from a three drill-holes near the proposed Alpha Bulk Sample test pit area.

standard Australian mining industry methodology (AMIRA, 2002). More recently, HCPL has generated 12 additional samples of coal and coal reject materials for drill-hole LD1290 at the Alpha Project during large diameter core sampling (also located near the proposed Alpha Bulk Sample test pit area). These large diameter core samples were collected using controlled roof and floor dilution (approximately 50 mm and 100 mm, respectively) and are expected to provide an indication of the likely dilution and geochemical characteristics of Alpha coal and coal reject materials.

RGS-Terrenus has commenced KLC tests on these new 12 coal and coal reject samples described above (November 2010). Additional KLC tests were also completed on six representative overburden samples from the Alpha Project with a range of total sulfur contents (low, medium and high). A further three KLC tests have commenced on coarse coal reject materials from drill-hole LD1290 with alkaline amendment using crushed limestone. Hence, in total 26 KLC tests are currently being completed by SRK and RGS-Terrenus for the Alpha Coal Project.

The 21 RGS-Terrenus KLC tests are being completed at the RGS in-house leaching laboratory in Brisbane over an estimated four month (18 week) period[3], with fortnightly column leaching over the test period (*ie.* 10 leaching events). Collected KLC test leachate have been sent to ALS Brisbane for analysis including pH, EC, acidity/alkalinity, major soluble cations and anions, and soluble trace metals. The five original KLC tests are still being operated at ALS Brisbane.

Task 3: Address Geochemical Compliance Issues for Environmental Authority MIN100746508 – Alpha Bulk Sample Project (MDL285)

RGS-Terrenus has developed a program of work for geochemical sampling and testing of representative samples of coal, overburden and mining waste materials from the Alpha Bulk Sampling Project to address specific compliance issues described in Conditions F15 to F22 of the approved Environmental Authority (EA) for the Project. Specifically a Mining Waste Management Plan (RGS-Terrenus, 2010b) has been developed for use by HCPL and is being used as required under Section F16 of the EA. The Mining Waste Management Plan includes:

- Characterisation programs to ensure that all mining waste is progressively characterised prior to and/or during disposal for Net Acid Producing Potential (NAPP), salinity, metals (including iron (Fe), aluminium (Al) copper (Cu), magnesium (Mg), manganese (Mn), calcium (Ca) and sodium (Na)), sulfate (SO_4)), physical properties, and leachability of metals;
- Quantification of the relative amount of any PAF compared to NAF mining waste and review of potential impacts of PAF mining waste on rehabilitation;
- Management actions for mining waste identified as having a high availability or leachability of metals or that has been defined as PAF;
- Identification of potential and actual environmental impacts;
- Control measures for routine operations to minimise the likelihood of environmental impacts;
- Contingency plans and emergency procedures for non-routine situations; and
- Periodic review of environmental performance and continual improvement.

The Mining Waste Management Plan addresses compliance with Condition F17 of the EA, in that all mining waste reporting to the out-of-pit mining waste emplacement area is progressively characterised for NAPP, salinity, metals (including Fe, Al, Cu, Mg, Mn, Ca and Na), SO_4, physical properties, and leachability of metals. No PAF mining waste reports back to the open-pit. Records are kept of the mining waste emplacement area to identify locations and geochemical characteristics of mining waste located on MDL 285. Where the acid producing potential of mining waste has not been conclusively determined, geochemical kinetic testing will be conducted to indicate oxidation rates, potential reaction products and effectiveness of control strategies.

The overall outcome of the Mining Waste Management Plan will be to ensure that all PAF materials and any materials identified as having a high availability or leachability of metals are disposed of in a manner that ensures that, subject to EA release limits, potential contaminants are not released to the

[3] The program would be assessed after four months and a decision made by RGS-Terrenus and HCPL on whether the KLC program would need to continue beyond four months. It is currently assumed by RGS-Terrenus that four months will be satisfactory.

environment, including release to groundwater or any surface water course. Areas proposed to be used, or used to store such materials, have been identified and submitted to the Regulator with the Annual Return. The Plan also outlines how areas disturbed by mining activities will be rehabilitated to a stable landform with a self-sustaining vegetation cover in accordance with the final land use and rehabilitation approval schedule and landform design criteria described in the EA.

The Mining Waste Management Plan includes aspects of the Environmental Management Plan developed for the Alpha Bulk Sample Project (AARC, 2010), where these are relevant. Specific commitments made by HCPL in the EIS for the Alpha Coal Project have been integrated into the Mining Waste Management Plan, where appropriate, to test/ensure that these commitments are fulfilled for that project in future.

Task 4: Geochemical Monitoring Program for the Alpha Bulk Sample Project

HCPL has developed a framework for the geochemical monitoring program associated with the Alpha Bulk Sample Project (HCPL, 2010). The monitoring program includes aspects of the project both at the mining operation and at the coal processing plant at Jellinbah. RGS-Terrenus has assisted HCPL to develop specific geochemical monitoring programs for the mining operation and the processing plant, associated with mining waste materials such as overburden and coal rejects. A total of 100 samples have been allowed for in the geochemical test program budget with 90% of these to be taken from approximately four locations in the test pit progressing down through the stratigraphic profile. The remaining samples will be taken from the coal processing plant at Jellinbah when coal is processed at that facility.

The program of work defined in the Mining Waste Management Plan is being used to select representative samples of coal and mining waste materials from the mining operation associated with the Alpha Bulk Sampling Project. Due to the prolonged wet season, there has been a delay in commencing this project and the current depth of the pit is only about 10-15 m. Hence, the number of samples taken to date has been limited and these are being stored securely and appropriately on site until sufficient samples have been taken to send a sample batch to ALS Brisbane for geochemical characterisation. RGS has worked closely with Salva Resources geology personnel based on site and has provided specific instructions with respect to sample collection and dispatch requirements, including relevant ALS Chain of Custody forms.

Geochemical Characterisation: All samples will be subjected to a series of ‘standard’ geochemical screening tests including paste pH, EC, total sulfur and ANC. Selected individual samples (approximately 15 samples) will also be tested for more specialised geochemical tests such as S_{CR} and ABCC tests. Approximately 15 composite samples will then be prepared and subjected to multi-element analysis on solids and distilled water extracts. Tests will also be completed on selected overburden samples including effective cation exchange capacity (eCEC), exchangeable sodium percentage (ESP) and Emerson aggregate tests.

Task 5: Supplementary EIS – Technical Assistance

RGS-Terrenus has also been commissioned by HCPL provide technical assistance with geochemical aspects of its response to stakeholder submissions arising from public advertising of the Alpha Coal Project EIS in a Supplementary EIS document. Three of the main areas where RGS–Terrenus is providing technical assistance are.

- Completing a targeted review of the methodology used for classifying coal and mine waste materials;
- Development of cross-sections to illustrate the geochemical nature of the coal and overburden materials; and
- Development of a geochemical sampling and testing program for infill drilling and future drilling programs being implemented by HPCL at the Alpha Coal Project.

Task 6: Reporting

RGS-Terrenus has provided summary and other geochemistry reports on the Project to URS/HCPL, as required. The Mining Waste Management Plan (RGS-Terrenus, 2010b) was prepared and submitted to HCPL in October 2010.

A more complete version of this Interim Report will be prepared as a Draft Report and submitted to HCPL in the second half of 2011, when all of the geochemical test results are available.

3.0 RESULTS AND DISCUSSION

3.1 Task 1: Fill Knowledge Gaps and Address EIS Commitments – Static Tests

3.1.1 Geochemical Characterisation of C Upper Coal Seam

Acid Base Account:

The results of geochemical testing of 24 samples of C Upper coal seam materials from nine drill-holes at the Alpha Coal Project are provided at **Table 3-1.** The location of the drill-holes used to obtain the C Upper coal seam samples is provided in **Figure 1.** Drill-holes were selected to provide a good lateral coverage of the open-pit area and make best use of existing available drill-core. The results in **Table 3-1** indicate that:

- Most of the C Upper coal seam samples have a neutral to slightly alkaline current $pH_{1:5}$ value (ranges from pH 5.3 to 9.8; median pH 8.9). Sample EA001 from drill-hole 1435D at the southern end of the proposed open-pit area has the lowest pH value of 5.3.
- The current $EC_{1:5}$ of the C Upper coal seam samples ranges from 222 to 2,100 µS/cm, with a median EC value of 807 µS/cm. This median EC value of 807 µS/cm is regarded as being 'medium' salinity criteria as defined in Queensland DME technical guideline (DME, 1995), reproduced in **Table 3-2**.

Table 3-2

Salinity Criteria for Mine Waste Assessment

Test	Very Low	Low	Medium	High	Very High
EC (1:5 sample:water) (µS/cm)	<150	150 - 450	450 - 900	900 – 2,000	>2,000

The pH and EC results for the C Upper coal seam samples are illustrated in **Graph 3-1**. Overall, these results indicate that initial runoff/seepage from C Upper coal seam materials is likely to be alkaline and have a 'medium' salinity value.

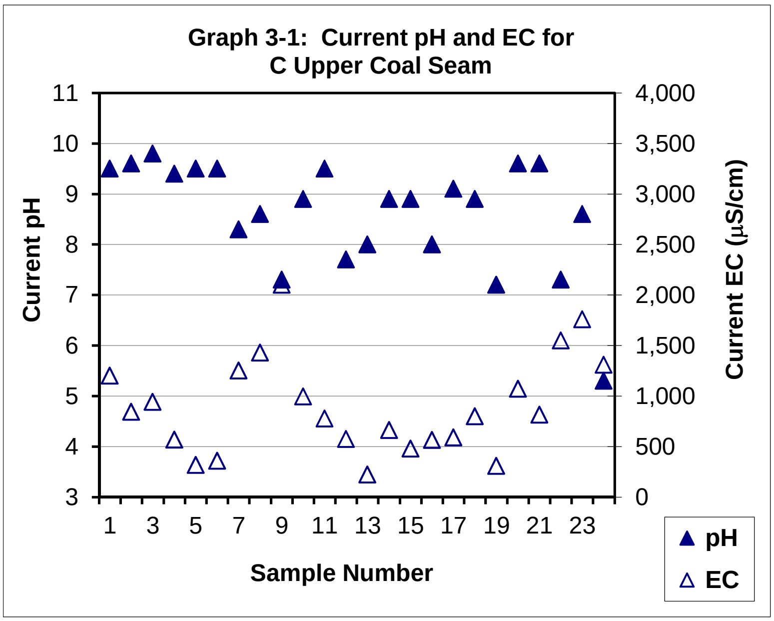
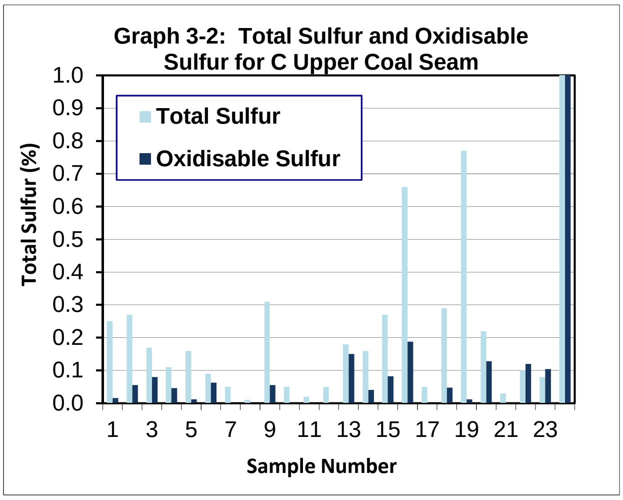


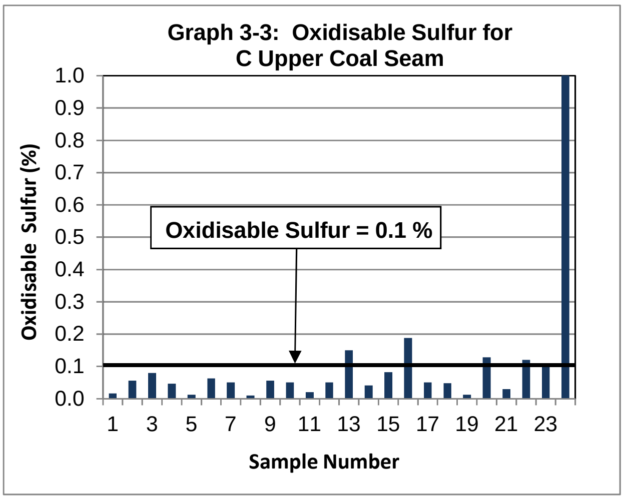
Table 3-1: Acid-base Results for Samples from C Upper Seam Plys - Alpha Project

ALS Laboratory Sample ID	Date	Client Sample Number	Sample Interval (m)			Drill Hole	Sample Type	pH[1]	EC[1]	Total Sulfur	CRS	MPA[2]	ANC[2]	NAPP[2]	ANC/MPA ratio	Sample Classification[3]
			From	To	Depth				(µS/cm)	(%)		(kg H_2SO_4/t)				
C Upper Seam																
EB1019792-001	28/10/10	EA001	35.82	38.82	3.00	1406D	C Upper Seam	9.5	1,200	0.25	0.016	0.5	13.2	-12.7	26.9	Non-Acid Forming (Barren)
EB1019792-002	28/10/10	EA002	39.31	40.10	0.79	1406D	C Upper Seam	9.6	843	0.27	0.056	1.7	18.8	-17.1	11.0	Non-Acid Forming (Barren)
EB1019792-003	28/10/10	EA003	40.10	41.35	1.25	1406D	C Upper Seam	9.8	942	0.17	0.080	2.5	39.4	-37.0	16.1	Non-Acid Forming (Barren)
EB1019792-004	28/10/10	EA004	41.57	42.92	1.35	1406D	C Upper Seam	9.4	567	0.11	0.046	1.4	19.4	-18.0	13.8	Non-Acid Forming (Barren)
EB1019792-006	28/10/10	EA001	84.09	86.30	2.21	1424D	C Upper Seam	9.5	316	0.16	0.012	0.4	16.8	-16.4	45.7	Non-Acid Forming (Barren)
EB1019792-007	28/10/10	EA002	86.30	88.17	1.87	1424D	C Upper Seam	9.5	358	0.09	0.063	1.9	37.5	-35.6	19.4	Non-Acid Forming (Barren)
EB1019792-008	28/10/10	EA003	88.17	90.48	2.31	1424D	C Upper Seam	8.3	1,250	0.05	-	1.5	36.3	-34.8	23.7	Non-Acid Forming (Barren)
EB1019792-010	28/10/10	EA001	42.00	43.50	1.50	1425D	C Upper Seam	8.6	1,430	0.01	-	0.3	6.4	-6.1	20.9	Non-Acid Forming (Barren)
EB1019792-012	28/10/10	EA001	53.23	56.12	2.89	1413D	C Upper Seam	7.3	2,100	0.31	0.056	1.7	9.0	-7.3	5.2	Non-Acid Forming (Barren)
EB1019792-013	28/10/10	EA002	56.70	58.40	1.70	1413D	C Upper Seam	8.9	995	0.05	-	1.5	3.8	-2.3	2.5	Non-Acid Forming (Barren)
EB1019792-014	28/10/10	EA003	58.40	60.14	1.74	1413D	C Upper Seam	9.5	776	0.02	-	0.6	15.4	-14.8	25.1	Non-Acid Forming (Barren)
EB1019792-015	28/10/10	EA004	60.14	61.97	1.83	1413D	C Upper Seam	7.7	574	0.05	-	1.5	8.6	-7.1	5.6	Non-Acid Forming (Barren)
EB1019792-016	28/10/10	EA005	64.07	65.56	1.49	1426D	C Upper Seam	8.0	222	0.18	0.150	4.6	15.5	-10.9	3.4	Non-Acid Forming
EB1019792-017	28/10/10	EA006	66.14	67.87	1.73	1426D	C Upper Seam	8.9	661	0.16	0.041	1.3	9.4	-8.1	7.5	Non-Acid Forming (Barren)
EB1019792-018	28/10/10	EA007	68.87	69.95	1.08	1426D	C Upper Seam	8.9	480	0.27	0.082	2.5	6.0	-3.5	2.4	Non-Acid Forming (Barren)
EB1019792-019	28/10/10	EA001	66.46	69.46	3.00	1415D	C Upper Seam	8.0	565	0.66	0.188	5.8	6.9	-1.1	1.2	Uncertain
EB1019792-020	28/10/10	EA002	69.46	71.85	2.39	1415D	C Upper Seam	9.1	588	0.05	-	1.5	12.8	-11.3	8.4	Non-Acid Forming (Barren)
EB1019792-021	28/10/10	EA003	71.85	75.03	3.18	1415D	C Upper Seam	8.9	800	0.29	0.048	1.5	6.9	-5.4	4.7	Non-Acid Forming (Barren)
EB1019792-022	28/10/10	EA001	56.86	57.19	0.33	1427D	C Upper Seam	7.2	307	0.77	0.012	0.4	7.2	-6.8	19.6	Non-Acid Forming (Barren)
EB1019792-023	28/10/10	EA002	62.50	63.36	0.86	1427D	C Upper Seam	9.6	1,070	0.22	0.128	3.9	12.0	-8.1	3.1	Non-Acid Forming
EB1019792-024	28/10/10	EA003	63.36	64.07	0.71	1427D	C Upper Seam	9.6	813	0.03	-	0.9	3.4	-2.5	3.7	Non-Acid Forming (Barren)
EB1019792-025	28/10/10	EA001	53.08	54.75	1.67	1419D	C Upper Seam	7.3	1,550	0.10	0.120	3.7	11.9	-8.2	3.2	Non-Acid Forming
EB1019792-026	28/10/10	EA002	54.75	55.84	1.09	1419D	C Upper Seam	8.6	1,760	0.08	0.104	3.2	19.3	-16.1	6.1	Non-Acid Forming
EB1019792-027	28/10/10	EA001	60.32	62.94	2.62	1435D	C Upper Seam	5.3	1,310	2.58	3.080	94.3	5.3	89.0	0.1	Potentially Acid Forming

Notes
1. Current pH, EC, Alkalinity and Acidity provided for 1:5 sample:water extracts
2. CRS = Chromium Reducible Sulfur MPA = Maximum potential acidity; ANC = Acid neutralising capacity; and NAPP = Net acid producing potential.
3. Sample classification detail provided in report text.

- **Sulfur**: The total sulfur content of the samples ranges from low to high (0.01 to 2.58 % S) and has a median total sulfur value of 0.29 %. However, as illustrated in **Graph 3-2**, in a lot of the samples the sulfur is present in non-pyritic forms such as organic- and sulfate-sulfur which do not contribute to the acid forming potential of these materials. When only the oxidisable sulfur component is taken into account (**Graph 3-3**), it is clear that most C Upper coal seam samples have an oxidisable sulfur content that is less than the low sulfur cut-off threshold value of 0.1 %, typically used by SRK and others to identify and screen out those materials that have a low to negligible risk of acid generation and are classified as NAF-Barren (See **Section 3.5.1** for a detailed explanation and justification of the geochemical classification criteria used for mining materials).



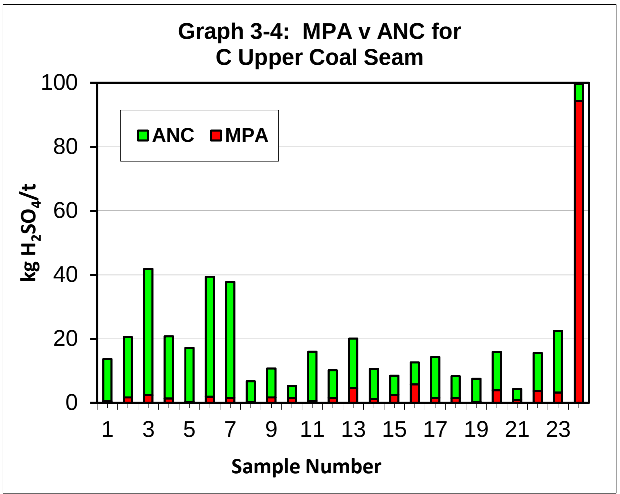


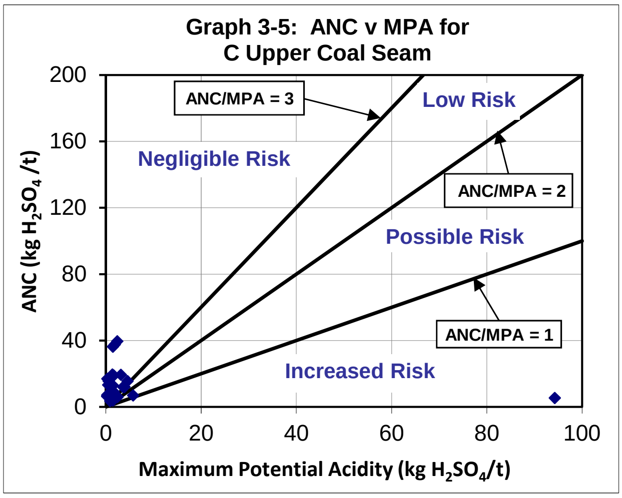
- **MPA**: The Maximum Potential Acidity (MPA) that could be theoretically generated by the C Upper coal seam samples ranges from 0.3 to 94.3 kg H_2SO_4/t and is generally low (median 1.5 kg H_2SO_4/t).
- **ANC**: The ANC values range from 3.4 to 39.4 kg H_2SO_4/t and are generally moderate (median 12 kg H_2SO_4/t). The median ANC value is an order of magnitude greater than the median MPA value.
- **NAPP**: The calculated net acid producing potential (NAPP) ranges from -37 to +89 kg H_2SO_4/t, with a median NAPP value of -8.2 kg H_2SO_4/t.

Graph 3-4 illustrates the elevated ANC:MPA ratio found for most of the C Upper coal seam samples and shows that most C Upper coal seam materials generated at the project are expected to be NAF and contain excess ANC. Again, the exception is sample EA001 from drill-hole 1435D at the southern end of the proposed open-pit area, which has a very low ANC:MPA ratio (0.1) and is likely to represent a material which is a potential source of acid generation.

Graph 3-5 shows a plot of ANC versus MPA for the individual C Upper coal seam samples. The ANC:MPA ratio ranges from 0.1 to 45.7, with a median ANC:MPA ratio of 6.8. ANC:MPA ratio lines have been plotted on the graph to illustrate the factor of safety associated with the samples. Generally those samples with an ANC:MPA ratio of greater than or equal to two are considered to have a low to negligible risk of acid generation and a high factor of safety in terms of potential for AMD (acid and metalliferous drainage)[4] (DITR, 2007; INAP, 2009). All but two of the 24 individual C Upper coal seam samples tested have an ANC:MPA ratio of greater than 2, with most having an ANC:MPA ratio significantly greater than two (refer to **Table 3.1**). These results indicate that most of the C Upper coal seam materials likely to be generated at the project are likely to be NAF, although some PAF C Upper coal seam materials do exist and will need to be managed at the Project.

[4] The International Network on Acid Prevention (INAP, 2009) considers that mine materials with an ANC/MPA ratio greater than two are likely to be NAF unless significant preferential exposure of sulfides along fracture planes occurs in combination with insufficiently reactive ANC.





The geochemical results presented in this section were used to geochemically classify the 24 C Upper coal seam samples, as presented in **Table 3-1**. The geochemical criteria used by RGS-Terrenus to classify these samples are provided at **Table 3-3,** and generally reflect Australian guideline (AMIRA, 2002; DITR, 2007) and other coal mining industry research criteria (ACARP, 2008).

Table 3-3

Geochemical Classification Criteria for C Upper Coal Seam Material

Geochemical Classification	Oxidisable Sulfur (%)	ANC:MPA Ratio	NAPP (kg H_2SO_4/t)	Number of samples	% of total samples
NAF - Barren	≤ 0.1	≥ 2	≤ 0	18	75
NAF	> 0.1	≥ 2	≤ 0	4	17
Uncertain	> 0.1	< 2	-5 to ≤ +5	1	4
PAF–Low Capacity	> 0.1	< 2	+5 to ≤ +10	0	0
PAF	> 0.1	< 2	> +10	1	4

PAF = Potentially Acid Forming; NAF = Non-Acid Forming

Applying the classification criteria in **Table 3-3** to the data in **Table 3-1**, the results in **Table 3-1** indicate that the large majority of C Upper coal seam samples tested (92 % = 22 of 24 samples) fall in the NAF-Barren and NAF categories. Only one sample is classified as PAF due to a low ANC value and relatively high oxidisable sulfur content. One sample is classified as “Uncertain” on the basis of a slightly elevated oxidisable sulfur value, a negative NAPP value, and an ANC:MPA ratio between one and two.

Overall, from a management perspective, most of the C Upper coal seam material likely to be generated from the project is expected to be NAF with excess ANC. Initial and ongoing runoff/seepage from most C Upper coal seam materials is likely to be alkaline and have a medium salinity value.

The atypical geochemical nature of the single PAF sample from the C Upper coal seam (Sample EA001 from drill-hole 1435D at the southern end of the proposed open-pit area) warrants further examination and discussion. **Section 3.5.3** of this report provides a number of north-south and west-east cross-sections through the proposed open-pit area to illustrate the geochemical nature of the coal and overburden materials. The north-south cross section, indicates that the base of weathering (BoW) at the northern and southern ends of the proposed open-pit area is shallower than in the main central parts of the pit. In some central parts of the proposed pit profile, the BoW extends below the C Upper coal seam into the C seam itself. In other (more central) parts of the proposed pit, the maximum vertical distance that the BoW extends above the C Upper coal seam is approximately 10 m. In contrast, the BoW at the northern and southern ends of the proposed pit can extend more than 30 m above the C Upper coal seam.

Overall, the data shows that the majority of the proposed Alpha Pit profile, the C Upper coal seam materials will be weathered to some extent and will be essentially be devoid of significant oxidisable sulfur content, have excess ANC, and will be classified as NAF. However, where the C Upper coal seam materials remain reasonably fresh below a relatively large unweathered overburden cover (*eg*. at the southern end of the proposed pit) PAF C Upper coal seam materials may be present. It is expected that open-pit mining geological control coupled with pre-mining and ongoing geochemical sampling and testing of C Upper coal seam material can be used to delineate the extent of any PAF C Upper coal seam materials and ensure that these are selectively handled and managed in a similar manner to PAF coarse coal reject materials from the coal handling and preparation plant (CHPP). Similar to most other Permian-age coal deposits in eastern Australia, it is also expected that PAF materials will predominantly occur in coal seam roof, floor and significant coal seam band materials.

Multi-Element Composition:

The individual C Upper coal seam samples were grouped, on the basis of their acid-base geochemical characteristics and relative position in the C Upper coal seam profile, into 12 composite samples. The make-up of the 12 composite samples is shown in **Table 3-4**.

Table 3-4

C Upper Coal Seam Ply Samples Selected for Composite Multi-Element Analyses

ALS Laboratory Sample ID	Date	Client Sample Number	Drill Hole Number	Composite Number	Position in C Upper Profile	RGS Composite Sample Number
EB1019792-001	28/10/10	EA001	1406D	C Upper Seam	Top	Comp 1
EB1019792-006	28/10/10	EA001	1424D	C Upper Seam	Top	
EB1019792-002	28/10/10	EA002	1406D	C Upper Seam	Middle	Comp 2
EB1019792-003	28/10/10	EA003	1406D	C Upper Seam	Middle	
EB1019792-007	28/10/10	EA002	1424D	C Upper Seam	Middle	
EB1019792-004	28/10/10	EA004	1406D	C Upper Seam	Bottom	Comp 3
EB1019792-008	28/10/10	EA003	1424D	C Upper Seam	Bottom	
EB1019792-010	28/10/10	EA001	1425D	C Upper Seam	Top	Comp 4
EB1019792-012	28/10/10	EA001	1413D	C Upper Seam	Top	Comp 5
EB1019792-016	28/10/10	EA005	1426D	C Upper Seam	Top	
EB1019792-013	28/10/10	EA002	1413D	C Upper Seam	Middle	Comp 6
EB1019792-014	28/10/10	EA003	1413D	C Upper Seam	Middle	
EB1019792-017	28/10/10	EA006	1426D	C Upper Seam	Middle	
EB1019792-015	28/10/10	EA004	1413D	C Upper Seam	Bottom	Comp 7
EB1019792-018	28/10/10	EA007	1426D	C Upper Seam	Bottom	
EB1019792-019	28/10/10	EA001	1415D	C Upper Seam	Top	Comp 8
EB1019792-022	28/10/10	EA001	1427D	C Upper Seam	Top	
EB1019792-020	28/10/10	EA002	1415D	C Upper Seam	Middle	Comp 9
EB1019792-023	28/10/10	EA002	1427D	C Upper Seam	Middle	
EB1019792-021	28/10/10	EA003	1415D	C Upper Seam	Bottom	Comp 10
EB1019792-024	28/10/10	EA003	1427D	C Upper Seam	Bottom	
EB1019792-025	28/10/10	EA001	1419D	C Upper Seam	Top	Comp 11
EB1019792-027	28/10/10	EA001	1435D	C Upper Seam	Top	
EB1019792-026	28/10/10	EA002	1419D	C Upper Seam	Middle	Comp 12

Note: Composite samples selected from slim-core drill-holes located in selected mine areas.

<u>Assessment of Element Enrichment and Solubility:</u>

Each composite sample underwent analysis at ALS for total and soluble metals and metalloids. The total metals results for C Upper coal seam samples were not available from ALS laboratory in time for inclusion in this Interim Report, however the soluble metal results, undertaken on 1:5 water extracts, are provided in **Table 3-5**.

Multi-element scans are typically carried out to identify any elements (particularly metals and metalloids) present in a material at concentrations that may be of environmental concern with respect to surface water quality and revegetation. The assay result for each element is compared to potentially relevant guideline criteria to determine any concerns related to mine operation and final rehabilitation. Elements identified as enriched may not necessarily be a concern for revegetation, drainage water quality, or human/animal health, but their significance should be evaluated. Similarly, because an element is not enriched does not mean it will never be a concern, because under some conditions (*eg*. low pH) the geochemical behaviour of common environmentally important elements such as Al, Cu, Cd and Zn increases significantly.

There are no guidelines and/or regulatory criteria specifically related to total metal concentrations in mine waste materials, such as overburden, coal and coal rejects. In the absence of these, and to provide relevant context for this assessment, the total concentration of each element reported in all mineral waste samples (solids) [*when these results are available*] will be compared to NEPC (1999a) health-based investigation levels (HIL) category 'E' for parks and recreation (open spaces). The applicability of the NEPC (1999a) guideline for 'open spaces' stems from the potential final land use of the mine following closure (*ie*. low-intensity livestock grazing).

The total metals concentration for individual elements in mineral waste materials can be relevant for revegetation activities and/or where the potential exists for human contact (*eg*. if the material was to be used off-site). Of more importance to the mine is the potential for mineral waste materials to leach soluble metals at concentrations that may impact the environment or human health. Water extract tests are used to determine the immediate solubility and potential mobility of elements under existing pH and oxygen (redox) conditions. Soluble element concentrations are generally compared with those recommended in relevant surface water and groundwater guideline criteria in order to determine their potential environmental significance.

Again, there are no guidelines and regulatory criteria specifically related to seepage from overburden, coal and coal reject materials since guidelines (and regulatory criteria) will depend upon the end-use and receiving environment of the seepage. Therefore, to provide relevant context, the soluble concentration of each element extracted from all overburden, coal and coal reject materials has been compared to livestock drinking water guidelines (NEPC, 1999b and ANZECC, 2000). These guidelines allow for higher concentrations of individual parameters (appropriate for an industrial facility in a rural area) and are less prescriptive and more appropriate (in the context of the project) than guidelines designed for water to be used for direct human consumption or being directly discharged into an aquatic environment (*eg*. stream, river, lake, *etc*.).

<u>Multi-elements in Water Extracts from C Upper Coal Seam Samples:</u>

To evaluate the immediate solubility of multi-elements in solids, water extract (1:5 sample:water) tests were completed for the 12 composite C Upper coal seam samples. The results from these tests are provided in **Table 3-5** and summarised herein. The soluble multi-element results show that soluble metal and metalloid concentrations in water extracts from C Upper coal seam samples tested are low.

Leachate from two of the composite samples (Comp 1 and Comp 7) contained soluble selenium (Se) concentrations (0.04 and 0.03 mg/L for Comp 1 and Comp 7 samples, respectively) marginally above the laboratory limit of reporting (LOR) and applied ANZECC (2000) livestock drinking water guideline and NEPC (1999b) groundwater investigation level (livestock drinking water) value of 0.02 mg/L.

Leachate from all other composite samples contained soluble elements at concentrations below the applied livestock drinking water quality guidelines, and in many cases, below the LOR.

Table 3-5: Multi-Element Results for Samples from C Upper Coal Seam Plys - Alpha Project

			C Upper Seam Materials											
	RGS composite number -->		Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6	Comp 7	Comp 8	Comp 9	Comp 10	Comp 11	Comp 12
	Material Location -->		Top	Middle	Bottom	Top	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle
Parameters	Detection Limit	Guideline Levels[1]												
pH	0.1 pH unit	-	7.8	7.9	7.9	7.0	7.5	7.4	7.8	7.3	7.3	7.3	7.1	7.5
Major Ions	All element concentrations in mg/L													
Calcium (Ca)	1	1,000	2	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Magnesium (Mg)	1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium (Na)	1	-	77	57	41	12	13	7	43	27	7	6	24	19
Potassium (K)	1	-	11	2	2	<1	<1	<1	1	<1	<1	<1	<1	<1
Chloride (Cl)	1	-	34	16	8	12	7	2	7	4	<1	1	4	8
Sulfate (SO_4)	1	1,000	38	52	23	4	8	4	34	45	5	4	42	18
Metals	All element concentrations in mg/L													
Aluminium (Al)	0.01	5	0.6	0.7	0.6	0.8	0.6	0.5	1.3	0.6	0.5	0.6	0.7	1.0
Antimony (Sb)	0.001	-	0.001	0.001	0.003	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.005	<0.001	<0.001
Arsenic (As)	0.001	0.5	0.007	0.00	0.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (B)	0.05	5	0.32	0.32	0.30	0.09	0.07	0.06	0.44	0.62	0.07	0.08	0.08	0.17
Cadmium (Cd)	0.0001	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (Cr)	0.001	1 / -	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (Co)	0.001	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (Cu)	0.001	1 / 0.5	0.002	0.002	0.001	0.003	<0.001	<0.001	0.004	0.001	0.002	<0.001	<0.001	<0.001
Fluoride (F)	0.1	2	0.9	0.9	1.6	1.6	0.6	0.3	1.0	0.2	0.2	0.2	0.2	<0.1
Iron (Fe)	0.05	-	0.13	0.16	0.17	0.19	0.13	0.11	1.02	0.23	0.15	0.35	0.10	0.19
Mercury (Hg)	0.0001	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead (Pb)	0.001	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (Mn)	0.001	-	0.002	0.001	<0.001	0.003	<0.001	0.00	0.006	0.001	<0.001	0.002	<0.001	0.001
Molybdenum (Mo)	0.001	0.15 / 0.01	<0.001	<0.001	<0.001	0.002	0.001	<0.001	0.003	0.002	0.001	<0.001	0.002	0.004
Nickel (Ni)	0.001	1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus (P)	0.01	-	<0.01	0.48	0.11	<0.01	<0.01	<0.01	0.21	<0.01	0.56	<0.01	<0.01	<0.01
Selenium (Se)	0.001	0.02	0.04	<0.01	0.02	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	0.02
Vanadium (V)	0.01	0.1	0.02	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc (Zn)	0.005	20	0.047	0.040	0.048	0.040	0.020	0.015	0.082	0.036	0.018	0.016	0.015	0.040

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

1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999) e.g. 0.15 / 0.01. Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

a. ANZECC and ARMCANZ, Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, ACT (2000). Low risk livestock drinking water trigger value (cattle).

b. NEPC (1999b). National Environment Protection Council (NEPC). National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) Guideline on investigation levels for soil and groundwater. Groundwater Investigations Levels (Agricultural: Livestock).

3.1.2 Geochemical Characterisation of Coal and Coal Reject Materials

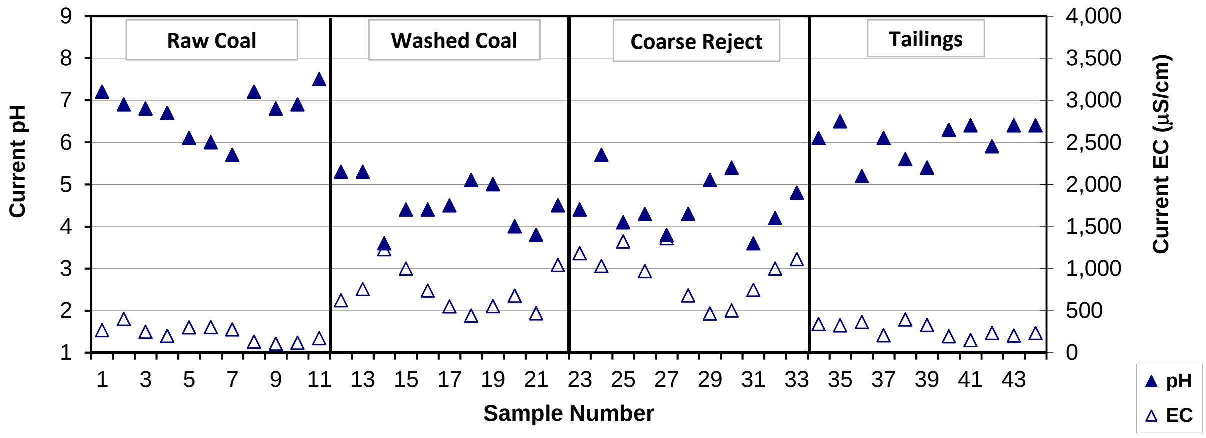
Acid Base Account:

The results of geochemical testing of 44 samples of coal and coal reject materials from eight drill-holes at the Alpha Coal Project are provided at **Table 3-6.** The location of the drill-holes used to obtain the samples is provided in **Figure 2.** Drill-holes were selected to provide a good lateral coverage of the open-pit area and make best use of existing available drill-core. The results in **Table 3-6** indicate that:

- Most of the raw coal and tailings samples have neutral current $pH_{1:5}$ values, whereas most of the washed coal and coarse coal reject samples have slightly acidic pH values.
- The current $EC_{1:5}$ of the all the coal and coal reject samples ranges from 106 to 1,360 µS/cm and the median $EC_{1:5}$ value is 421 µS/cm, which is defined as 'low' to 'medium' salinity (see DME, 1995 previously reproduced at **Table 3-2**). The $EC_{1:5}$ values for the raw coal and tailings samples tend to be in the 'low' range and for the washed coal and coarse coal reject samples tend to be in the 'medium' range.

The pH and EC results for the coal and coal reject samples are illustrated in **Graph 3-6**. Overall, these results indicate that initial surface runoff/seepage from raw coal and tailings is likely to be pH-neutral and have a 'low' salinity value, whereas initial surface runoff/seepage from the washed coal and coarse reject samples is likely to be slightly acidic and have a 'medium' salinity value.

Graph 3-6: Current pH and EC for Coal and Coal Reject Samples



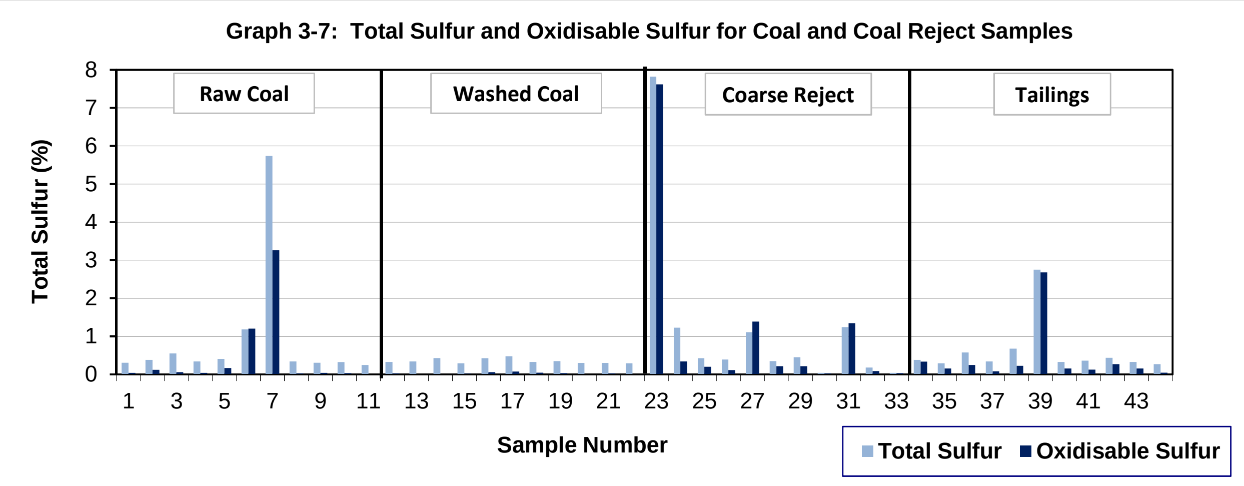
- **Sulfur**: The total sulfur content of the samples ranges from low to high (0.04 to 7.82 % S) and has a median total sulfur value of 0.35 %. However, as illustrated in **Graph 3-7**, in a lot of the samples containing lower amounts of sulfur, the sulfur is present in non-pyritic forms, such as organic- and sulfate-sulfur, which do not contribute to the acid forming potential of these materials. Some of the coal and coal reject samples have an oxidisable sulfur content that is less than the low sulfur cut-off threshold value of 0.1 %, typically used to screen out those materials that have a low to negligible risk of acid generation and are classified as NAF-Barren. (See **Section 3.5.1** for a detailed explanation and justification of the geochemical classification criteria used for mining materials). Further assessment of the information presented in **Graph 3-7** and **Table 3-6**, indicates that most of the oxidisable sulfur content of the raw coal samples reports to coarse coal reject materials and some to tailings materials, in preference to washed coal materials.

Table 3-6: Acid-base Results for Coal and Coal Reject Samples - Alpha Project

ALS Laboratory Sample ID	Date	Client Sample Number	Coal Seam	Drill Holes used to Make Up Samples	Sample Type	pH[1]	EC[1]	Total Sulfur	CRS	MPA[2]	ANC[2]	NAPP[2]	ANC/MPA ratio	Sample Classification[3]
							(µS/cm)	(%)		(kg H_2SO_4/t)				
C Upper Seam														
EB1023357-001	17/12/10	Composite 1	C	1413D, 1426D	Raw Coal	7.2	266	0.31	0.042	1.3	6.9	-5.6	5.4	Non-Acid Forming (Barren)
EB1023357-005	17/12/10	Composite 2	C	1427D, 1435D	Raw Coal	6.9	401	0.38	0.120	3.7	6.3	-2.6	1.7	Uncertain
EB1023357-009	17/12/10	Composite 3	DU	1406D, 1423D, 1424D	Raw Coal	6.8	247	0.55	0.063	1.9	0.5	1.4	0.3	Non-Acid Forming (Barren)
EB1023357-013	17/12/10	Composite 4	DU	1425	Raw Coal	6.7	201	0.34	0.040	1.2	7.2	-6.0	5.9	Non-Acid Forming (Barren)
EB1023357-017	17/12/10	Composite 5	DU	1413D, 1426D, 1427D	Raw Coal	6.1	299	0.41	0.169	5.2	4.9	0.3	0.9	Uncertain
EB1023357-021	17/12/10	Composite 6	DLM	1406D, 1423D, 1424D	Raw Coal	6.0	304	1.18	1.200	36.8	5.2	31.6	0.1	Potentially Acid Forming
EB1023357-025	17/12/10	Composite 7	DLM	1413D, 1426D	Raw Coal	5.7	277	5.74	3.260	99.8	4.1	95.7	0.04	Potentially Acid Forming
EB1023357-029	17/12/10	Composite 8	DLM	1427D, 1435D	Raw Coal	7.2	130	0.34	0.028	0.9	6.0	-5.1	7.0	Non-Acid Forming (Barren)
EB1023357-033	17/12/10	Composite 9	DL	1406D, 1423D	Raw Coal	6.8	106	0.31	0.042	1.3	5.2	-3.9	4.0	Non-Acid Forming (Barren)
EB1023357-037	17/12/10	Composite 10	DL	1413D, 1426D	Raw Coal	6.9	119	0.32	0.035	1.1	4.9	-3.8	4.6	Non-Acid Forming (Barren)
EB1023357-041	17/12/10	Composite 11	DL	1427D, 1435D	Raw Coal	7.5	171	0.25	0.007	0.2	6.7	-6.5	31.3	Non-Acid Forming (Barren)
EB1023357-002	17/12/10	Composite 1	C	1413D, 1426D	Washed Coal	5.3	623	0.33	0.024	0.7	5.7	-5.0	7.8	Non-Acid Forming (Barren)
EB1023357-006	17/12/10	Composite 2	C	1427D, 1435D	Washed Coal	5.3	755	0.34	0.012	0.4	6.0	-5.6	16.3	Non-Acid Forming (Barren)
EB1023357-010	17/12/10	Composite 3	DU	1406D, 1423D, 1424D	Washed Coal	3.6	1230	0.43	0.015	0.5	2.3	-1.8	5.0	Non-Acid Forming (Barren)
EB1023357-014	17/12/10	Composite 4	DU	1425	Washed Coal	4.4	998	0.29	0.019	0.6	5.7	-5.1	9.8	Non-Acid Forming (Barren)
EB1023357-018	17/12/10	Composite 5	DU	1413D, 1426D, 1427D	Washed Coal	4.4	738	0.42	0.060	1.8	4.6	-2.8	2.5	Non-Acid Forming (Barren)
EB1023357-022	17/12/10	Composite 6	DLM	1406D, 1423D, 1424D	Washed Coal	4.5	550	0.48	0.074	2.3	4.9	-2.6	2.2	Non-Acid Forming (Barren)
EB1023357-026	17/12/10	Composite 7	DLM	1413D, 1426D	Washed Coal	5.1	441	0.33	0.049	1.5	4.8	-3.3	3.2	Non-Acid Forming (Barren)
EB1023357-030	17/12/10	Composite 8	DLM	1427D, 1435D	Washed Coal	5.0	552	0.35	0.033	1.0	4.4	-3.4	4.4	Non-Acid Forming (Barren)
EB1023357-034	17/12/10	Composite 9	DL	1406D, 1423D	Washed Coal	4.0	678	0.30	0.014	0.4	3.2	-2.8	7.5	Non-Acid Forming (Barren)
EB1023357-038	17/12/10	Composite 10	DL	1413D, 1426D	Washed Coal	3.8	467	0.30	0.026	0.8	2.5	-1.7	3.1	Non-Acid Forming (Barren)
EB1023357-042	17/12/10	Composite 11	DL	1427D, 1435D	Washed Coal	4.5	1040	0.29	0.003	0.1	3.2	-3.1	34.8	Non-Acid Forming (Barren)
EB1023357-003	17/12/10	Composite 1	C	1413D, 1426D	Coarse Reject	4.4	1180	7.82	7.620	233.4	13.3	220.1	0.1	Potentially Acid Forming
EB1023357-007	17/12/10	Composite 2	C	1427D, 1435D	Coarse Reject	5.7	1030	1.23	0.341	10.4	6.9	3.5	0.7	Uncertain
EB1023357-011	17/12/10	Composite 3	DU	1406D, 1423D, 1424D	Coarse Reject	4.1	1320	0.42	0.201	6.2	3.5	2.7	0.6	PAF-Low Capacity
EB1023357-015	17/12/10	Composite 4	DU	1425	Coarse Reject	4.3	967	0.39	0.115	3.5	1.5	2.0	0.4	PAF-Low Capacity
EB1023357-019	17/12/10	Composite 5	DU	1413D, 1426D, 1427D	Coarse Reject	3.8	1360	1.11	1.390	42.6	2.7	39.9	0.1	Potentially Acid Forming
EB1023357-023	17/12/10	Composite 6	DLM	1406D, 1423D, 1424D	Coarse Reject	4.3	679	0.35	0.212	6.5	5.7	0.8	0.9	PAF-Low Capacity
EB1023357-027	17/12/10	Composite 7	DLM	1413D, 1426D	Coarse Reject	5.1	464	0.45	0.212	6.5	4.1	2.4	0.6	Uncertain
EB1023357-031	17/12/10	Composite 8	DLM	1427D, 1435D	Coarse Reject	5.4	501	0.04	0.028	0.9	2.6	-1.7	3.0	Non-Acid Forming (Barren)
EB1023357-035	17/12/10	Composite 9	DL	1406D, 1423D	Coarse Reject	3.6	748	1.24	1.340	41.0	2.2	38.8	0.1	Potentially Acid Forming
EB1023357-039	17/12/10	Composite 10	DL	1413D, 1426D	Coarse Reject	4.2	998	0.18	0.089	2.7	7.9	-5.2	2.9	PAF-Low Capacity
EB1023357-043	17/12/10	Composite 11	DL	1427D, 1435D	Coarse Reject	4.8	1110	0.04	0.034	1.0	2.0	-1.0	1.9	Non-Acid Forming (Barren)
EB1023357-004	17/12/10	Composite 1	C	1413D, 1426D	Tailings	6.1	338	0.38	0.336	10.3	7.5	2.8	0.7	Uncertain
EB1023357-008	17/12/10	Composite 2	C	1427D, 1435D	Tailings	6.5	323	0.29	0.153	4.7	6.4	-1.7	1.4	Uncertain
EB1023357-012	17/12/10	Composite 3	DU	1406D, 1423D, 1424D	Tailings	5.2	363	0.58	0.250	7.7	2.6	5.1	0.3	PAF-Low Capacity
EB1023357-016	17/12/10	Composite 4	DU	1425	Tailings	6.1	207	0.34	0.081	2.5	4.7	-2.2	1.9	Non-Acid Forming (Barren)
EB1023357-020	17/12/10	Composite 5	DU	1413D, 1426D, 1427D	Tailings	5.6	394	0.68	0.226	6.9	5.4	1.5	0.8	Uncertain
EB1023357-024	17/12/10	Composite 6	DLM	1406D, 1423D, 1424D	Tailings	5.4	326	2.75	2.680	82.1	3.6	78.5	0.04	Potentially Acid Forming
EB1023357-028	17/12/10	Composite 7	DLM	1413D, 1426D	Tailings	6.3	194	0.33	0.155	4.7	6.3	-1.6	1.3	Uncertain
EB1023357-032	17/12/10	Composite 8	DLM	1427D, 1435D	Tailings	6.4	148	0.36	0.127	3.9	4.6	-0.7	1.2	Uncertain
EB1023357-036	17/12/10	Composite 9	DL	1406D, 1423D	Tailings	5.9	233	0.44	0.272	8.3	4.9	3.4	0.6	Uncertain
EB1023357-040	17/12/10	Composite 10	DL	1413D, 1426D	Tailings	6.4	203	0.33	0.157	4.8	9.6	-4.8	2.0	Non-Acid Forming
EB1023357-044	17/12/10	Composite 11	DL	1427D, 1435D	Tailings	6.4	234	0.27	0.045	1.4	3.8	-2.4	2.8	Non-Acid Forming (Barren)

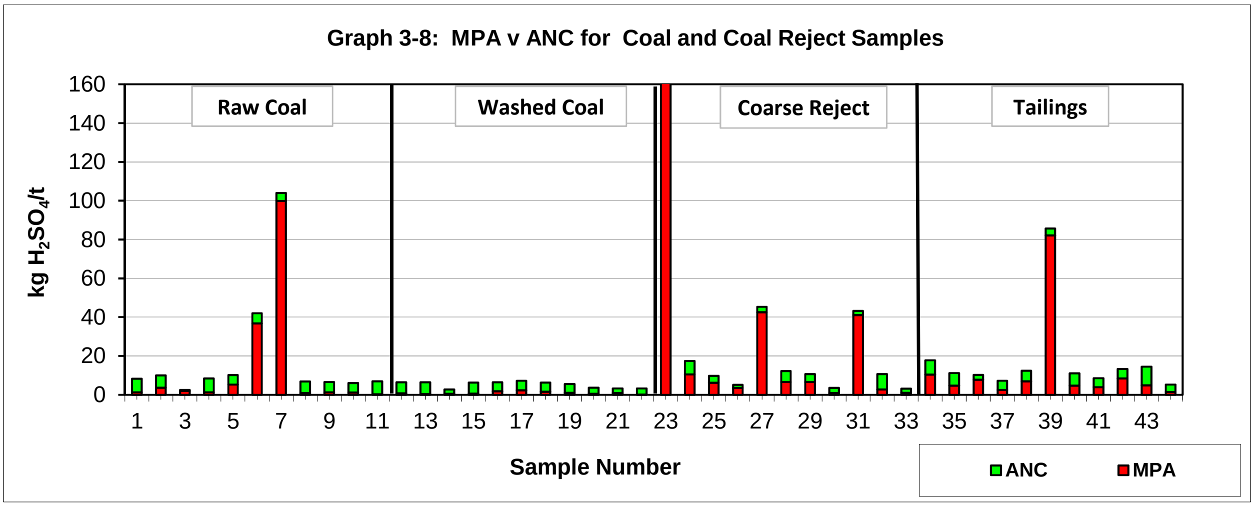
Notes

1. Current pH, EC, Alkalinity and Acidity provided for 1:5 sample:water extracts
2. CRS = Chromium Reducible Sulfur MPA = Maximum potential acidity; ANC = Acid neutralising capacity; and NAPP = Net acid producing potential.
3. Sample classification detail provided in report text.

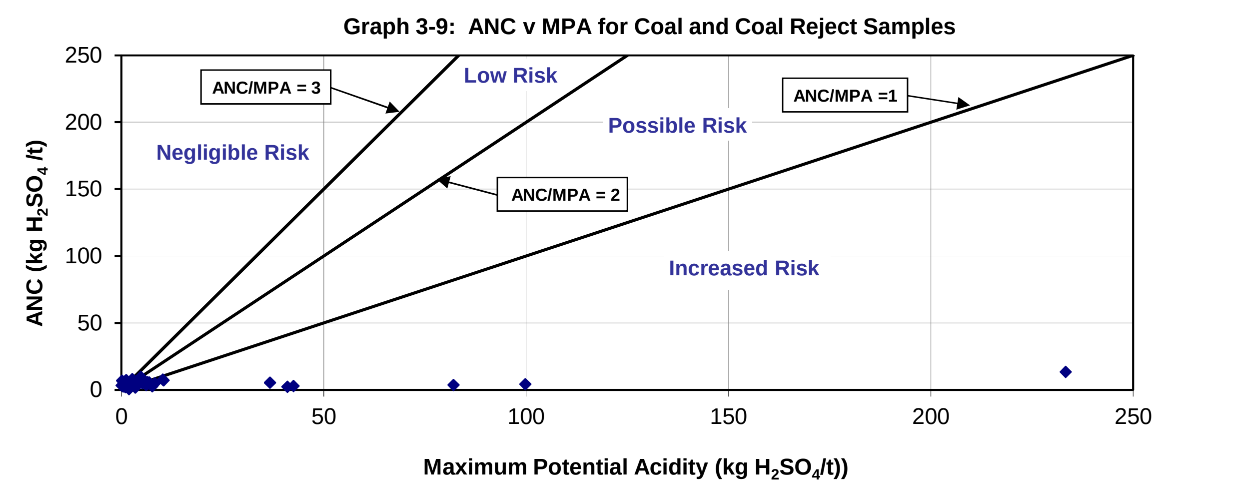


- **MPA**: The MPA that could be theoretically generated by the Coal and Coal Reject samples ranges from 0.1 to 233.4 kg H_2SO_4/t and is generally low (median 2.6 kg H_2SO_4/t).
- **ANC**: The ANC values range from 0.5 to 13.3 kg H_2SO_4/t and are generally low (median 4.9 kg H_2SO_4/t).
- **NAPP**: The calculated NAPP values range from -6.5 to +220.1 kg H_2SO_4/t, with a median NAPP value of -1.7 kg H_2SO_4/t.

Graph 3-8 illustrates the range of ANC:MPA ratios found for the coal and coal reject samples and suggests that some of the raw coal and tailings samples may be PAF (due to their excess MPA), most of the coarse rejects may be PAF (also due to their excess MPA) and the washed coal is likely to be NAF. Overall, the materials with the greatest risk of acid generation appear to be the coarse rejects, although some of the raw coal and tailings materials may also be a source of acid generation.



Graph 3-9 shows a plot of ANC versus MPA for the coal and coal reject samples. The ANC:MPA ratio ranges from 0.1 to 34.8, with a median ANC:MPA ratio of 1.9. ANC:MPA ratio lines have been plotted on the graph to illustrate the factor of safety associated with the samples. Generally those samples with an ANC:MPA ratio of greater than or equal to two are considered to have a low to negligible risk of acid generation and a high factor of safety in terms of potential for AMD as described previously in **Section 3.1.1**. The graph illustrates that although some of the samples have a low oxidisable sulfur content, most also have a low ANC and, consequently, only a few samples have an ANC:MPA ratio greater than two, with most having an ANC:MPA ratio less than two. These results indicate that some of the raw coal and tailings, and most of the coarse reject materials have a low factor of safety and could be a potential source of acid generation and will need to be managed at the Project.



The geochemical results presented in this section were used to geochemically classify the 44 Coal and coal reject samples, as presented in **Table 3-6**. The geochemical criteria used by RGS-Terrenus to classify these samples are provided at **Table 3-7** and generally reflect Australian guideline criteria (AMIRA, 2002; DITR, 2007) and other Australian coal mining industry research criteria (ACARP, 2008).

Table 3-7

Geochemical Classification Criteria for Coal and Coal Reject Samples

Geochemical Classification	Oxidisable Sulfur (%)	ANC:MPA Ratio	NAPP (kg H_2SO_4/t)	Number of samples	% of total samples
NAF - Barren	≤ 0.1	≥ 2	≤ 0	23	52
NAF	> 0.1	≥ 2	≤ 0	1	2
Uncertain	> 0.1	< 2	-5 to ≤ +5	9	30
PAF–Low Capacity	> 0.1	< 2	+5 to ≤ +10	5	2
PAF	> 0.1	< 2	> +10	6	14

Notes: PAF = Potentially Acid Forming; NAF = Non-Acid Forming. If current pH is less than 4.5, the sample is classified as Uncertain, PAF-Low Capacity or PAF depending on magnitude of NAPP Value.

Applying the classification criteria in **Table 3-7** to the data in **Table 3-6**, the results in **Table 3-6** indicate that about half of the coal and coal reject samples tested (55 % = 24 of 44 samples) fall in the NAF-Barren or NAF categories. Eleven samples (25 %) are classified as PAF-Low Capacity or PAF and six of these samples some carry a significant risk of acid generation. The remaining nine samples (20 %) are classified as “Uncertain” on the basis that they have relatively low NAPP values and generally low ANC:MPA ratios (less than two), however most have low oxidisable sulfur contents (low S_{CR} values). The uncertainty surrounding the acid generating nature of these “Uncertain” samples is being evaluated by the kinetic leaching tests currently underway.

Overall, from a management perspective, the materials that are expected to present the most risk of acid generation are, in descending order from most risk to least risk: coarse rejects; tailings; raw coal and washed coal. Estimates of runoff/seepage water quality from some of these materials, based on the static test data alone, is difficult to predict. For example, the washed coal samples already have a relatively low current pH (mildly acidic) yet are expected to not generate significant additional quantities of acid due to their very low oxidisable sulfur contents. Comparatively, the tailings samples, are currently pH-neutral, although some of these materials may generate acidic leachate over time due to their general lack of ANC. The raw coal samples are expected to initially produce pH-neutral runoff/seepage with low salinity but lower pH runoff/seepage with increased salinity could occur from some raw coal materials if exposed to oxidising conditions for an extended period of time (more than a few weeks). The coarse rejects are expected to generate acidic leachate with potentially 'medium' salinity, and the salinity value could be expected to increase over time (a few weeks).

ROM coal materials will require appropriate surface water management to minimise any potential for acidic and/or saline runoff/seepage from interacting with surface water and groundwater environments. Coarse reject will need to be managed as a PAF material and will require suitable compaction, disposal and encapsulation, in addition to alkaline amendment, to increase the ANC of these materials. KLC test results described in **Section 4** of this Interim Report suggests that the use of a fast acting lime product rather than crushed limestone is likely to have the most beneficial effect at the project.

Multi-Element Composition:

The 44 individual coal and coal reject samples were grouped, on the basis of their coal seam and their acid-base geochemical characteristics, into 16 composite samples. The make-up of the 16 composite samples is shown in **Table 3-8**.

Assessment of Element Enrichment and Solubility:

Each composite coal and coal reject sample underwent analysis at ALS for total and soluble metals and metalloids. The total metals results were not available from ALS laboratory in time for inclusion in this Interim Report, however the soluble metal results, undertaken on 1:5 water extracts, are provided in **Table 3-9**.

Multi-elements in Water Extracts from Coal and Coal Reject Samples:

To evaluate the immediate solubility of multi-elements in solids, water extract (1:5 sample:water) tests were completed for the 16 composite coal and coal reject samples. The results from these tests are provided in **Table 3-9** and summarised herein. The soluble multi-element results show that soluble metal and metalloid concentrations in water extracts from coal and coal reject samples tested are low.

Leachate from all except two composite samples (raw coal from C seam and DU seam) contained soluble selenium (Se) concentrations above the LOR and applied ANZECC (2000) livestock drinking water guideline and NEPC (1999b) groundwater investigation level (livestock drinking water) value of 0.02 mg/L.

Leachate from all composite samples contained soluble elements, excluding Se, at concentrations below the applied livestock drinking water quality guidelines, and in many cases, below the laboratory limit of reporting (LOR).

Table 3-8

Coal and Coal Reject Samples Selected for Composite Multi-Element Analyses

ALS Laboratory Sample ID	Date	Client Sample Name	Composite Number	Sample Location
EB1023357-001	17/12/2010	Raw Coal Sample	Comp 1	C Seam
EB1023357-005	17/12/2010	Raw Coal Sample		C Seam
EB1023357-002	17/12/2010	Clean Coal Sample	Comp 2	C Seam
EB1023357-006	17/12/2010	Clean Coal Sample		C Seam
EB1023357-003	17/12/2010	Coarse Reject	Comp 3	C Seam
EB1023357-007	17/12/2010	Coarse Reject		C Seam
EB1023357-004	17/12/2010	Tailings	Comp 4	C Seam
EB1023357-008	17/12/2010	Tailings		C Seam
EB1023357-009	17/12/2010	Raw Coal Sample	Comp 5	DU Seam
EB1023357-013	17/12/2010	Raw Coal Sample		DU Seam
EB1023357-017	17/12/2010	Raw Coal Sample		DU Seam
EB1023357-010	17/12/2010	Clean Coal Sample	Comp 6	DU Seam
EB1023357-014	17/12/2010	Clean Coal Sample		DU Seam
EB1023357-018	17/12/2010	Clean Coal Sample		DU Seam
EB1023357-011	17/12/2010	Coarse Reject	Comp 7	DU Seam
EB1023357-015	17/12/2010	Coarse Reject		DU Seam
EB1023357-019	17/12/2010	Coarse Reject		DU Seam
EB1023357-012	17/12/2010	Tailings	Comp 8	DU Seam
EB1023357-016	17/12/2010	Tailings		DU Seam
EB1023357-020	17/12/2010	Tailings		DU Seam
EB1023357-021	17/12/2010	Raw Coal Sample	Comp 9	DLM Seam
EB1023357-025	17/12/2010	Raw Coal Sample		DLM Seam
EB1023357-029	17/12/2010	Raw Coal Sample		DLM Seam
EB1023357-022	17/12/2010	Clean Coal Sample	Comp 10	DLM Seam
EB1023357-026	17/12/2010	Clean Coal Sample		DLM Seam
EB1023357-030	17/12/2010	Clean Coal Sample		DLM Seam
EB1023357-023	17/12/2010	Coarse Reject	Comp 11	DLM Seam
EB1023357-027	17/12/2010	Coarse Reject		DLM Seam
EB1023357-031	17/12/2010	Coarse Reject		DLM Seam
EB1023357-024	17/12/2010	Tailings	Comp 12	DLM Seam
EB1023357-028	17/12/2010	Tailings		DLM Seam
EB1023357-032	17/12/2010	Tailings		DLM Seam
EB1023357-033	17/12/2010	Raw Coal Sample	Comp 13	DLL Seam
EB1023357-037	17/12/2010	Raw Coal Sample		DLL Seam
EB1023357-041	17/12/2010	Raw Coal Sample		DLL Seam
EB1023357-034	17/12/2010	Clean Coal Sample	Comp 14	DLL Seam
EB1023357-038	17/12/2010	Clean Coal Sample		DLL Seam
EB1023357-042	17/12/2010	Clean Coal Sample		DLL Seam
EB1023357-035	17/12/2010	Coarse Reject	Comp 15	DLL Seam
EB1023357-039	17/12/2010	Coarse Reject		DLL Seam
EB1023357-043	17/12/2010	Coarse Reject		DLL Seam
EB1023357-036	17/12/2010	Tailings	Comp 16	DLL Seam
EB1023357-040	17/12/2010	Tailings		DLL Seam
EB1023357-044	17/12/2010	Tailings		DLL Seam

Note: Composite samples selected from slim-core drill-holes located in selected mine areas.

Table 3-9: Multi-Element Results for Coal and Coal Reject Samples - Alpha Project

			Coal and Coal Reject Materials															
	RGS composite number -->		Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6	Comp 7	Comp 8	Comp 9	Comp 10	Comp 11	Comp 12	Comp 13	Comp 14	Comp 15	Comp 16
	Material Location -->		**Raw Coal** C Seam	**Clean Coal** C Seam	**Coarse Reject** C Seam	**Tailings** C Seam	**Raw Coal** DU Seam	**Clean Coal** DU Seam	**Coarse Reject** DU Seam	**Tailings** DU Seam	**Raw Coal** DLM Seam	**Clean Coal** DLM Seam	**Coarse Reject** DLM Seam	**Tailings** DLM Seam	**Raw Coal** DLL Seam	**Clean Coal** DLL Seam	**Coarse Reject** DLL Seam	**Tailings** DLL Seam
Parameters	Detection Limit	Guideline Levels[1]																
pH	0.01 pH unit	-	7.41	6.52	5.70	7.11	6.99	4.91	4.52	6.48	7.00	5.46	4.77	6.50	7.24	4.17	5.23	6.92
Major Ions	All element concentrations in mg/L																	
Calcium (Ca)	1	1,000	<1	16	47	9	4	38	94	20	5	60	82	32	1	73	71	11
Magnesium (Mg)	1	-	<1	6	18	3	1	11	32	7	1	11	20	7	<1	12	15	2
Sodium (Na)	1	-	36	60	97	20	32	46	70	17	36	74	76	17	26	67	53	13
Potassium (K)	1	-	1	2	8	3	2	3	12	4	1	3	9	2	<1	4	8	1
Chloride (Cl)	1	-	9	132	119	14	7	198	431	13	6	332	306	24	11	395	341	21
Sulfate (SO_4)	1	1,000	47	22	255	58	58	26	131	91	69	8	169	124	24	7	29	24
Metals	All element concentrations in mg/L																	
Aluminium (Al)	0.01	5	0.34	0.11	0.20	0.21	0.23	0.54	2.06	0.07	0.18	0.18	1.49	0.02	0.10	2.51	0.75	0.18
Antimony (Sb)	0.001	-	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (As)	0.001	0.5	0.002	0.116	0.114	0.007	0.002	0.164	0.315	0.011	0.005	0.256	0.239	0.014	0.008	0.299	0.270	0.028
Boron (B)	0.05	5	0.58	0.58	0.36	0.39	0.40	0.61	0.49	0.42	0.35	0.62	0.41	0.46	0.49	0.78	0.30	0.32
Cadmium (Cd)	0.0001	0.01	<0.0001	<0.0001	0.0017	<0.0001	<0.0001	0.0005	0.0058	<0.0001	<0.0001	0.0006	0.0079	0.0001	<0.0001	0.0006	0.0018	<0.0001
Chromium (Cr)	0.001	1 / -	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Cobalt (Co)	0.001	1	<0.001	0.003	0.050	0.006	<0.001	0.044	0.256	0.056	0.001	0.020	0.167	0.034	<0.001	0.026	0.063	0.004
Copper (Cu)	0.001	1 / 0.5	0.004	0.004	0.008	0.001	<0.001	0.012	0.045	<0.001	<0.001	0.005	0.056	<0.001	0.002	0.012	0.011	<0.001
Fluoride (F)	0.1	2	0.2	0.2	0.4	0.3	0.3	0.3	0.9	0.2	0.2	0.4	0.6	0.2	0.4	0.5	0.8	0.3
Iron (Fe)	0.05	-	0.52	0.06	2.08	0.05	0.23	2.24	20.8	<0.05	0.06	2.36	13.5	<0.05	<0.05	12.9	6.54	0.07
Mercury (Hg)	0.0001	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead (Pb)	0.001	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.019	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	0.010	0.003	<0.001
Manganese (Mn)	0.001	-	0.008	0.436	2.440	0.111	0.024	0.559	2.06	0.244	0.081	5.40	8.23	2.16	0.022	2.66	11.2	0.252
Molybdenum (Mo)	0.001	0.15 / 0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Nickel (Ni)	0.001	1	<0.001	0.001	0.018	0.002	<0.001	0.050	0.359	0.062	0.001	0.010	0.168	0.025	0.003	0.016	0.049	0.003
Phosphorus (P)	0.01	-	0.04	<0.01	0.04	0.03	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.02	<0.01	0.06	<0.01	0.05	0.06
Selenium (Se)	0.01	0.02	0.01	0.42	0.42	0.03	0.02	0.59	1.15	0.04	0.03	0.92	0.88	0.06	0.04	1.07	0.97	0.10
Vanadium (V)	0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc (Zn)	0.005	20	0.036	0.368	1.70	0.143	0.012	3.44	2.16	0.552	0.013	2.08	4.62	2.78	0.023	3.67	2.71	0.368

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

1. The first guideline level shown refers to ANZECC (2000) and the second to NEPC (1999b) e.g. 0.15 / 0.01. Where the two guidelines limits for a given element are in agreement, only one value is shown. A 'dash' represents no trigger value provided for this element.

a. ANZECC and ARMCANZ, Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, ACT (2000). Low risk livestock drinking water trigger value (cattle).

b. NEPC (1999b). National Environment Protection Council (NEPC). National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) Guideline on investigation levels for soil and groundwater. Groundwater Investigations Levels (Agricultural: Livestock).

3.2 Task 2: Fill Knowledge Gaps and Address EIS Commitments – Kinetic Tests

3.1.1 Sample Selection

A total of 26 KLC tests are currently being completed by SRK and RGS-Terrenus on overburden, coal and coal reject materials from the Alpha Coal Project as described in **Section 2.0**. A description of the sample materials used in the KLC tests is provided at **Table 3-10**.

Sample selection was based on a need to address the range of likely material types from the Alpha Coal Project, although the focus of the KLC program was skewed towards testing representative samples of those materials where there was perceived to be some risk of acid generation (and related metalliferous and saline drainage) and/or which would require permanent storage at the mine site (*ie.* coal, coal seam roof and floor materials, coarse coal reject and tailings). Six samples of overburden materials covering a range of sulfur contents (low, medium and high) were also included in the KLC test program, although the risk of acid generation from the large majority of these materials (particularly those with a total or oxidisable sulfur content less than 0.1 %) is regarded as negligible to low.

3.1.2 Results

SRK has recently produced an interim Project Memo report for the five KLC tests operated for the Alpha Coal Project for a period of 20 weeks (SRK, 2011). The SRK Project Memo report is included as an attachment to this Interim Report (**Attachment A**) and the findings are summarised in this section.

The results of the SRK KLC tests confirm the PAF nature of the coarse rejects from the DU and DL seams, as column leachate has a pH value less than 4.5. The coarse rejects from the C Upper coal seam and the blended tailings are not yet confirmed as PAF, although SRK has indicated that data trends suggest a potential for acid generation in future, due to the potential for the available ANC to be depleted before all of the available sulfide can oxidise. For the blended raw coal, current data trends (including a very low sulfate release rate) indicate that this material is unlikely to generate acid conditions. This NAF result is expected given the relatively low oxidisable sulfur content of this material *ie*. 0.06 %). On the basis of the KLC results, SRK has reclassified the blended raw coal sample as NAF, which agrees with the RGS-Terrenus classification of this sample material in **Table 3-10** (*ie*. NAF-Barren). SRK has recommended that these KLC tests continue for a further 20 week period and HCPL has agreed to fund this additional test program. A final SRK report will be prepared at the end of the total 40 week KLC test period.

For the acidic coarse reject samples in the SRK KLC tests there has been an increase in the release rate of a number of elements including aluminium, cadmium, copper, iron, lead and zinc. This is to be expected with acid-generating materials as there is a direct relationship between acidic pH and the increased solubility of these elements. These and other elements are already included in the proposed water quality monitoring program in the Environmental Management Plan for the Alpha Coal Project (HPPL, 2010).

The results of the KLC tests on the 21 overburden, coal and coal reject materials included in the RGS-Terrenus test program are also provided at **Attachment A**, along with data trends. The results of the RGS-Terrenus KLC tests also confirm the PAF nature of the coarse reject samples and indicate that under controlled laboratory conditions some of these materials are likely to generate relatively low pH, high acidity surface runoff and seepage (pH 2.5 to 3.5), with elevated salinity levels (3,000 to 4,000 µS/cm) and elevated sulfate concentrations (300 to 400 mg/L) after a few weeks of exposure to oxidising conditions[5]. Alkaline amendment with 5 % (w/w) crushed limestone had some beneficial effect in terms of extending the lag period preceding acid generation and improved leachate quality in two of the coarse reject materials but did not have the same effect on the coarse reject sample with the highest total sulfur content (0.69 % S for coarse reject from C Seam).

[5] The samples included in the RGS-Terrenus KLC study had been crushed and stored at ALS for several months prior to testing and would therefore have been exposed to minor oxidising conditions during the storage period.

Table 3-10

Samples Selected for KLC Tests

Material Type	Drill-Hole Number	KLC Sample Number	Sulfur Content (%)*	Initial SRK (NPR) Sample Classification	RGS-Terrenus Sample Classification
Coarse Reject (C Seam)	1243L, 1244L & 1246L	1	0.43 (0.26)	PAF	PAF-LC
Coarse Reject (DL Seam)	1243L, 1244L & 1246L	2	1.81 (1.11)	PAF	PAF
Coarse Reject (DU Seam)	1243L, 1244L & 1246L	3	0.56 (0.48)	PAF	PAF
Blended Raw Coal (C, DU & DL seams)	1243L, 1244L & 1246L	4	0.44 (0.06)	PAF	NAF-Barren
Blended Tailings (C, DU & DL seams)	1243L, 1244L & 1246L	5	0.66 (0.35)	PAF	PAF
Coarse Reject (DL Seam)	RL290L	KLC 1	0.14	PAF	PAF-LC
Coarse Reject (DU Seam)	RL290L	AKLC 2	0.32	PAF	PAF-LC
Coarse Reject (C Seam)	RL290L	KLC 3	0.69	PAF	PAF
Tailings (DL Seam)	RL290L	KLC 4	0.44	PAF	PAF-LC
Tailings (C Seam)	RL290L	KLC 5	0.44	PAF	PAF
Carbonaceous Mudstone Overburden	R1435D	KLC6	0.34	PAF	PAF
Siltstone Overburden	R1406D	KLC 7	0.06 (0.07)	PAF	NAF-Barren
Claystone Overburden	R1415D	KLC 8	0.02	NAF	NAF-Barren
Claystone Overburden	R1362D	KLC 9	0.06	Uncertain	NAF-Barren
Claystone Overburden	R1362D	KLC 10	0.02	NAF	NAF-Barren
Carbonaceous Shale Overburden	R1424D	KLC 11	1.16 (0.96)	Uncertain	Uncertain
Raw Coal (C Seam)	RL290L	KLC 12	0.32	PAF	PAF-LC
Washed Coal (C Seam)	RL290L	KLC 13	0.34	PAF	PAF
Raw Coal (DU Seam)	RL290L	KLC 14	0.32	PAF	PAF
Washed Coal (DU Seam)	RL290L	KLC 15	0.30	PAF	PAF
Tailings (DU Seam)	RL290L	KLC 16	0.45	PAF	PAF
Raw Coal (DL Seam)	RL290L	KLC 17	0.19	PAF	Uncertain
Washed Coal (DL Seam)	RL290L	KLC 18	0.15	PAF	PAF-LC
Coarse Reject (DL Seam) and 5% crushed limestone	RL290L	KLC 19	0.14	PAF	PAF-LC
Coarse Reject (DU Seam and 5% crushed limestone)	RL290L	KLC 20	0.32	PAF	PAF-LC
Coarse Reject (C Seam and 5% crushed limestone)	RL290L	KLC 21	0.69	PAF	PAF

Notes:
* Total sulfur content presented. Oxidisable sulfur content shown in parenthesis, where available.

Tailings may also be PAF, but in comparison to coarse rejects tailings typically have generated pH conditions in leachate greater than pH 5.0, much lower acidity, and tailings have much lower salinity levels compared to coarse rejects (up to approximately 1,000 µS/cm). Sulfate concentrations from tailings are elevated and generally similar to those of coarse reject materials.

Leachate from raw coal samples typically have pH values ranging from 4.5 to 6.5 and low acidity, with salinity levels lower that coarse rejects and tailings (100 to 500 µS/cm), and generally lower sulfate concentrations (35 to 200 mg/L).

Washed coal samples have typically produced leachate in the range pH 3.5 to 4.5 with low acidity, similar salinity levels to tailings, but comparatively lower sulfate concentration (7 to 33 mg/L). In comparison, overburden materials with low oxidisable sulfur content included in the KLC study (<0.1% S) typically have produced leachate with higher pH values (5.4 to 8.2), very low acidity values which are more than balanced by alkalinity values, initially high salinity values which show a decreasing trend towards a value typically less than 100 µS/cm, and low sulfate concentrations (occasionally initially elevated but show a significant decreasing trend to a typical value of less than 10 mg/L).

Overburden samples with oxidisable sulfur values significantly greater than 0.1 %[6] have produced leachate with pH values ranging from slightly acidic (KLC 6 – carbonaceous mudstone: pH 4.34) to pH-neutral (KLC 11 – carbonaceous shale) depending on the amount of ANC in the sample. Salinity levels also varied considerably in leachate from these two overburden samples (approximately 100 to ~2,000 µS/cm) and sulfate concentrations ranged from 'low' (maximum SO_4 concentration of approximately 40 mg/L for KLC 6) to 'high' (approximately 1,000 mg/L from KLC11).

Some metal concentrations, such as aluminium, cadmium, copper, iron, lead, selenium and zinc are elevated in leachate from some materials, particularly coarse reject. However, significant metal solubility from raw coal, washed coal and tailings samples appears to be limited to manganese and occasionally selenium and zinc. For leachate from overburden samples, metal solubility is mainly limited to aluminium and iron, which given the neutral pH values of leachate and the highly dispersive nature of the claystone material is likely to be an artefact of colloidal material passing through the laboratory filtration stage[7]. The highly dispersive nature of some claystone materials is evident in the salinity of overburden sample Alpha 10, which has an atypical initial EC in leachate of 20,000 µS/cm, which rapidly diminished to about 100 µS/cm over the test period.

Overall, the available KLC results for the SRK and RGS-Terrenus test programs have confirmed that some coal and coal reject materials can be PAF. From a material management perspective, as predicted in **Section 3.1.2**, the materials that are expected to present the most risk of significant acid generation are, in descending order from most risk to least risk: coarse rejects; tailings; raw coal and washed coal.

In contrast, overburden materials (and other materials, such as raw coal) with oxidisable sulfur content less than 0.1 % have been confirmed in the KLC test program to be NAF. In particular, a blended raw coal sample initially classified as PAF on the basis of elevated total sulfur content rather than low oxidisable sulfur content has been reclassified by SRK as NAF based on the KLC test program results. Initial salinity levels, particularly for tertiary clay materials, are elevated and will be managed at the Project by avoiding placement of tertiary clay materials in the final cover or batters of overburden storage areas and also by using surface runoff/seepage (sediment) ponds. Salinity levels in overburden are expected to diminish over time as a result of surface exposure and ongoing flushing (rainfall) events Some carbonaceous overburden materials with atypical elevated sulfur content and representing a very small proportion of the overburden sample materials (located near the main coal seams) may be PAF.

Coarse reject samples from the DU and DL seams blended with five percent crushed limestone have maintained pH-neutral conditions throughout the KLC program, but these two samples still hold some potential to generate acid in future. A coarse reject sample from C seam blended with five percent crushed limestone has generated high concentrations of acidity since leaching commenced and in doing so has released some metals into solution.

The key findings of the KLC program for all materials assessed by RGS-Terrenus are broadly summarised in **Table 3-11**.

[6] Carbonaceous overburden samples with atypical high oxidisable sulfur values of 0.34% and 0.96% were included in the KLC tests.

[7] ALS laboratory has had to increase decrease the solid:water ratio used on the water extract tests for some claystone materials to 1:5 instead of a 1:2 saturated paste as the material is so dispersive that the contact water is difficult to extract.

Table 3-11. Summary of Key Parameters and Trends from KLC Data (at Week 14; ~3 Months)

Material Type	KLC Sample Number	pH	Net Alkalinity* (mg/L as $CaCO_3$)	EC (µS/cm)	SO_4 Release rate (mg/kg)	Comments
Coarse Reject (DL Seam)	KLC 1	3.90 S	-20 S	939 F	22 ↑	Acid generating status confirmed and continuing.
Coarse Reject (DU Seam)	KLC 2	3.87 S	-17 F	1,050 ↑	44 ↑	
Coarse Reject (C Seam)	KLC 3	2.52 S	-560 ↓	3,020 S	157 ↑	
Tailings (DL Seam)	KLC 4	4.96 ↓	-2 S	858 F	158 F	PAF status confirmed. Acid generation expected to continue.
Tailings (C Seam)	KLC 5	4.27 ↓	-21 ↓	666 ↓F	124 F	
Carbonaceous Mudstone Overburden	KLC 6	4.42 S	-12 S	120 S	17 ↑	PAF status confirmed. Weak acid generation expected to continue.
Siltstone Overburden	KLC 7	5.42 ↓	7 S	5 S	2.6 S	NAF status confirmed and expected to continue. Benign material. 'Low' pH in leachate from Alpha 7 and Alpha 8 mimics the naturally low pH of the deionised water applied combined with almost no ANC for these two samples.
Claystone Overburden	KLC 8	6.39 S	6 S	79 S	2 0 S	
Claystone Overburden	KLC 9	7.29 S	56 ↑	73 ↓	1.8 ↓	
Claystone Overburden	KLC 10	8.22 ↑	68 ↑	70 ↓	3.4 S	
Carbonaceous Shale Overburden	KLC 11	7.10 S	64 ↑	1,790 ↑	318 F	Currently NAF and expected to remain so for the duration of the KLC program. NAF status is maintained by excess ANC, however it is unclear whether the ANC will 'outlast' the sulfide oxidation and potential acid generation.
Raw Coal (C Seam)	KLC 12	4.58 S	-6 F	479 S	76 F	PAF status confirmed. Acid generation expected to continue.
Washed Coal (C Seam)	KLC 13	3.54 S	-23 ↓	562 F	16.7 ↑	
Raw Coal (DU Seam)	KLC 14	5.45 ↓	-1 S	154 S	31 F	PAF status not yet confirmed but acid generation is expected.
Washed Coal (DU Seam)	KLC 15	4.60 S	-3 S	245 S	12 S	PAF status confirmed. Acid generation expected to continue.
Tailings (DU Seam)	KLC 16	5.15 ↓	-4 S	659 S	150 S	PAF status not yet confirmed but acid generation is expected.
Raw Coal (DL Seam)	KLC 17	6.44 S	27 F	93 S	19 S	Currently NAF and expected to remain so for the duration of the KLC program.
Washed Coal (DL Seam)	KLC 18	4.10 S	-9 ↓	388 S	3.6 S	PAF status confirmed. Acid generation expected to continue.
Coarse Reject (DL Seam) with 5% crushed limestone	KLC 19	7.52 S	40 F	1,010 ↓	37 F	Currently NAF, however ANC is being diminished rapidly. Expected to become acid generating once ANC from limestone is exhausted.
Coarse Reject (DU Seam) with 5% crushed limestone	KLC 20	7.34 S	51 F	861 F	68 ↑	
Coarse Reject (C Seam) with 5% crushed limestone	KLC 21	2.69 ↓	-310 ↓	2,980 F	400 ↑	PAF status confirmed. Acid generation expected to continue.

* Net alkalinity is total alkalinity minus acidity. A negative value indicates the sample has overall acidity whereas a positive value indicates the sample has overall alkalinity.

Arrows (↑,↓) and symbols (S,F) indicate whether the key parameter value is increasing (↑), decreasing (↓), remaining relatively stable (S) or fluctuating significantly (F). Whether a trend is regarded as relatively stable or fluctuating significantly is somewhat subjective and is relative to the previous three leaching results for the sample.

3.3 Task 3: Address Geochemical Compliance Issues for Environmental Authority MIN100746508 – Alpha Bulk Sample Project (MDL285)

RGS-Terrenus has developed a program of work for geochemical sampling and testing of representative samples of coal, overburden and mining waste materials from the Alpha Bulk Sampling Project to address specific compliance issues described in Conditions F15 to F22 of the approved Environmental Authority (EA) for the Project (DERM, 2010). Specifically a Mining Waste Management Plan (RGS-Terrenus, 2010b) has been developed for use by HCPL and is being used as required under Section F16 of the EA. The contents of the Mining Waste Management Plan have already been described in detail at **Section 2**. The Plan was submitted to HCPL in October 2010 and is a ‘live' document that is being utilised by HCPL and updated as a result of ongoing communications between RGS-Terrenus and the site Geologist.

3.4 Task 4: Geochemical Monitoring Program for the Alpha Bulk Sample Project

The framework for the geochemical monitoring program for the Alpha Bulk Sample Project is the Mining Waste Management Plan (HCPL, 2010). The monitoring program includes aspects of the project at the mining operation and at the CHPP at Jellinbah. RGS-Terrenus has assisted HCPL to develop specific geochemical monitoring programs for the mining operation and the CHPP, associated with managing waste materials such as overburden and coal rejects. A total of 100 samples have been allowed for in the geochemical test program with 90 % of these to be taken from approximately four locations in the test pit progressing down through the stratigraphic profile. The remaining samples will be taken from the coal processing plant at Jellinbah when coal is processed at that facility. For a sample pit and coal processing project of this relatively small size, 100 samples is regarded as sufficient to meet the objectives of the geochemical assessment and adequately understand the potential risks associated with mineral waste materials with respect to their environmental characteristics.

The program of work defined in the Mining Waste Management Plan is being used to select representative samples of coal and mining waste materials from the mining operation associated with the Alpha Bulk Sampling Project. Due to the prolonged wet season, there has been a delay in commencing this project and the current depth of the bulk sample pit is only about 10-15 m. Hence, the number of samples obtained has been limited. The samples are being stored securely and appropriately on site until sufficient samples have been collected to send a sample batch to ALS Brisbane for geochemical characterisation. RGS-Terrenus has worked closely with Salva Resources geology personnel, based on site, and has provided specific instructions with respect to sample collection and dispatch requirements, including relevant ALS Chain of Custody forms.

The outcomes of the geochemical monitoring program will be included in a more complete version of this Interim Report, which will be prepared as a Draft Report and submitted to HCPL in the second half of 2011, when all of the geochemical test results are available.

3.5 Task 5: Supplementary EIS – Technical Assistance

RGS-Terrenus was commissioned by HCPL to provide technical assistance with geochemical aspects of its response to stakeholder submissions arising from public advertising of the Alpha Coal Project EIS. The responses to stakeholder submissions will be provided in a Supplementary EIS document. Three of the main areas where RGS–Terrenus is providing technical assistance at the Alpha Coal Project are provided below and detailed in **Sections 3.5.1** to **3.5.3.**

- Completing a targeted review of the methodology used for classifying coal and mine waste materials;
- Development of a geochemical sampling and testing program for in-fill drilling and future drilling programs; and
- Development of cross-sectional diagrams to illustrate the geochemical nature of the coal and overburden materials.

3.5.1 Targeted Review of Methodology used for Classifying Coal and Mine Waste Materials

The geochemical report for the Alpha Cola Project EIS (SRK, 2010b) used two methods to classify the acid forming nature of mine waste materials:

- The net potential ratio (NPR) method (Price, 2009); and
- The Australian Minerals Industry Research Association (AMIRA) method (AMIRA, 2002).

The net potential ratio (NPR) is a Canadian classification method, defined as the ratio of ANC to MPA of a mining material. Whilst the NPR provides a useful screening tool for the geochemical assessment of mining materials, it can incorrectly classify samples with a very low concentration of oxidisable sulfur as potentially acid forming (PAF), when there is negligible oxidisable sulfur present and there is negligible risk of acid generation. **Section 4.2.1.1** of the geochemical report relied upon in the EIS for the Alpha Coal Project (SRK, 2010b) stated that "*the majority of overburden and interburden samples contain a very low concentration of oxidisable sulfur*".

Recent HCPL communications with SRK confirm that for other coal mining projects SRK has utilised a low sulfur cut-off threshold method to eliminate this drawback of the NPR classification method. This issue was originally highlighted in **Figure 4-13** of the SRK geochemical report (SRK, 2010b), a plot of ANC versus total sulfur for Alpha overburden and interburden samples. The plot shows that samples with total sulfur content less than 0.03 % and 0.1 % carry a negligible and very low risk, respectively, of acid generation even though the NPR screening method has been used to classify these materials as PAF in **Appendix 5** of the SRK report.

RGS-Terrenus has recently been requested by HCPL to prepare cross sections of the proposed mining area at the Alpha Coal Project to assist with preparation of a Supplementary EIS document (**Section 5.1.2** of this Interim Report). During this process the limitations and intrinsic errors in the NPR material classification method were noted as a number of overburden samples located well away from the main coal seams and in the weathered Tertiary rock types, (*eg*. sand), were classified as PAF by the NPR method, many with total and/or oxidisable sulfur contents less than 0.03 % and all with less than 0.1 %.

As a result of this finding, HCPL has written to SRK to clarify the limitations of the NPR material classification methodology for low sulfur materials and has received a letter of response from SRK regarding the approach used by SRK on other coal mining projects, to apply a low sulfur cut-off threshold method to the NPR classification method. When this low sulfur cut-off threshold method is applied, many of the NPR overburden material classifications change, and the cross sections become much clearer and better aligned with the expected geochemistry of the deposit based on the geological model, sedimentary rock types, extent of weathering and genesis of the coal deposit. Essentially overburden located away from the coal seams is likely to be NAF and/or have negligible to very low risk of acid generation. Both the HCPL letter to SRK and SRK letter of response are included in this Interim Report at **Attachment B**.

The use of the low-sulfur cut-off method has additional benefit in that it allows HCPL to focus on the management of other mine waste materials (coal, coal seam roof and floor, coarse reject and fine reject materials), some of which pose a tangible risk of acid generation in the field.

SRK has suggested validating the low-sulfur cut-off threshold classification method by undertaking laboratory scale KLC tests on representative overburden materials with varying sulfur content. The results of the KLC tests have already been described in **Section 3.2** of this Interim Report and demonstrate that overburden materials with a low sulfur content of less than 0.1 % are likely to be NAF. In fact, on the basis of KLC test results, SRK has reclassified a blended raw coal sample with low oxidisable sulfur (0.06 % S) as NAF instead of the original PAF classification generated using the NPR method. It is also noted in the SRK interim Project Memo (SRK, 2011) for the KLC test (**Attachment B**) that "*The chromium reducible sulfur method is a reliable and direct measure of the reducible inorganic sulfur content (Ahern et al, 2004) and therefore provides a more likely estimate of the potential acidity the total sulfur*".

In the proposed operational phase of the Alpha Coal Project, HCPL is committed to conducting larger-scale field trial kinetic tests to provide further validation of the adopted material classification approach.

<u>Acid Base Account Data and Geochemical Classification Criteria Used in EIS:</u>

The results of geochemical testing of 278 overburden (and coal) samples from 35 drill-holes at the Alpha Coal Project relied upon for the geochemical assessment program in the EIS are provided at **Table 3-12**. Data for 25 additional samples of CHPP waste materials (raw coal, washed coal, coarse reject and tailings) from an additional four drill-holes are also provided at **Table 3.12** for completeness, but are not a focus of this part of the Interim Report. The overburden (and coal) data have been classified using both the Canadian NPR classification criteria used in the EIS (SRK, 2010b) and an alternative classification criteria based on an applied low sulfur cut-off threshold of 0.1 % S. From the data presented at **Table 3-12** it is clear that the alternative classification criteria provided a significantly different outcome to the NPR classification method, which is more closely aligned with the AMIRA method (**Attachment B**).

The geochemical classification criteria utilised by RGS-Terrenus for overburden (and coal) materials is summarised in **Table 3-13** and generally reflect Australian guideline criteria (AMIRA, 2002; DITR, 2007) and other Australian coal mining industry research criteria (ACARP, 2008).

Table 3-13

Geochemical Classification Criteria for Coal and Coal Reject Samples

Geochemical Classification	Oxidisable Sulfur (%)	ANC:MPA Ratio	NAPP (kg H_2SO_4/t)	Number of samples	% of total samples
NAF - Barren	≤ 0.1	≥ 2	≤ 0	227	82
NAF	> 0.1	≥ 2	≤ 0	9	3
Uncertain	> 0.1	< 2	-5 to ≤ +5	32	12
PAF–Low Capacity	> 0.1	< 2	+5 to ≤ +10	8	3
PAF	> 0.1	< 2	> +10	2	1

Notes: PAF = Potentially Acid Forming; NAF = Non-Acid Forming. If current pH is less than 4.5, the sample is classified as Uncertain, PAF-Low Capacity or PAF depending on magnitude of NAPP Value.

Application of the classification criteria in **Table 3-13** to the data in **Table 3-12** indicates that 236 (85 %) of the overburden samples are classified as NAF-Barren or NAF. Ten samples (4 %) are classified as PAF-Low Capacity or PAF and only two of these samples have a significant capacity to generate acid (>10 kg H_2SO_4/t). The remaining 32 samples (12 %) are classified as "Uncertain" on the basis that they have relatively low NAPP values and generally low ANC:MPA ratios (less than two), however most have low oxidisable sulfur contents (low S_{CR} values). The uncertainty surrounding the acid generating nature of most of these "Uncertain" samples could be clarified by using oxidisable sulfur (S_{CR}) tests as these provide *"a more likely estimate of the potential acidity the total sulfur"* as stated above.

In direct contrast to these results, the NPR classification methodology used in the EIS indicated (see **Table 3-12**) that 80 samples (29 %) of the total 278 samples tested were PAF. However, over half of these 80 samples (*ie*. 43 samples) have a total sulfur and/or oxidisable sulfur content less than 0.1 %, and 31 of the 43 samples have a total sulfur and or oxidisable sulfur content less than 0.05 %. Hence, it is clear that the NPR method has serious limitations for the geochemical classification of mining materials at the Alpha Coal Project when very low sulfur concentrations are apparent.

Table 3-12: Acid-base Results for Overburden, Coal and Coal Reject Samples used in EIS - Alpha Project

Sample ID	Lithology	Drill Hole	From	To	Depth	pH[1]	EC[1] (µS/cm)	Total Sulfur (%)	CRS[2] (%)	MPA[2] (kg H_2SO_4/t)	ANC[2] (kg H_2SO_4/t)	NAPP[2] (kg H_2SO_4/t)	ANC/MPA ratio	Original NPR Sample Classification[3]	RGS-Terrenus Sample Classification[3]
Overburden and Coal															
75551	CLAY AND SOIL	1327D	0.51	1.00	0.49	5.4	1,570	0.02	N/A	0.6	5.6	-5.0	9.1	Non-Acid Forming	Non-Acid Forming (Barren)
75552	CLAY AND SOIL	1327D	3.00	3.49	0.49	4.9	1,280	0.01	N/A	0.3	4.0	-3.7	13.1	Non-Acid Forming	Non-Acid Forming (Barren)
75553	CLAY AND SOIL	1327D	7.50	7.99	0.49	5.4	4,670	0.02	N/A	0.6	6.3	-5.7	10.3	Non-Acid Forming	Non-Acid Forming (Barren)
75554	CLAY AND SOIL	1327D	11.89	12.28	0.39	6.0	2,040	0.01	N/A	0.2	11.4	-11.2	74.4	Non-Acid Forming	Non-Acid Forming (Barren)
75555	CLAY AND SOIL	1327D	17.32	17.78	0.46	6.3	4,560	0.01	N/A	0.2	10.4	-10.2	67.9	Non-Acid Forming	Non-Acid Forming (Barren)
75556	CLAY AND SOIL	1327D	21.35	21.83	0.48	6.4	463	0.01	N/A	0.2	3.9	-3.7	25.5	Non-Acid Forming	Non-Acid Forming (Barren)
75557	REMAINING	1327D	28.05	28.55	0.50	6.1	1,130	0.01	N/A	0.2	1.2	-1.0	7.84	Non-Acid Forming	Non-Acid Forming (Barren)
75559	REMAINING	1327D	39.09	39.58	0.49	6.3	633	0.01	N/A	0.2	1.4	-1.2	9.1	Non-Acid Forming	Non-Acid Forming (Barren)
75560	REMAINING	1327D	45.91	46.38	0.47	6.2	282	0.01	N/A	0.2	8.2	-8.0	53.6	Non-Acid Forming	Non-Acid Forming (Barren)
75561	REMAINING	1327D	51.02	51.47	0.45	6.5	34	0.01	N/A	0.2	2.5	-2.3	16.3	Non-Acid Forming	Non-Acid Forming (Barren)
75562	REMAINING	1327D	54.95	55.45	0.50	6.3	128	0.01	N/A	0.2	1.6	-1.4	10.4	Non-Acid Forming	Non-Acid Forming (Barren)
75563	REMAINING	1327D	66.42	66.95	0.53	6.5	131	0.02	N/A	0.6	2.4	-1.8	3.9	Non-Acid Forming	Non-Acid Forming (Barren)
75564	CLAY AND SOIL	1337DG	0.30	0.74	0.44	6.6	353	0.04	N/A	1.2	5.6	-4.4	4.6	Non-Acid Forming	Non-Acid Forming (Barren)
75565	CLAY AND SOIL	1337DG	2.40	2.90	0.50	5.3	1,740	0.01	N/A	0.3	1.6	-1.3	5.2	Non-Acid Forming	Non-Acid Forming (Barren)
75566	SAND AND GRAVEL	1337DG	3.49	4.00	0.51	5.7	1,170	0.01	N/A	0.2	1.4	-1.2	9.1	Non-Acid Forming	Non-Acid Forming (Barren)
75567	CLAY AND SOIL	1337DG	9.07	9.50	0.43	5.8	4,100	0.02	N/A	0.6	3.4	-2.8	5.6	Non-Acid Forming	Non-Acid Forming (Barren)
75568	CLAY AND SOIL	1337DG	12.45	12.94	0.49	6.0	4,360	0.01	N/A	0.3	9.1	-8.8	29.7	Non-Acid Forming	Non-Acid Forming (Barren)
75569	REMAINING	1337DG	22.29	22.69	0.40	6.3	2,390	0.01	N/A	0.2	3.2	-3.0	20.9	Non-Acid Forming	Non-Acid Forming (Barren)
75570	REMAINING	1337DG	35.06	35.59	0.53	6.7	1,730	0.01	N/A	0.3	9.1	-8.8	29.7	Non-Acid Forming	Non-Acid Forming (Barren)
75571	REMAINING	1337DG	39.60	40.05	0.45	6.7	1,100	0.01	N/A	0.2	2.2	-2.0	14.4	Non-Acid Forming	Non-Acid Forming (Barren)
75572	REMAINING	1337DG	43.54	44.06	0.52	6.7	1,480	0.03	N/A	0.9	3.4	-2.5	3.7	Non-Acid Forming	Non-Acid Forming (Barren)
75573	COAL	1337DG	51.98	52.46	0.48	6.6	168	0.18	N/A	5.5	9.1	-3.6	1.7	Uncertain	Uncertain
75574	REMAINING	1337DG	62.84	63.34	0.50	6.4	123	0.02	N/A	0.6	1.5	-0.9	2.4	Uncertain	Non-Acid Forming (Barren)
75575	REMAINING	1337DG	76.15	76.65	0.50	6.3	314	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
C3-4-5	SAND AND GRAVEL	1296L	2.00	4.00	2.00	6.2	4,400	0.02	N/A	0.6	2.1	-1.5	3.4	Non-Acid Forming	Non-Acid Forming (Barren)
C10-11-12	CLAY AND SOIL	1296L	9.00	12.00	3.00	6.4	4,620	0.02	N/A	0.6	4.1	-3.5	6.7	Non-Acid Forming	Non-Acid Forming (Barren)
C19-20	CLAY AND SOIL	1296L	18.00	20.00	2.00	6.6	3,660	0.02	N/A	0.6	5.3	-4.7	8.7	Non-Acid Forming	Non-Acid Forming (Barren)
C23-24	REMAINING	1296L	22.00	24.00	2.00	6.3	2,020	0.01	N/A	0.3	3.8	-3.5	12.4	Non-Acid Forming	Non-Acid Forming (Barren)
C27-28	REMAINING	1296L	26.00	28.00	2.00	6.3	783	0.02	N/A	0.6	1.3	-0.7	2.1	Uncertain	Non-Acid Forming (Barren)
C33-34	REMAINING	1296L	32.00	34.00	2.00	6.2	1	0.01	N/A	0.2	2.2	-2.0	14.4	Non-Acid Forming	Non-Acid Forming (Barren)
C42	REMAINING	1296L	41.00	42.00	1.00	6.6	1	0.01	N/A	0.3	2.7	-2.4	8.8	Non-Acid Forming	Non-Acid Forming (Barren)
C45-46	COAL	1296L	44.00	46.00	2.00	6.9	3,300	0.20	N/A	6.1	5.0	1.1	0.8	Potentially Acid Forming	Uncertain
C14-15-16	CLAY AND SOIL	1296L	13.00	16.00	3.00	6.4	2,760	0.02	N/A	0.6	6.2	-5.6	10.1	Non-Acid Forming	Non-Acid Forming (Barren)
C36-37	REMAINING	1296L	35.00	37.00	2.00	6.4	1,570	0.01	N/A	0.2	1.9	-1.7	12.4	Non-Acid Forming	Non-Acid Forming (Barren)
C40-41	REMAINING	1296L	39.00	41.00	2.00	6.8	236	0.01	N/A	0.2	1.2	-1.0	7.8	Non-Acid Forming	Non-Acid Forming (Barren)
1252D_ARD03	REMAINING	1252D	23.89	27.82	3.93	8.4	1,140	0.06	N/A	1.8	54.6	-52.8	29.7	Non-Acid Forming	Non-Acid Forming (Barren)
1252D_ARD04	REMAINING	1252D	30.28	31.16	0.88	8.6	911	0.09	0.052	1.6	57.6	-56.0	36.2	Non-Acid Forming	Non-Acid Forming (Barren)
1252D_ARD05	COAL	1252D	33.39	33.92	0.53	7.2	1,200	0.68	0.064	2.0	16.0	-14.0	8.2	Potentially Acid Forming	Non-Acid Forming (Barren)
1252D_ARD07	REMAINING	1252D	42.93	43.55	0.62	6.6	303	0.11	N/A	3.4	4.9	-1.5	1.5	Uncertain	Uncertain
1252D_ARD08	REMAINING	1252D	45.28	55.83	10.55	6.6	160	0.11	N/A	3.4	2.8	0.6	0.8	Potentially Acid Forming	Uncertain
1252D_ARD09	REMAINING	1252D	57.76	60.91	3.15	6.8	172	0.03	N/A	0.9	4.6	-3.7	5.0	Non-Acid Forming	Non-Acid Forming (Barren)
1252D_ARD10	REMAINING	1252D	61.76	64.10	2.34	5.7	610	0.13	N/A	4.0	6.0	-2.0	1.5	Uncertain	Uncertain
1252D_ARD11	COAL	1252D	64.48	65.70	1.22	5.8	1,580	0.40	0.136	4.2	1.0	3.2	0.2	Potentially Acid Forming	Uncertain
1262D_ARD01	SAND AND GRAVEL	1262D	3.00	5.40	2.40	8.3	878	0.01	N/A	0.3	4.6	-4.3	15.0	Non-Acid Forming	Non-Acid Forming (Barren)
1262D_ARD02	SAND AND GRAVEL	1262D	6.90	8.70	1.80	7.9	1,230	0.01	N/A	0.2	3.8	-3.6	24.8	Non-Acid Forming	Non-Acid Forming (Barren)
1262D_ARD03	REMAINING	1262D	10.72	19.67	8.95	7.1	2,790	0.01	N/A	0.3	3.9	-3.6	12.7	Non-Acid Forming	Non-Acid Forming (Barren)
1262D_ARD04	CARBONACEOUS	1262D	29.61	30.27	0.66	6.7	1,860	0.01	N/A	0.3	3.8	-3.5	12.4	Non-Acid Forming	Non-Acid Forming (Barren)
1262D_ARD05	COAL	1262D	30.27	30.82	0.55	5.0	3,140	0.37	0.038	1.2	4.2	-3.0	3.6	Potentially Acid Forming	Non-Acid Forming (Barren)
1277D_ARD01	CLAY AND SOIL	1277D	7.04	8.24	1.20	6.6	1,610	0.01	N/A	0.3	4.2	-3.9	13.7	Non-Acid Forming	Non-Acid Forming (Barren)
1277D_ARD02	SAND AND GRAVEL	1277D	9.08	9.86	0.78	7.2	2,080	0.05	N/A	1.5	4.9	-3.4	3.2	Non-Acid Forming	Non-Acid Forming (Barren)
1277D_ARD03	CLAY AND SOIL	1277D	12.27	17.38	5.11	7.2	1,010	0.07	N/A	2.1	6.9	-4.8	3.2	Non-Acid Forming	Non-Acid Forming (Barren)
1277D_ARD04	REMAINING	1277D	18.76	22.41	3.65	8.3	2,240	0.09	N/A	2.8	4.2	-1.4	1.5	Uncertain	Non-Acid Forming (Barren)
1277D_ARD05	REMAINING	1277D	22.64	23.45	0.81	8.6	1,480	0.04	N/A	1.2	4.4	-3.2	3.6	Non-Acid Forming	Non-Acid Forming (Barren)
1277D_ARD10	REMAINING	1277D	37.55	40.22	2.67	7.4	309	0.03	N/A	0.9	1.4	-0.5	1.5	Uncertain	Non-Acid Forming (Barren)
1277D_ARD11	REMAINING	1277D	55.38	57.84	2.46	5.1	306	0.09	N/A	2.8	0.3	2.5	0.1	Potentially Acid Forming	Non-Acid Forming (Barren)
1326D_ARD01	CLAY AND SOIL	1326D	0.20	2.27	2.07	6.1	5,140	0.14	0.003	0.1	5.2	-5.1	67.9	Uncertain	Non-Acid Forming (Barren)
1326D_ARD02	CLAY AND SOIL	1326D	2.36	3.57	1.21	5.4	4,360	0.03	N/A	0.9	3.6	-2.7	3.9	Non-Acid Forming	Non-Acid Forming (Barren)
1326D_ARD03	SAND AND GRAVEL	1326D	5.77	7.59	1.82	6.0	3,570	0.04	N/A	1.2	3.4	-2.2	2.8	Uncertain	Non-Acid Forming (Barren)
1326D_ARD04	SAND AND GRAVEL	1326D	8.36	10.00	1.64	6.8	4,090	0.10	N/A	3.1	7.0	-3.9	2.3	Uncertain	Non-Acid Forming (Barren)
1326D_ARD05	REMAINING	1326D	29.36	33.56	4.20	7.0	960	0.05	N/A	1.5	3.4	-1.9	2.2	Uncertain	Non-Acid Forming (Barren)
1327D_ARD01	SAND AND GRAVEL	1327D	5.60	6.02	0.42	6.9	2,550	0.03	N/A	0.9	3.9	-3.0	4.2	Non-Acid Forming	Non-Acid Forming (Barren)
1327D_ARD03	COAL	1327D	59.00	60.55	1.55	7.1	392	0.10	N/A	3.1	3.8	-0.7	1.2	Uncertain	Non-Acid Forming (Barren)
1336D_ARD01	REMAINING	1336D	32.00	56.90	24.90	7.2	234	0.08	N/A	2.5	3.1	-0.7	1.3	Uncertain	Non-Acid Forming (Barren)
1336D_ARD02	CARBONACEOUS	1336D	56.90	58.22	1.32	7.0	238	0.01	N/A	0.2	3.0	-2.8	19.6	Non-Acid Forming	Non-Acid Forming (Barren)
1336D_ARD03	REMAINING	1336D	58.22	58.78	0.56	6.4	344	0.08	N/A	2.5	3.0	-0.6	1.2	Uncertain	Non-Acid Forming (Barren)
1337DG_ARD01	SAND AND GRAVEL	1337DG	3.24	5.24	2.00	6.2	1,950	0.01	N/A	0.3	3.6	-3.3	11.8	Non-Acid Forming	Non-Acid Forming (Barren)
1337DG_ARD02	REMAINING	1337DG	47.62	48.60	0.98	6.9	1,850	0.07	N/A	2.1	16.1	-14.0	7.5	Non-Acid Forming	Non-Acid Forming (Barren)
1337DG_ARD03	COAL	1337DG	49.93	50.79	0.86	8.0	1,660	0.21	0.018	0.6	15.7	-15.1	28.5	Uncertain	Non-Acid Forming (Barren)
1339DG_ARD01	REMAINING	1339DG	0.17	3.21	3.04	8.0	826	0.01	N/A	0.2	5.9	-5.7	38.5	Non-Acid Forming	Non-Acid Forming (Barren)
1339DG_ARD02	REMAINING	1339DG	6.48	9.07	2.59	5.4	1,950	0.13	N/A	4.0	3.5	0.5	0.9	Potentially Acid Forming	Uncertain
1339DG_ARD03	CARBONACEOUS	1339DG	24.19	24.68	0.49	7.4	2,380	0.27	0.048	1.5	14.0	-12.5	9.5	Uncertain	Non-Acid Forming (Barren)
1339DG_ARD04	REMAINING	1339DG	27.54	29.78	2.24	7.6	609	0.09	N/A	2.8	5.5	-2.7	2.0	Uncertain	Non-Acid Forming (Barren)
1339DG_ARD05	REMAINING	1339DG	31.69	33.50	1.81	5.4	1,070	0.27	0.178	5.5	4.8	0.7	0.9	Potentially Acid Forming	Non-Acid Forming
1339DG_ARD06	REMAINING	1339DG	33.94	33.98	0.04	3.8	2,930	26.8	16.3	499.2	0.3	498.9	0.0	Potentially Acid Forming	Potentially Acid Forming
1339DG_ARD08	REMAINING	1339DG	36.83	54.44	17.61	7.5	268	0.02	N/A	0.6	3.8	-3.2	6.2	Non-Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD001	CLAY AND SOIL	1347DG	0.99	9.50	8.51	8.6	798	0.02	N/A	0.6	23.3	-22.7	38.0	Non-Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD002	REMAINING	1347DG	16.56	24.45	7.89	7.2	1,550	0.01	N/A	0.3	2.0	-1.7	6.5	Non-Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD003	REMAINING	1347DG	26.52	35.75	9.23	7.4	923	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD004	CARBONACEOUS	1347DG	85.56	86.97	1.41	8.9	1,290	0.05	N/A	1.5	40.9	-39.4	26.7	Non-Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD005	REMAINING	1347DG	89.88	99.87	9.99	8.9	752	0.04	N/A	1.2	50.0	-48.8	40.8	Non-Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD006	CARBONACEOUS	1347DG	99.87	100.30	0.43	8.9	1,590	0.05	N/A	1.5	20.3	-18.8	13.3	Non-Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD007	CARBONACEOUS	1347DG	107.80	114.20	6.40	8.8	1,010	0.07	N/A	2.1	29.0	-26.9	13.5	Non-Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD008	REMAINING	1347DG	114.35	116.05	1.70	9.2	977	0.06	N/A	1.8	116.0	-114.2	63.1	Non-Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD010	CARBONACEOUS	1347DG	128.18	129.12	0.94	7.6	178	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD011	REMAINING	1347DG	129.12	130.73	1.61	7.8	249	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1347DG_ARD012	CARBONACEOUS	1347DG	130.73	131.33	0.60	7.0	331	0.06	N/A	1.8	0.3	1.6	0.1	Potentially Acid Forming	Non-Acid Forming (Barren)

Table 3-12: Acid-base Results for Overburden, Coal and Coal Reject Samples used in EIS - Alpha Project

Sample ID	Lithology	Drill Hole	From	To	Depth	pH[1]	EC[1]	Total Sulfur	CRS[2]	MPA[2]	ANC[2]	NAPP[2]	ANC/MPA ratio	Original NPR Sample Classification[3]	RGS-Terrenus Sample Classification[3]
							(µS/cm)	(%)		(kg H_2SO_4/t)					
1349D_ARD01	CLAY AND SOIL	1349D	1.96	18.50	16.54	7.9	4,930	0.14	0.003	0.1	54.6	-54.5	713.1	Non-Acid Forming	Non-Acid Forming (Barren)
1349D_ARD02	REMAINING	1349D	18.50	26.32	7.82	7.6	1,860	0.11	0.003	0.1	6.4	-6.3	83.6	Uncertain	Non-Acid Forming (Barren)
1349D_ARD03	REMAINING	1349D	36.58	39.50	2.92	7.2	231	0.01	N/A	0.2	3.0	-2.8	19.6	Non-Acid Forming	Non-Acid Forming (Barren)
1350D_ARD01	SAND AND GRAVEL	1350D	1.59	4.83	3.24	6.7	203	0.01	N/A	0.2	2.5	-2.3	16.3	Non-Acid Forming	Non-Acid Forming (Barren)
1350D_ARD02	REMAINING	1350D	32.00	34.31	2.31	7.6	493	0.01	N/A	0.3	4.6	-4.3	15.0	Non-Acid Forming	Non-Acid Forming (Barren)
1350D_ARD03	REMAINING	1350D	37.24	38.50	1.26	7.5	579	0.08	N/A	2.5	4.3	-1.9	1.8	Uncertain	Non-Acid Forming (Barren)
1350D_ARD04	COAL	1350D	48.26	48.75	0.49	6.9	1,280	0.14	N/A	4.3	12.8	-8.5	3.0	Uncertain	Non-Acid Forming
1361D_ARD01	REMAINING	1361D	1.97	3.24	1.27	8.6	1,090	0.06	N/A	1.8	9.0	-7.2	4.9	Non-Acid Forming	Non-Acid Forming (Barren)
1361D_ARD02	REMAINING	1361D	6.20	7.30	1.10	7.2	1,010	0.01	N/A	0.2	3.0	-2.8	19.6	Non-Acid Forming	Non-Acid Forming (Barren)
1361D_ARD03	REMAINING	1361D	12.19	28.05	15.86	7.3	2,400	0.08	N/A	2.5	3.1	-0.7	1.3	Uncertain	Non-Acid Forming (Barren)
1362D_ARD01	REMAINING	1362D	0.45	3.02	2.57	8.4	651	0.06	N/A	1.8	9.8	-8.0	5.3	Non-Acid Forming	Non-Acid Forming (Barren)
1362D_ARD02	REMAINING	1362D	30.15	32.54	2.39	7.8	403	0.06	N/A	1.8	2.9	-1.1	1.6	Uncertain	Non-Acid Forming (Barren)
1362D_ARD03	REMAINING	1362D	34.01	35.13	1.12	4.5	320	0.06	N/A	1.8	3.4	-1.6	1.9	Uncertain	Non-Acid Forming (Barren)
1362D_ARD04	REMAINING	1362D	39.40	41.74	2.34	7.4	494	0.02	N/A	0.6	9.0	-8.4	14.7	Non-Acid Forming	Non-Acid Forming (Barren)
1362D_ARD05	REMAINING	1362D	47.53	51.40	3.87	8.0	1,430	0.13	N/A	4.0	3.6	0.4	0.9	Potentially Acid Forming	Non-Acid Forming
1362D_ARD06	COAL	1362D	52.13	53.07	0.94	5.6	1,070	0.44	0.074	2.3	8.0	-5.7	3.5	Potentially Acid Forming	Non-Acid Forming (Barren)
1406D_ARD01	CLAY AND SOIL	1406D	2.09	2.97	0.88	5.4	3,440	0.03	N/A	0.9	2.9	-2.0	3.2	Non-Acid Forming	Non-Acid Forming (Barren)
1406D_ARD02	REMAINING	1406D	9.67	10.45	0.78	8.5	2,170	0.02	N/A	0.6	22.6	-22.0	36.9	Non-Acid Forming	Non-Acid Forming (Barren)
1406D_ARD03	REMAINING	1406D	21.92	22.86	0.94	8.9	1,740	0.02	N/A	0.6	15.8	-15.2	25.8	Non-Acid Forming	Non-Acid Forming (Barren)
1406D_ARD04	REMAINING	1406D	35.09	35.82	0.73	8.9	821	0.04	N/A	1.2	14.7	-13.5	12.0	Non-Acid Forming	Non-Acid Forming (Barren)
1406D_ARD06	COAL	1406D	42.93	44.29	1.36	8.5	697	0.05	N/A	1.5	10.2	-8.7	6.7	Non-Acid Forming	Non-Acid Forming (Barren)
1406D_ARD07	REMAINING	1406D	46.66	47.82	1.16	8.0	242	0.06	0.074	2.3	1.4	0.9	0.6	Potentially Acid Forming	Non-Acid Forming (Barren)
1406D_ARD08	REMAINING	1406D	56.82	59.41	2.59	7.3	108	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1406D_ARD09	COAL	1406D	71.04	71.82	0.78	6.9	242	0.15	N/A	4.6	9.7	-5.1	2.1	Uncertain	Non-Acid Forming
1406D_ARD10	REMAINING	1406D	73.24	74.82	1.58	7.8	94	0.03	0.010	0.3	1.2	-0.9	3.9	Uncertain	Non-Acid Forming (Barren)
1411D_ARD01	CLAY AND SOIL	1411D	3.28	4.27	0.99	9.0	1,040	0.02	0.006	0.2	1.6	-1.4	8.7	Uncertain	Non-Acid Forming (Barren)
1411D_ARD02	REMAINING	1411D	14.84	16.98	2.14	7.5	1,780	0.02	N/A	0.6	1.7	-1.1	2.8	Uncertain	Non-Acid Forming (Barren)
1411D_ARD04	REMAINING	1411D	36.78	37.84	1.06	7.8	333	0.03	N/A	0.9	2.5	-1.6	2.7	Uncertain	Non-Acid Forming (Barren)
1411D_ARD05	REMAINING	1411D	38.23	39.47	1.24	7.9	232	0.02	0.012	0.4	2.1	-1.7	5.7	Non-Acid Forming	Non-Acid Forming (Barren)
1411D_ARD06	CARBONACEOUS	1411D	39.65	40.11	0.46	6.9	416	0.11	0.124	3.8	1.3	2.5	0.3	Potentially Acid Forming	Uncertain
1411D_ARD07	COAL	1411D	43.70	44.53	0.83	7.2	196	0.29	0.006	0.2	1.0	-0.8	5.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1413D_ARD02	SAND AND GRAVEL	1413D	26.12	29.49	3.37	7.1	1,360	0.01	N/A	0.3	1.2	-0.9	3.9	Non-Acid Forming	Non-Acid Forming (Barren)
1413D_ARD03	REMAINING	1413D	45.03	46.01	0.98	7.1	2,020	0.02	N/A	0.6	12.5	-11.9	20.4	Non-Acid Forming	Non-Acid Forming (Barren)
1413D_ARD04	REMAINING	1413D	52.67	53.23	0.56	7.5	891	0.02	N/A	0.6	1.2	-0.6	2.0	Uncertain	Non-Acid Forming (Barren)
1413D_ARD05	COAL	1413D	56.12	56.70	0.58	8.7	1,060	0.07	N/A	2.1	12.5	-10.4	5.8	Non-Acid Forming	Non-Acid Forming (Barren)
1413D_ARD06	REMAINING	1413D	66.45	66.84	0.39	7.4	155	0.03	0.020	0.6	1.2	-0.6	2.0	Uncertain	Non-Acid Forming (Barren)
1413D_ARD07	REMAINING	1413D	67.64	68.85	1.21	7.6	129	0.03	N/A	0.9	0.3	0.7	0.3	Potentially Acid Forming	Non-Acid Forming (Barren)
1413D_ARD08	COAL	1413D	73.71	74.58	0.87	6.7	205	0.21	N/A	6.4	3.9	2.5	0.6	Potentially Acid Forming	Uncertain
1415D_ARD01	SAND AND GRAVEL	1415D	8.85	10.50	1.65	6.9	874	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1415D_ARD02	CLAY AND SOIL	1415D	14.16	15.57	1.41	7.5	3,580	0.02	0.003	0.1	7.4	-7.3	96.7	Non-Acid Forming	Non-Acid Forming (Barren)
1415D_ARD03	REMAINING	1415D	37.03	39.05	2.02	6.9	1,360	0.02	N/A	0.6	1.9	-1.3	3.1	Non-Acid Forming	Non-Acid Forming (Barren)
1415D_ARD04	COAL	1415D	61.95	62.25	0.30	6.7	921	0.25	N/A	7.7	4.4	3.3	0.6	Potentially Acid Forming	Uncertain
1415D_ARD05	COAL	1415D	76.68	77.52	0.84	6.8	298	0.58	0.276	8.5	5.1	3.4	0.6	Potentially Acid Forming	Uncertain
1415D_ARD06	REMAINING	1415D	78.10	79.78	1.68	7.9	109	0.02	N/A	0.6	4.6	-4.0	7.5	Non-Acid Forming	Non-Acid Forming (Barren)
1415D_ARD07	REMAINING	1415D	79.78	80.72	0.94	8.4	111	0.02	0.012	0.4	1.4	-1.0	3.8	Uncertain	Non-Acid Forming (Barren)
1418D_ARD01	REMAINING	1418D	20.00	21.00	1.00	8.8	1,050	0.02	N/A	0.6	13.6	-13.0	22.2	Non-Acid Forming	Non-Acid Forming (Barren)
1418D_ARD02	REMAINING	1418D	48.00	50.90	2.90	8.3	664	0.02	0.003	0.1	1.6	-1.5	20.9	Uncertain	Non-Acid Forming (Barren)
1418D_ARD03	COAL	1418D	51.20	51.70	0.50	6.6	517	0.25	N/A	7.7	5.6	2.1	0.7	Potentially Acid Forming	Uncertain
1419D_ARD01	CLAY AND SOIL	1419D	10.49	11.58	1.09	8.5	2,600	0.02	N/A	0.6	5.8	-5.2	9.5	Non-Acid Forming	Non-Acid Forming (Barren)
1419D_ARD02	REMAINING	1419D	20.77	21.57	0.80	7.9	1,070	0.02	N/A	0.6	2.5	-1.9	4.1	Non-Acid Forming	Non-Acid Forming (Barren)
1419D_ARD03	CLAY AND SOIL	1419D	25.71	26.63	0.92	7.5	1,980	0.18	N/A	5.5	1.4	4.1	0.3	Potentially Acid Forming	Uncertain
1419D_ARD04	REMAINING	1419D	39.73	40.26	0.53	7.8	1,440	0.02	N/A	0.6	5.9	-5.3	9.6	Non-Acid Forming	Non-Acid Forming (Barren)
1419D_ARD05	REMAINING	1419D	49.91	50.54	0.63	7.7	994	0.03	0.012	0.4	10.7	-10.3	29.1	Non-Acid Forming	Non-Acid Forming (Barren)
1419D_ARD06	COAL	1419D	58.16	58.88	0.72	7.2	392	0.36	N/A	11.0	6.7	4.3	0.6	Potentially Acid Forming	Uncertain
1419D_ARD07	REMAINING	1419D	60.37	62.09	1.72	7.8	199	0.03	N/A	0.9	1.3	-0.4	1.4	Uncertain	Non-Acid Forming (Barren)
1419D_ARD08	REMAINING	1419D	62.18	62.72	0.54	8.2	182	0.03	N/A	0.9	1.1	-0.2	1.2	Uncertain	Non-Acid Forming (Barren)
1419D_ARD09	COAL	1419D	64.79	65.28	0.49	7.0	285	0.27	N/A	8.3	6.1	2.2	0.7	Potentially Acid Forming	Uncertain
1419D_ARD10	REMAINING	1419D	70.03	71.37	1.34	8.6	108	0.02	0.008	0.2	2.7	-2.5	11.0	Non-Acid Forming	Non-Acid Forming (Barren)
1420D_ARD01	SAND AND GRAVEL	1420D	3.00	6.00	3.00	7.7	530	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1420D_ARD02	CLAY AND SOIL	1420D	27.00	28.00	1.00	7.7	1,880	0.02	N/A	0.6	3.8	-3.2	6.2	Non-Acid Forming	Non-Acid Forming (Barren)
1420D_ARD03	REMAINING	1420D	40.50	42.00	1.50	8.0	601	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1420D_ARD04	REMAINING	1420D	47.11	47.61	0.50	7.9	647	0.03	N/A	0.9	0.3	0.7	0.3	Potentially Acid Forming	Non-Acid Forming (Barren)
1420D_ARD05	CARBONACEOUS	1420D	54.16	54.62	0.46	8.3	648	0.02	N/A	0.6	2.2	-1.6	3.6	Non-Acid Forming	Non-Acid Forming (Barren)
1420D_ARD06	REMAINING	1420D	58.20	59.50	1.30	7.8	151	0.04	N/A	1.2	0.7	0.5	0.6	Potentially Acid Forming	Non-Acid Forming (Barren)
1420D_ARD07	REMAINING	1420D	60.00	60.69	0.69	7.9	153	0.03	N/A	0.9	1.7	-0.8	1.9	Uncertain	Non-Acid Forming (Barren)
1420D_ARD08	COAL	1420D	61.72	62.19	0.47	7.4	214	0.27	N/A	8.3	4.1	4.2	0.5	Potentially Acid Forming	Uncertain
1420D_ARD09	REMAINING	1420D	65.62	66.10	0.48	7.5	173	0.04	0.086	2.6	1.9	0.7	0.7	Uncertain	Non-Acid Forming (Barren)
1420D_ARD10	COAL	1420D	67.19	68.59	1.40	6.9	155	0.23	0.060	1.8	4.1	-2.3	2.2	Potentially Acid Forming	Non-Acid Forming (Barren)
1420D_ARD11	REMAINING	1420D	68.59	69.10	0.51	8.0	100	0.02	N/A	0.6	0.8	-0.2	1.3	Uncertain	Non-Acid Forming (Barren)
1421D_ARD01	CLAY AND SOIL	1421D	27.00	29.00	2.00	7.0	1,570	0.02	N/A	0.6	1.4	-0.8	2.3	Uncertain	Non-Acid Forming (Barren)
1421D_ARD02	REMAINING	1421D	33.00	34.00	1.00	7.0	1,430	0.02	N/A	0.6	3.2	-2.6	5.2	Non-Acid Forming	Non-Acid Forming (Barren)
1421D_ARD03	CARBONACEOUS	1421D	47.00	48.00	1.00	7.6	1,540	0.03	N/A	0.9	0.3	0.7	0.3	Potentially Acid Forming	Non-Acid Forming (Barren)
1421D_ARD04	CARBONACEOUS	1421D	49.00	49.84	0.84	7.1	893	0.02	N/A	0.6	3.5	-2.9	5.7	Non-Acid Forming	Non-Acid Forming (Barren)
1421D_ARD05	COAL	1421D	52.11	53.26	1.15	6.8	210	0.31	0.048	1.5	5.1	-3.6	3.5	Potentially Acid Forming	Non-Acid Forming (Barren)
1421D_ARD06	REMAINING	1421D	54.10	55.33	1.23	8.0	129	0.03	N/A	0.9	0.3	0.7	0.3	Potentially Acid Forming	Non-Acid Forming (Barren)
1421D_ARD07	COAL	1421D	58.02	58.78	0.76	7.1	194	0.33	0.038	1.2	3.2	-2.0	2.7	Potentially Acid Forming	Non-Acid Forming (Barren)
1422D_ARD01	REMAINING	1422D	17.00	18.00	1.00	7.2	469	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1422D_ARD02	CARBONACEOUS	1422D	27.68	28.23	0.55	5.9	1,190	0.60	0.128	3.9	12.8	-8.9	3.3	Potentially Acid Forming	Non-Acid Forming
1422D_ARD03	COAL	1422D	28.73	29.17	0.44	6.6	238	0.76	N/A	23.3	3.2	20.1	0.1	Potentially Acid Forming	Potentially Acid Forming
1422D_ARD04	REMAINING	1422D	29.93	33.00	3.07	7.8	142	0.08	0.087	2.7	2.1	0.6	0.8	Potentially Acid Forming	Non-Acid Forming (Barren)
1423D_ARD01	REMAINING	1423D	7.00	8.00	1.00	7.9	596	0.02	N/A	0.6	2.2	-1.6	3.6	Non-Acid Forming	Non-Acid Forming (Barren)
1423D_ARD03	REMAINING	1423D	25.05	25.61	0.56	7.2	545	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1423D_ARD04	CARBONACEOUS	1423D	27.40	28.00	0.60	7.5	1,010	0.05	N/A	1.5	1.9	-0.4	1.2	Uncertain	Non-Acid Forming (Barren)
1423D_ARD05	CARBONACEOUS	1423D	30.20	31.05	0.85	7.5	815	0.04	N/A	1.2	1.6	-0.4	1.3	Uncertain	Non-Acid Forming (Barren)
1423D_ARD06	CARBONACEOUS	1423D	31.52	32.01	0.49	6.2	495	0.29	0.060	1.8	4.0	-2.2	2.2	Potentially Acid Forming	Non-Acid Forming (Barren)
1423D_ARD07	REMAINING	1423D	33.10	33.67	0.57	4.6	771	0.21	N/A	6.4	0.3	6.2	0.04	Potentially Acid Forming	PAF-Low Capacity
1423D_ARD08	REMAINING	1423D	36.20	37.11	0.91	4.2	838	0.23	0.003	0.1	0.3	-0.2	3.3	Potentially Acid Forming	Uncertain

Table 3-12: Acid-base Results for Overburden, Coal and Coal Reject Samples used in EIS - Alpha Project

Sample ID	Lithology	Drill Hole	From	To	Depth	pH[1]	EC[1]	Total Sulfur	CRS[2]	MPA[2]	ANC[2]	NAPP[2]	ANC/MPA ratio	Original NPR Sample Classification[3]	RGS-Terrenus Sample Classification[3]
							(µS/cm)	(%)		(kg H_2SO_4/t)					
1423D_ARD09	COAL	1423D	38.50	38.94	0.44	6.2	228	0.49	N/A	15.0	6.8	8.2	0.5	Potentially Acid Forming	PAF-Low Capacity
1423D_ARD10	REMAINING	1423D	39.25	39.78	0.53	9.1	744	0.05	N/A	1.5	9.9	-8.4	6.5	Non-Acid Forming	Non-Acid Forming (Barren)
1423D_ARD11	COAL	1423D	40.69	41.39	0.70	6.2	234	0.38	N/A	11.6	5.6	6.0	0.5	Potentially Acid Forming	PAF-Low Capacity
1423D_ARD12	REMAINING	1423D	41.57	42.20	0.63	8.1	128	0.02	N/A	0.6	1.3	-0.7	2.1	Uncertain	Non-Acid Forming (Barren)
1423D_ARD13	REMAINING	1423D	42.23	43.73	1.50	7.6	101	0.01	N/A	0.2	0.7	-0.5	4.6	Non-Acid Forming	Non-Acid Forming (Barren)
1423D_ARD14	REMAINING	1423D	48.20	48.61	0.41	7.9	99	0.03	N/A	0.9	2.1	-1.2	2.3	Uncertain	Non-Acid Forming (Barren)
1424D_ARD01	REMAINING	1424D	7.00	8.00	1.00	4.6	1,560	0.03	N/A	0.9	1.3	-0.4	1.4	Uncertain	Non-Acid Forming (Barren)
1424D_ARD02	CARBONACEOUS	1424D	20.00	22.20	2.20	8.0	675	0.08	N/A	2.5	7.6	-5.2	3.1	Non-Acid Forming	Non-Acid Forming (Barren)
1424D_ARD03	COAL	1424D	22.70	23.35	0.65	6.4	796	0.29	N/A	8.9	6.8	2.1	0.8	Potentially Acid Forming	Uncertain
1424D_ARD04	CARBONACEOUS	1424D	27.81	28.39	0.58	7.4	1,330	1.16	0.962	29.5	46.9	-17.4	1.6	Uncertain	Uncertain
1424D_ARD05	REMAINING	1424D	31.67	34.38	2.71	9.2	492	0.03	N/A	0.9	10.4	-9.5	11.3	Non-Acid Forming	Non-Acid Forming (Barren)
1424D_ARD06	REMAINING	1424D	49.20	50.52	1.32	9.0	523	0.03	N/A	0.9	5.4	-4.5	5.9	Non-Acid Forming	Non-Acid Forming (Barren)
1424D_ARD07	REMAINING	1424D	72.35	73.13	0.78	9.3	486	0.03	N/A	0.9	10.4	-9.5	11.3	Non-Acid Forming	Non-Acid Forming (Barren)
1424D_ARD08	REMAINING	1424D	83.76	84.09	0.33	7.9	578	0.17	0.018	0.6	6.2	-5.6	11.2	Uncertain	Non-Acid Forming (Barren)
1424D_ARD09	COAL	1424D	90.48	91.35	0.87	8.4	380	0.11	0.014	0.4	8.8	-8.4	20.5	Uncertain	Non-Acid Forming (Barren)
1424D_ARD10	REMAINING	1424D	93.73	94.53	0.80	8.3	117	0.02	N/A	0.6	3.2	-2.6	5.2	Non-Acid Forming	Non-Acid Forming (Barren)
1424D_ARD11	REMAINING	1424D	99.48	101.82	2.34	7.9	107	0.03	N/A	0.9	2.2	-1.3	2.4	Uncertain	Non-Acid Forming (Barren)
1424D_ARD12	CARBONACEOUS	1424D	106.89	107.34	0.45	4.8	1,000	0.24	N/A	7.4	3.2	4.2	0.4	Potentially Acid Forming	Uncertain
1424D_ARD13	COAL	1424D	116.40	117.01	0.61	7.0	211	0.40	0.024	0.7	5.4	-4.7	7.3	Potentially Acid Forming	Non-Acid Forming (Barren)
1424D_ARD14	COAL	1424D	117.86	118.44	0.58	7.2	159	0.27	N/A	8.3	5.3	3.0	0.6	Potentially Acid Forming	Uncertain
1424D_ARD15	CARBONACEOUS	1424D	119.24	119.75	0.51	7.6	151	0.17	0.158	4.8	0.3	4.6	0.1	Potentially Acid Forming	Uncertain
1425D_ARD01	SAND AND GRAVEL	1425D	14.00	15.00	1.00	7.1	2,100	0.04	N/A	1.2	3.2	-2.0	2.6	Uncertain	Non-Acid Forming (Barren)
1425D_ARD02	REMAINING	1425D	32.00	33.00	1.00	8.6	605	0.02	N/A	0.6	1.3	-0.7	2.1	Uncertain	Non-Acid Forming (Barren)
1425D_ARD03	COAL	1425D	40.00	42.00	2.00	8.1	1,530	0.02	N/A	0.6	10.4	-9.8	17.0	Non-Acid Forming	Non-Acid Forming (Barren)
1425D_ARD04	COAL	1425D	45.47	46.02	0.55	6.2	2,740	0.38	0.393	12.0	15.9	-3.9	1.3	Uncertain	Uncertain
1425D_ARD05	REMAINING	1425D	50.36	51.15	0.79	7.7	383	0.04	N/A	1.2	0.3	1.0	0.2	Potentially Acid Forming	Non-Acid Forming (Barren)
1425D_ARD06	REMAINING	1425D	60.57	62.76	2.19	6.8	121	0.03	N/A	0.9	0.7	0.2	0.8	Potentially Acid Forming	Non-Acid Forming (Barren)
1425D_ARD07	COAL	1425D	64.11	64.67	0.56	7.2	225	0.40	0.018	0.6	5.0	-4.4	9.1	Potentially Acid Forming	Non-Acid Forming (Barren)
1425D_ARD08	REMAINING	1425D	69.80	70.53	0.73	8.1	76	0.03	N/A	0.9	0.3	0.7	0.3	Potentially Acid Forming	Non-Acid Forming (Barren)
1427D_ARD01	SAND AND GRAVEL	1427D	9.00	10.00	1.00	6.9	706	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1427D_ARD02	CLAY AND SOIL	1427D	10.00	24.00	14.00	6.8	3,100	0.03	0.003	0.1	7.0	-6.9	91.4	Non-Acid Forming	Non-Acid Forming (Barren)
1427D_ARD03	REMAINING	1427D	42.10	45.20	3.10	7.6	3,020	0.02	N/A	0.6	5.6	-5.0	9.1	Non-Acid Forming	Non-Acid Forming (Barren)
1427D_ARD04	REMAINING	1427D	54.20	55.70	1.50	8.6	877	0.07	N/A	2.1	50.8	-48.7	23.7	Non-Acid Forming	Non-Acid Forming (Barren)
1427D_ARD05	REMAINING	1427D	56.56	57.10	0.54	8.8	628	0.03	N/A	0.9	6.1	-5.2	6.6	Non-Acid Forming	Non-Acid Forming (Barren)
1427D_ARD06	REMAINING	1427D	60.93	62.15	1.22	9.4	582	0.05	N/A	1.5	48.6	-47.1	31.7	Non-Acid Forming	Non-Acid Forming (Barren)
1427D_ARD07	COAL	1427D	64.07	64.73	0.66	10.0	948	0.07	0.082	2.5	15.5	-13.0	6.2	Non-Acid Forming	Non-Acid Forming (Barren)
1427D_ARD08	REMAINING	1427D	71.17	72.20	1.03	8.3	113	0.04	0.016	0.5	1.0	-0.5	2.0	Potentially Acid Forming	Non-Acid Forming (Barren)
1427D_ARD09	REMAINING	1427D	73.32	74.00	0.68	8.2	135	0.03	N/A	0.9	1.3	-0.4	1.4	Uncertain	Non-Acid Forming (Barren)
1427D_ARD10	COAL	1427D	76.03	76.58	0.55	7.6	227	0.34	0.096	2.9	49.2	-46.3	16.7	Non-Acid Forming	Non-Acid Forming (Barren)
1426D_ARD01	REMAINING	1426D	25.00	26.00	1.00	7.6	2,000	0.02	N/A	0.6	0.3	0.4	0.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1426D_ARD02	COAL	1426D	43.32	45.01	1.69	8.2	1,340	0.05	0.008	0.2	5.8	-5.6	23.7	Non-Acid Forming	Non-Acid Forming (Barren)
1426D_ARD03	REMAINING	1426D	50.74	51.19	0.45	9.4	1,500	0.08	N/A	2.5	10.8	-8.4	4.4	Non-Acid Forming	Non-Acid Forming (Barren)
1426D_ARD04	REMAINING	1426D	60.19	60.73	0.54	8.4	1,600	0.05	N/A	1.5	8.0	-6.5	5.2	Non-Acid Forming	Non-Acid Forming (Barren)
1426D_ARD05	CARBONACEOUS	1426D	62.01	64.07	2.06	8.0	1,140	0.36	N/A	11.0	11.3	-0.3	1.0	Uncertain	Uncertain
1426D_ARD06	REMAINING	1426D	65.56	66.14	0.58	7.4	188	0.16	0.048	1.5	13.7	-12.2	9.3	Uncertain	Non-Acid Forming (Barren)
1426D_ARD07	COAL	1426D	67.87	68.87	1.00	8.5	724	0.11	N/A	3.4	10.4	-7.0	3.1	Non-Acid Forming	Non-Acid Forming
1426D_ARD08	COAL	1426D	71.47	72.24	0.77	7.1	301	0.32	N/A	9.8	6.3	3.5	0.6	Potentially Acid Forming	Uncertain
1426D_ARD09	COAL	1426D	74.89	75.50	0.61	8.2	746	0.11	0.046	1.4	1.6	-0.2	1.1	Potentially Acid Forming	Non-Acid Forming (Barren)
1426D_ARD10	REMAINING	1426D	76.54	77.36	0.82	7.6	124	0.01	N/A	0.3	0.6	-0.3	2.0	Uncertain	Non-Acid Forming (Barren)
1426D_ARD11	REMAINING	1426D	77.63	78.20	0.57	6.4	424	0.33	N/A	10.1	2.1	8.0	0.2	Potentially Acid Forming	PAF-Low Capacity
1426D_ARD12	COAL	1426D	79.47	80.13	0.66	7.0	262	0.42	0.068	2.1	5.8	-3.7	2.8	Potentially Acid Forming	Non-Acid Forming (Barren)
1426D_ARD13	COAL	1426D	81.67	82.67	1.00	6.8	195	0.37	0.164	5.0	3.6	1.4	0.7	Potentially Acid Forming	Uncertain
1426D_ARD14	REMAINING	1426D	85.05	85.88	0.83	8.1	103	0.01	0.008	0.2	0.3	0.0	1.0	Uncertain	Non-Acid Forming (Barren)
1435D_ARD01	SAND AND GRAVEL	1435D	6.00	9.00	3.00	8.8	1,070	0.01	0.003	0.1	0.3	-0.2	3.3	Uncertain	Non-Acid Forming (Barren)
1435D_ARD02	CLAY AND SOIL	1435D	15.00	17.00	2.00	7.0	3,480	0.01	N/A	0.3	2.1	-1.8	6.9	Non-Acid Forming	Non-Acid Forming (Barren)
1435D_ARD03	CLAY AND SOIL	1435D	28.00	30.00	2.00	7.4	2,460	0.02	0.003	0.1	4.1	-4.0	53.6	Non-Acid Forming	Non-Acid Forming (Barren)
1435D_ARD04	REMAINING	1435D	32.79	33.77	0.98	9.2	954	0.05	N/A	1.5	10.2	-8.7	6.7	Non-Acid Forming	Non-Acid Forming (Barren)
1435D_ARD05	REMAINING	1435D	46.17	47.22	1.05	8.8	1,400	0.14	N/A	4.3	14.6	-10.3	3.4	Non-Acid Forming	Non-Acid Forming
1435D_ARD06	COAL	1435D	48.25	49.51	1.26	8.4	804	0.03	0.014	0.4	3.3	-2.9	7.7	Non-Acid Forming	Non-Acid Forming (Barren)
1435D_ARD07	REMAINING	1435D	59.74	60.32	0.58	6.8	828	0.08	0.060	1.8	9.4	-7.6	5.1	Non-Acid Forming	Non-Acid Forming (Barren)
1435D_ARD08	COAL	1435D	61.65	62.56	0.91	6.9	642	0.47	0.146	4.5	12.4	-7.9	2.8	Potentially Acid Forming	Non-Acid Forming
1435D_ARD09	REMAINING	1435D	65.40	66.02	0.62	7.8	175	0.04	0.022	0.7	1.3	-0.6	1.9	Uncertain	Non-Acid Forming (Barren)
1435D_ARD10	CARBONACEOUS	1435D	67.88	68.34	0.46	8.0	179	0.08	N/A	2.5	0.3	2.2	0.1	Potentially Acid Forming	Non-Acid Forming (Barren)
1435D_ARD11	CARBONACEOUS	1435D	69.06	69.82	0.76	7.2	256	0.34	0.062	1.9	1.3	0.6	0.7	Potentially Acid Forming	Uncertain
1435D_ARD12	COAL	1435D	71.98	72.44	0.46	7.5	194	0.13	N/A	4.0	2.4	1.6	0.6	Potentially Acid Forming	Uncertain
1435D_ARD13	REMAINING	1435D	72.76	73.46	0.70	7.1	158	0.30	0.006	0.2	5.2	-5.0	28.3	Potentially Acid Forming	Non-Acid Forming (Barren)
1435D_ARD14	REMAINING	1435D	75.32	76.62	1.30	8.7	124	0.01	N/A	0.2	1.3	-1.1	8.5	Non-Acid Forming	Non-Acid Forming (Barren)
1437R_ARD01	REMAINING	1437R	17.00	18.00	1.00	7.5	1,600	0.02	N/A	0.6	6.3	-5.7	10.3	Non-Acid Forming	Non-Acid Forming (Barren)
1437R_ARD02	REMAINING	1437R	28.00	29.00	1.00	7.2	611	0.01	0.003	0.1	0.3	-0.2	3.3	Uncertain	Non-Acid Forming (Barren)
1437R_ARD03	REMAINING	1437R	38.00	39.00	1.00	7.4	1,610	0.02	N/A	0.6	5.8	-5.2	9.5	Non-Acid Forming	Non-Acid Forming (Barren)
1437R_ARD04	REMAINING	1437R	52.00	53.00	1.00	8.8	1,820	0.04	N/A	1.2	21.7	-20.5	17.7	Non-Acid Forming	Non-Acid Forming (Barren)
1437R_ARD05	REMAINING	1437R	67.00	68.00	1.00	9.2	1,280	0.03	N/A	0.9	21.3	-20.4	23.2	Non-Acid Forming	Non-Acid Forming (Barren)
1437R_ARD06	CARBONACEOUS	1437R	78.00	79.00	1.00	9.4	1,590	0.03	N/A	0.9	8.4	-7.5	9.1	Non-Acid Forming	Non-Acid Forming (Barren)
1437R_ARD07	COAL	1437R	86.50	87.00	0.50	7.8	1,470	0.31	N/A	9.5	9.7	-0.2	1.0	Uncertain	Uncertain
1437R_ARD08	CARBONACEOUS	1437R	88.50	89.00	0.50	8.5	924	0.17	0.036	1.1	16.4	-15.3	14.9	Non-Acid Forming	Non-Acid Forming (Barren)
1437R_ARD09	CARBONACEOUS	1437R	90.00	90.50	0.50	7.2	773	0.42	N/A	12.9	7.0	5.9	0.5	Potentially Acid Forming	PAF-Low Capacity
1437R_ARD10	COAL	1437R	92.00	92.50	0.50	7.9	655	0.24	0.014	0.4	11.4	-11.0	26.6	Uncertain	Non-Acid Forming (Barren)
1437R_ARD11	COAL	1437R	102.00	102.50	0.50	7.0	508	0.33	N/A	10.1	3.8	6.3	0.4	Potentially Acid Forming	PAF-Low Capacity
1438R_ARD01	REMAINING	1438R	3.00	4.00	1.00	6.0	605	0.01	N/A	0.2	0.9	-0.7	5.9	Non-Acid Forming	Non-Acid Forming (Barren)
1438R_ARD02	REMAINING	1438R	17.00	18.00	1.00	6.7	2,680	0.02	N/A	0.6	1.8	-1.2	2.9	Uncertain	Non-Acid Forming (Barren)
1438R_ARD03	REMAINING	1438R	30.00	31.00	1.00	7.1	2,000	0.01	N/A	0.3	1.3	-1.0	4.2	Non-Acid Forming	Non-Acid Forming (Barren)
1438R_ARD04	REMAINING	1438R	41.00	42.00	1.00	7.1	1,440	0.02	0.003	0.1	3.6	-3.5	47.0	Non-Acid Forming	Non-Acid Forming (Barren)
1438R_ARD05	REMAINING	1438R	63.00	64.00	1.00	9.1	1,350	0.04	N/A	1.2	34.6	-33.4	28.2	Non-Acid Forming	Non-Acid Forming (Barren)
1438R_ARD06	REMAINING	1438R	78.00	79.00	1.00	9.0	995	0.04	N/A	1.2	18.9	-17.7	15.4	Non-Acid Forming	Non-Acid Forming (Barren)
1438R_ARD07	COAL	1438R	86.00	86.50	0.50	9.0	1,550	0.08	0.050	1.5	17.8	-16.3	11.6	Non-Acid Forming	Non-Acid Forming (Barren)
1438R_ARD08	COAL	1438R	88.50	89.00	0.50	8.7	1,050	0.11	N/A	3.4	17.4	-14.0	5.2	Non-Acid Forming	Non-Acid Forming
1439R_ARD01	REMAINING	1439R	15.00	16.00	1.00	8.6	2,580	0.02	N/A	0.6	50.0	-49.4	81.6	Non-Acid Forming	Non-Acid Forming (Barren)

Table 3-12: Acid-base Results for Overburden, Coal and Coal Reject Samples used in EIS - Alpha Project

Sample ID	Lithology	Drill Hole	From	To	Depth	pH[1]	EC[1]	Total Sulfur	CRS[2]	MPA[2]	ANC[2]	NAPP[2]	ANC/MPA ratio	Original NPR Sample Classification[3]	RGS-Terrenus Sample Classification[3]
							(µS/cm)	(%)		($kg\ H_2SO_4/t$)					
1439R_ARD02	REMAINING	1439R	25.00	26.00	1.00	7.6	2,740	0.01	N/A	0.3	2.6	-2.3	8.5	Non-Acid Forming	Non-Acid Forming (Barren)
1439R_ARD03	REMAINING	1439R	46.00	47.00	1.00	9.1	1,680	0.04	N/A	1.2	47.1	-45.9	38.4	Non-Acid Forming	Non-Acid Forming (Barren)
1439R_ARD04	REMAINING	1439R	59.00	60.00	1.00	9.3	766	0.04	N/A	1.2	43.7	-42.5	35.7	Non-Acid Forming	Non-Acid Forming (Barren)
1439R_ARD05	COAL	1439R	73.00	74.00	1.00	9.3	668	0.01	0.006	0.2	161.0	-160.8	876.2	Non-Acid Forming	Non-Acid Forming (Barren)
1439R_ARD06	COAL	1439R	80.50	81.00	0.50	8.4	996	0.16	0.03	0.9	0.3	0.7	0.3	Potentially Acid Forming	Non-Acid Forming (Barren)
1439R_ARD07	CARBONACEOUS	1439R	84.50	85.00	0.50	8.3	1,220	0.62	N/A	19.0	12.0	7.0	0.6	Potentially Acid Forming	PAF-Low Capacity
1439R_ARD08	CARBONACEOUS	1439R	86.50	87.00	0.50	6.7	272	0.31	N/A	9.5	3.6	5.9	0.4	Potentially Acid Forming	PAF-Low Capacity
1439R_ARD09	COAL	1439R	91.00	91.50	0.50	6.9	418	0.35	0.078	2.4	5.7	-3.3	2.4	Potentially Acid Forming	Non-Acid Forming (Barren)
1440R_ARD01	CLAY AND SOIL	1440R	2.00	3.00	1.00	6.8	56	0.01	N/A	0.2	1.3	-1.1	8.5	Non-Acid Forming	Non-Acid Forming (Barren)
1440R_ARD02	REMAINING	1440R	11.00	12.00	1.00	6.5	517	0.01	N/A	0.2	0.3	-0.1	1.6	Uncertain	Non-Acid Forming (Barren)
1440R_ARD03	REMAINING	1440R	34.00	35.00	1.00	9.2	982	0.02	0.008	0.2	216.0	-215.8	881.6	Non-Acid Forming	Non-Acid Forming (Barren)
1440R_ARD04	REMAINING	1440R	50.00	51.00	1.00	8.8	1,780	0.05	N/A	1.5	222.0	-220.5	145.0	Non-Acid Forming	Non-Acid Forming (Barren)
1440R_ARD05	REMAINING	1440R	78.00	79.00	1.00	8.9	1,320	0.08	N/A	2.5	10.2	-7.8	4.2	Non-Acid Forming	Non-Acid Forming (Barren)
1440R_ARD06	COAL	1440R	90.50	91.00	0.50	7.6	1,490	0.51	N/A	15.6	14.3	1.3	0.9	Potentially Acid Forming	Uncertain
1440R_ARD07	COAL	1440R	92.00	92.50	0.50	7.4	801	0.47	N/A	14.4	11.6	2.8	0.8	Potentially Acid Forming	Uncertain
1440R_ARD08	REMAINING	1440R	94.50	95.00	0.50	8.0	701	0.08	0.026	0.8	3.8	-3.0	4.8	Uncertain	Non-Acid Forming (Barren)
1440R_ARD09	CARBONACEOUS	1440R	96.00	96.50	0.50	8.9	744	0.07	N/A	2.1	8.0	-5.9	3.7	Non-Acid Forming	Non-Acid Forming (Barren)
1440R_ARD10	COAL	1440R	105.50	106.00	0.50	6.8	499	0.35	N/A	10.7	8.0	2.7	0.7	Potentially Acid Forming	Uncertain
Washery Materials															
Alpha_C-0.250mm	Washery Materials	N/A	N/A	N/A	N/A	6.5	256	0.58	0.300	9.2	5.4	3.8	0.6	Potentially Acid Forming	Uncertain
Alpha_DLL-0.250mm	Washery Materials	N/A	N/A	N/A	N/A	6.1	236	0.67	0.420	12.9	4.2	8.7	0.3	Potentially Acid Forming	PAF-Low Capacity
Alpha_DU-0.250mm	Washery Materials	N/A	N/A	N/A	N/A	6.8	202	0.74	0.370	11.3	4.4	6.9	0.4	Potentially Acid Forming	PAF-Low Capacity
C_Seam_S1.60+0.250mm	Washery Materials	N/A	N/A	N/A	N/A	7.1	426	0.43	0.260	8.0	5.4	2.6	0.68	Potentially Acid Forming	Uncertain
Seam_C_Roof/Floor+0.250mm	Washery Materials	N/A	N/A	N/A	N/A	4.2	1,130	0.26	0.040	1.2	4.7	-3.5	3.8	Potentially Acid Forming	Uncertain
C_Seam-0.250mm_Roof/Floor	Washery Materials	N/A	N/A	N/A	N/A	6.2	174	0.32	0.090	2.8	4.0	-1.2	1.5	Potentially Acid Forming	Non-Acid Forming (Barren)
Seam_DLL_S1.60+0.25	Washery Materials	N/A	N/A	N/A	N/A	4.6	461	1.81	1.110	34.0	2.1	31.9	0.1	Potentially Acid Forming	Potentially Acid Forming
Roof/Floor_Seam_DLL	Washery Materials	N/A	N/A	N/A	N/A	4.5	470	0.07	0.200	6.1	1.4	4.7	0.2	Potentially Acid Forming	Uncertain
DLL_Seam-0.250mm_Roof/Floor	Washery Materials	N/A	N/A	N/A	N/A	6.6	103	0.02	N/A	0.6	0.7	-0.1	1.1	Uncertain	Non-Acid Forming (Barren)
Seam_DU_S1.60+0.250mm	Washery Materials	N/A	N/A	N/A	N/A	6.3	305	0.56	0.480	14.7	1.2	13.5	0.1	Potentially Acid Forming	Potentially Acid Forming
Seam_DU_+0.250mm_Roof/Floor	Washery Materials	N/A	N/A	N/A	N/A	4.5	596	0.58	0.470	14.4	5.0	9.4	0.3	Potentially Acid Forming	Potentially Acid Forming
DU_Seam-0.250mm_Roof/Floor	Washery Materials	N/A	N/A	N/A	N/A	6.2	183	0.42	0.220	6.7	4.7	2.0	0.7	Potentially Acid Forming	Uncertain
Blended raw coal	Washery Materials	N/A	N/A	N/A	N/A	5.9	127	0.44	0.060	1.8	4.8	-3.0	2.6	Potentially Acid Forming	Non-Acid Forming (Barren)
201064 (C Seam Raw Coal)	Washery Materials	1290L	N/A	N/A	N/A	7.5	146	0.32	N/A	9.8	5.2	4.6	0.5	Potentially Acid Forming	Uncertain
201076 (C Seam Washed Coal)	Washery Materials	1290L	N/A	N/A	N/A	3.8	496	0.34	N/A	10.4	1.9	8.5	0.2	Potentially Acid Forming	PAF-Low Capacity
201077 (C Seam Coarse Reject)	Washery Materials	1290L	N/A	N/A	N/A	3.3	1,430	0.69	N/A	21.1	0.3	20.9	0.01	Potentially Acid Forming	Potentially Acid Forming
201074 (C Seam Tailings)	Washery Materials	1290L	N/A	N/A	N/A	6.3	585	0.44	N/A	13.5	2.8	10.7	0.2	Potentially Acid Forming	Potentially Acid Forming
201085 (DU Seam Raw Coal)	Washery Materials	1290L	N/A	N/A	N/A	7.1	218	0.32	N/A	9.8	4.7	5.1	0.5	Potentially Acid Forming	PAF-Low Capacity
201098 (DU Seam Washed Coal)	Washery Materials	1290L	N/A	N/A	N/A	4.8	417	0.30	N/A	9.2	3.4	5.8	0.4	Potentially Acid Forming	PAF-Low Capacity
201099 (DU Seam Coarse Reject)	Washery Materials	1290L	N/A	N/A	N/A	4.3	652	0.32	N/A	9.8	1.8	8.0	0.2	Potentially Acid Forming	PAF-Low Capacity
201096 (DU Seam Tailings)	Washery Materials	1290L	N/A	N/A	N/A	6.7	341	0.45	N/A	13.8	6.3	7.5	0.5	Potentially Acid Forming	PAF-Low Capacity
201105(DL Seam Raw Coal)	Washery Materials	1290L	N/A	N/A	N/A	7.3	144	0.19	N/A	5.8	6.8	-1.0	1.2	Uncertain	Uncertain
201118 (DL Seam Washed Coal)	Washery Materials	1290L	N/A	N/A	N/A	4.2	480	0.15	N/A	4.6	2.8	1.8	0.6	Potentially Acid Forming	PAF-Low Capacity
201119 (DL Seam Coarse Reject)	Washery Materials	1290L	N/A	N/A	N/A	4.0	875	0.14	N/A	4.3	2.4	1.9	0.6	Potentially Acid Forming	PAF-Low Capacity
201116 (DL Seam Tailings)	Washery Materials	1290L	N/A	N/A	N/A	7.0	231	0.44	N/A	13.5	3.8	9.7	0.3	Potentially Acid Forming	Potentially Acid Forming

Notes

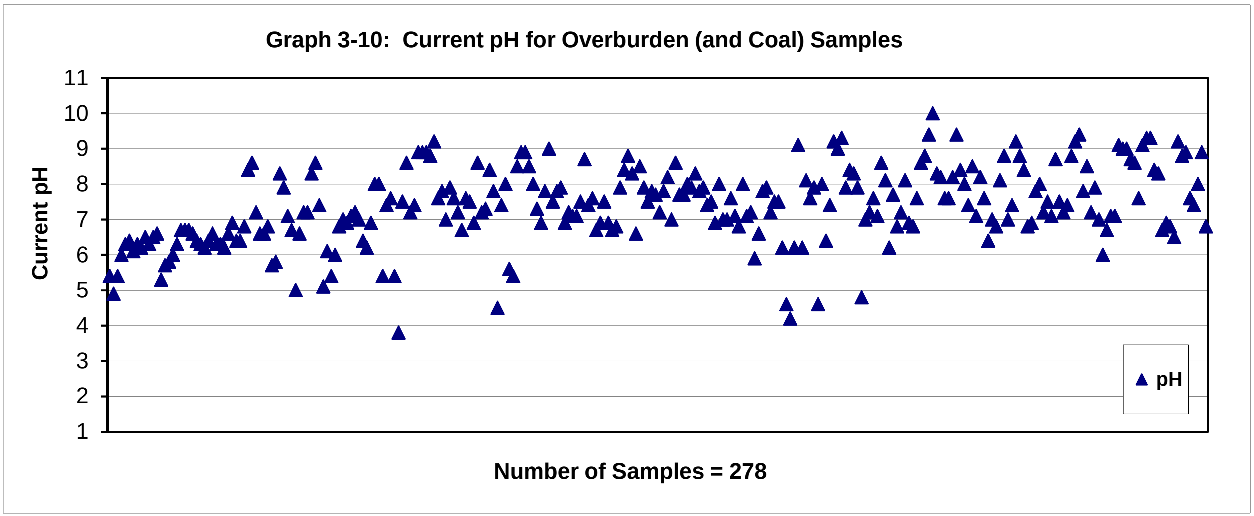
1. Current pH, EC, Alkalinity and Acidity provided for 1:5 sample:water extracts
2. CRS = Chromium Reducible Sulfur MPA = Maximum potential acidity; ANC = Acid neutralising capacity; NAPP = Net acid producing potential, NPR = Net Potential Ratio.
3. Sample classification detail provided in report text.

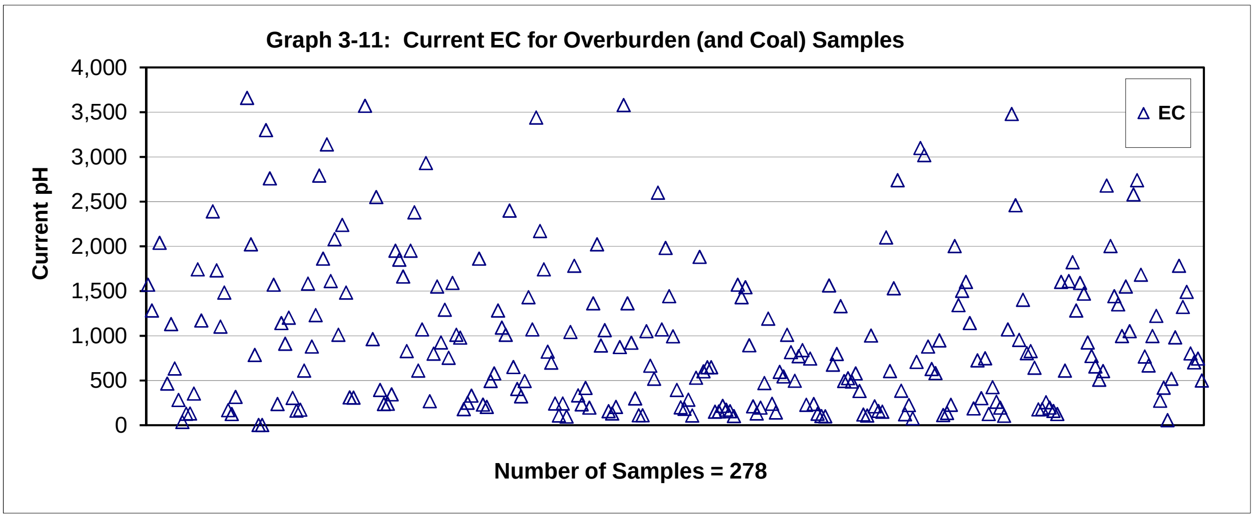
Further study of data presented in **Table 3-12** shows that the PAF samples (2 samples of PAF and 8 samples of PAF-Low Capacity materials) comprise either coal material from the coal seams (4 samples) or carbonaceous materials located in or directly adjacent to the coal seams (*ie*. some roof, floor and parting materials – 6 samples). The remainder of the overburden samples more than one metre from the coal seams are classified as NAF-Barren (due to a very low sulfur content), NAF or Uncertain.

The overall Acid-Base Accounting results for the 278 overburden (and coal) samples utilised in the EIS for the Alpha Coal Project are presented and discussed further in the remainder of this section at **Graphs 3-10** to **3-17**.

- Most of the overburden (and coal) samples have neutral current $pH_{1:5}$ values, which range from 3.8 to 10 (median pH = 7.4) (**Graph 3-10**). The single sample with a pH value less than pH 4 is from drill-hole 1339DG (Sample ARD06) and is located directly adjacent to a coal seam.
- The current $EC_{1:5}$ of the overburden (and coal) samples spans a large and broadly distributed range from 1 to 5,140 µS/cm (**Graph 3-11**). The samples have a median $EC_{1:5}$ value of 797 µS/cm, which is defined as 'medium' salinity (see DME, 1995 previously reproduced at **Table 3-2)**. Some of the highest $EC_{1:5}$ values are associated with naturally saline tertiary clay materials at the project, whereas lower .$EC_{1:5}$values are associated with more competent Permian rock types deeper in the stratigraphic profile (*eg.* sandstone).

Overall, these results indicate that initial surface runoff/seepage from overburden (and coal) away from the coal seams is likely to be pH-neutral and have a 'medium' to 'high' salinity value[8].



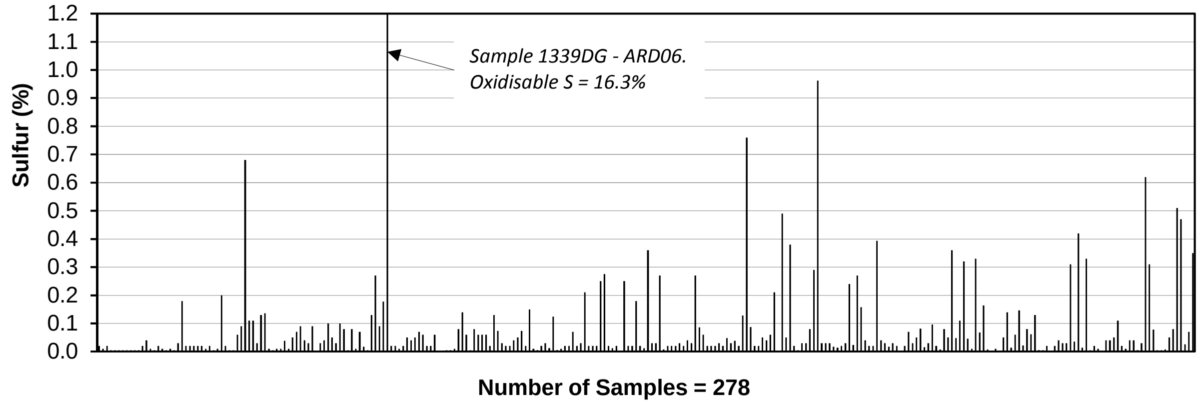


[8] Weathered Tertiary clay materials with high salinity will not report to the top cover or final batters of overburden emplacement areas.

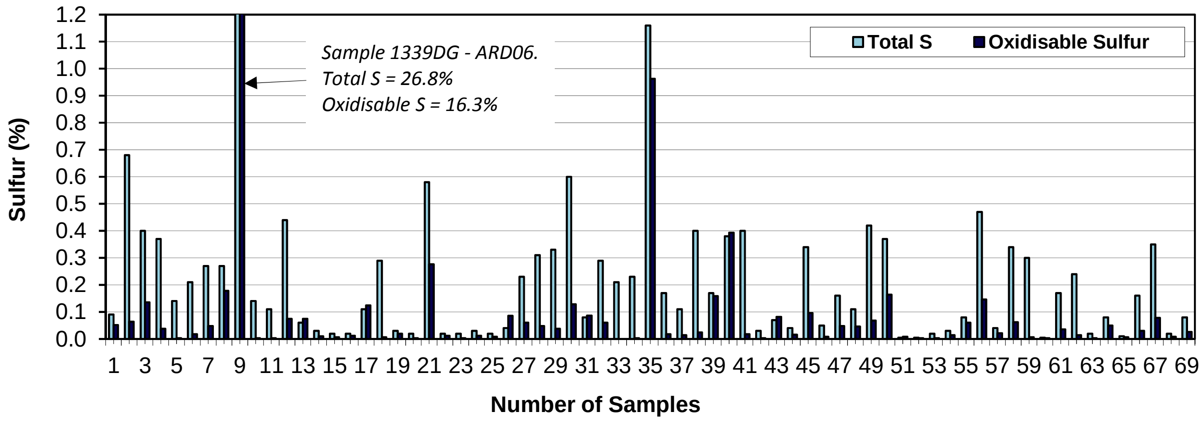
- **Sulfur**: The total sulfur content of the samples ranges from low to very high (0.01 to 26.8 % S) and has a low median value of 0.04%[9]. However, 276 of the 278 samples tested had a total sulfur value less than one percent. In many of the samples a proportion of the sulfur is present in non-pyritic forms, such as organic- and sulfate-sulfur, which do not contribute to the acid forming potential of these materials. **Graph 3-12** shows the sulfur data used to generate the MPA all of the samples. Oxidisable sulfur data is used in preference to total sulfur data in samples where this information is available. The proportion of total sulfur present as oxidisable sulfur is illustrates at **Graph 3-13**.

Note: the Y-axes of Graphs 3-12 to 3-16 do not show the full scale for a few selected atypical samples for the benefit of better result presentation, as indicated in each graph.

Graph 3-12: Sulfur Data used to Calculate MPA for Overburden (and Coal) Samples



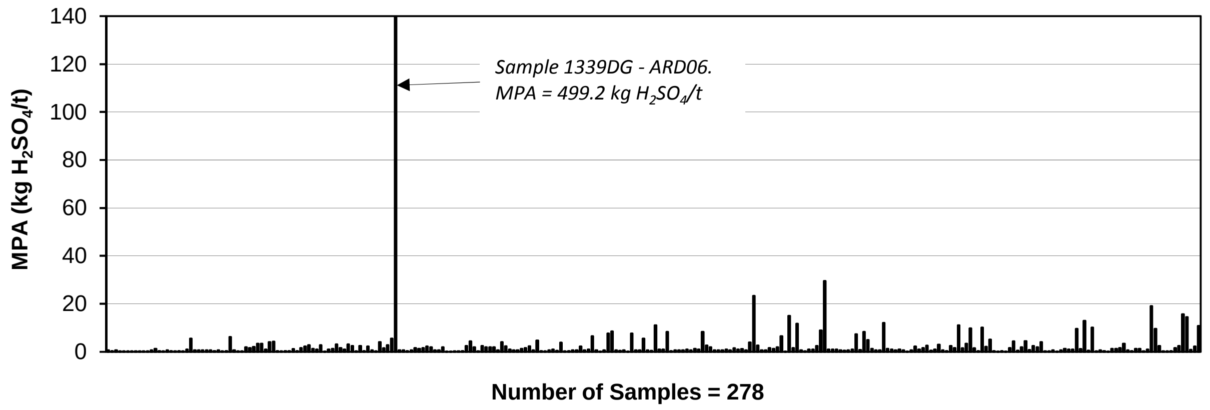
Graph 3-13: Total and Oxidisable Sulfur Data for Overburden (and Coal)Samples



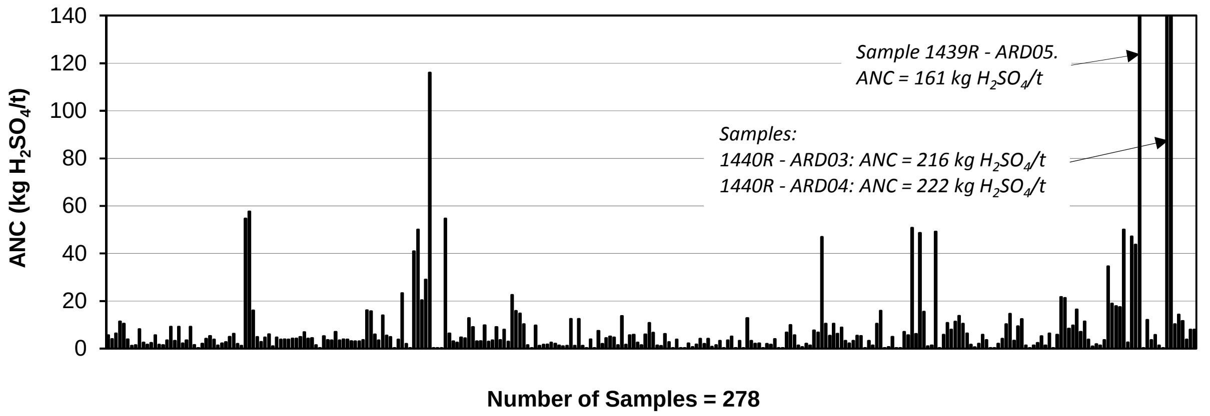
- **MPA**: The MPA that could be theoretically generated by the coal and coal reject samples ranges from 0.1 to 499.2 kg H_2SO_4/t and is generally low (median 0.9 kg H_2SO_4/t) (**Graph 3-14**).
- **ANC**: The ANC values range from 0.3 to 222 kg H_2SO_4/t and are generally low (median 3.9 kg H_2SO_4/t), although the median ANC value is still approximately four times that of the median MPA value (**Graph 3-15**).
- **NAPP**: The calculated NAPP values range from -220.5 to +498.9 kg H_2SO_4/t, with a median NAPP value of -2.2 kg H_2SO_4/t (**Graph 3-16**). The NAPP data at **Graph 3-16** show that only two of the 278 samples have a positive NAPP value greater than 10 kg H_2SO_4/t and are classified as PAF. The samples represent coal and carbonaceous materials located in and directly adjacent to a coal seam[9].

[9] A single carbonaceous sample from drill-hole 1339DG (Sample ARD06) produced a very high total sulfur concentration (26.8%) but represented only 4cm of rock. The sample was located directly adjacent to a coal seam below the base of weathering.

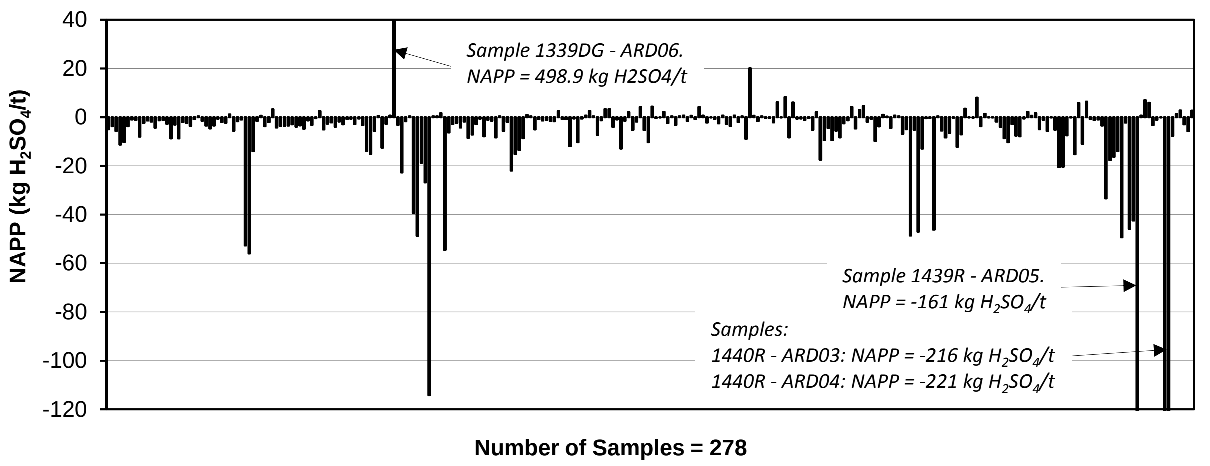
Graph 3-14: MPA Data for Overburden (and Coal) Samples



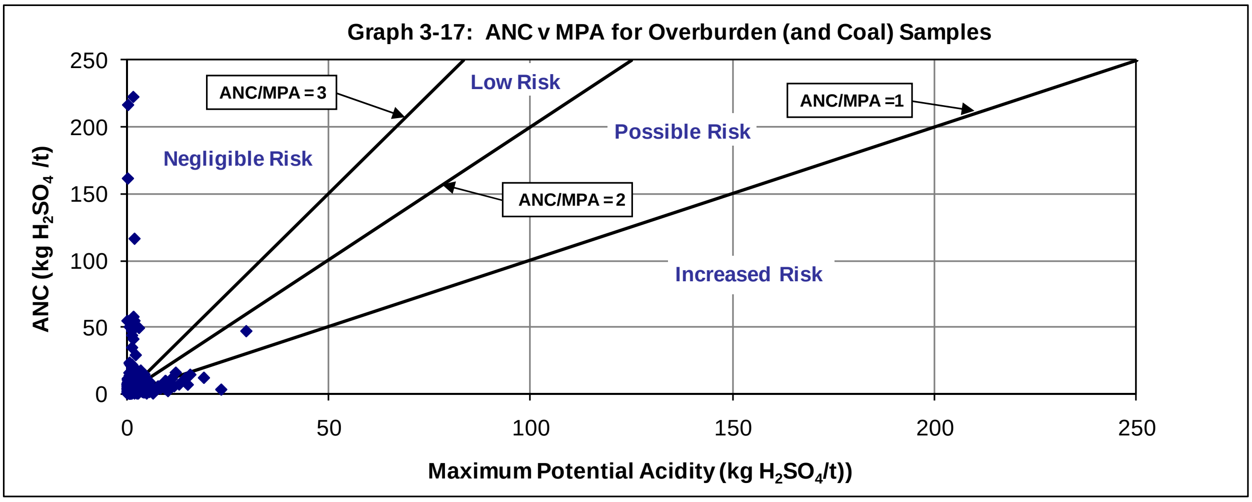
Graph 3-15: ANC Data for Overburden (and Coal) Samples



Graph 3-16: NAPP Data for Overburden (and Coal) Samples



Graph 3-17 shows a plot of ANC versus MPA for the overburden (and coal) samples. The ANC:MPA ratio ranges from 0.001 to 881.6, with a median ANC:MPA ratio of 3.9. ANC:MPA ratio lines have been plotted on the graph to illustrate the factor of safety associated with the samples. Generally those samples with an ANC:MPA ratio of greater than or equal to two are considered to have a low to negligible risk of acid generation and a high factor of safety in terms of potential for AMD as described previously in **Section 3.1.1**.



The graph illustrates overburden and coal samples have a wide range of ANC:MPA ratio values. It should be noted that those samples which plot in the 'Possible Risk' and 'Increased Risk' domains represent coal samples, samples taken from strata adjacent to or within the coal seams (roof, floor and parting materials), or have no oxidisable sulfur data to clarify any uncertain classification. If the above sample types were to be removed from the data set, the plot would confirm that most of the overburden materials have a high factor of safety (and/or a very low oxidisable sulfur content) and are very unlikely to be a source of acid generation at the Project.

Overall, from a management perspective, the overburden materials that are expected to present the most risk of acid generation are located below the BoW, either within or very close to the target coal seams or other zones where other non-target seams are present (*eg.* the B seam) at the north-western extremity of the proposed mining area (the western edge of Pit 6). HCPL has already committed in the EIS to managing PAF materials located close to or within the target coal seams in a similar manner to PAF coarse reject materials at the Project (*ie*. selective handling, compaction, alkaline amendment and encapsulation within a thick NAF and inert overburden shell).

3.5.2 Development of a Geochemical Sampling and Testing Program for Infill Drilling Programs at the Alpha Coal Project

SRK (2010b) describes geostatistical modelling of the geochemical data obtained at the Alpha Coal Project. As reported in the EIS (HPPL, 2010), the modelling was used to further evaluate the extent and variability of any acid generating potential, total metal and leaching properties of the coal and mining waste materials. Whilst this additional geostatistical modelling process is commonly used in natural resource assessment, this was believed to be the first time it had been used at the EIS stage of a proposed coal mining operation in Australia.

The SRK report (2010b) found that the distribution of the mining waste samples (in terms of rock type) reflects the distribution of the mining waste rock types likely to be generated at the Alpha Coal Project. The modelling found that the uniform geology and stratigraphy at the Project site is reflected by the predictable geochemical characteristics of materials at the Project site. The uniform geology and stratigraphy at the project site is illustrated at **Figures 3** to **5**.

The modelling (SRK, 2010b - Section 5.5). specifically concluded adequate drill-hole spacing for ANC measurements in both the north-south and west-east directions. With regard to drill-hole spacing for sulfur measurements, only the west-east drill-hole spacing (approximately 2.5 km) was sufficient. The north-south drill-hole spacing was deemed too wide. The location of the drill-holes used for geochemical sampling in the EIS for the Alpha Coal Project is provided at **Figure 6**. Drill-holes were selected to provide a good lateral coverage of the open-pit area and make best use of existing available drill-core.

The SRK report (2010b) has provided an excellent geostatistical framework and planning tool for the Alpha Coal Project going forward. **Figure 7** shows the location of nine drill-holes (marked in red) flagged by HCPL specifically as fully cored holes for geochemical sampling from surface through to full project depth below the coal seams at Alpha. These drill-holes are located midway between existing drill-holes in the north-south direction for the area planned to be mined in the first five years of mining. Essentially, this infill drilling program will close the drill-hole spacing in the north-south direction to that advocated for sulfur measurements by SRK in their geostatistical model.

Planning for these drill-holes is well underway with Salva Resources having been commissioned to undertake the drilling program commencing in mid-2011 when sufficient capacity at the Alpha site camp becomes available (following completion of the Alpha Bulk Sample Test Pit program) to accommodate additional drilling crews. Recent communications between RGS-Terrenus and the Salva Resources site geologist indicate that approximately 25 drill-core samples per drill-hole will be sufficient to enhance the current geochemical knowledge of the rock types encountered through the stratigraphic profile. This will also present an opportunity to generate a wider variety of other mine materials such as coal, coarse reject and tailings through sample material processing at the coal quality laboratory. Hence, a total of approximately 250-300 additional samples from nine drill-holes will be generated at the project for geochemical testing over the next two to three months.

For the remaining 25 year period of the planned 30 year life of mine, HCPL has committed to drilling a total of 45 drill-holes over the proposed mine pit area as shown at **Figure 8**. Nine holes will be drilled for each consecutive area to be mined over subsequent five year periods (*ie*. moving in a westerly direction). Geochemical testing of approximately 25 samples per drill-hole will be completed in advance of mining and results used for mine planning purposes. Hence, including the sampling completed at the EIS stage, the sampling to be completed at the Bulk Sample Test Pit, and that to which HCPL has committed to over the life of mine, a total of over 2,000 samples from approximately 90 drill-holes will be geochemically tested over the 30 year life of mine. The total number of samples provided here does not include additional sampling of coarse and fine reject materials, and additional overburden validation sampling for materials which report to on-site mining waste storage areas.

3.5.3 Development of Cross-Sections to Illustrate the Geochemical Nature of the Coal and Overburden Materials at the Alpha Coal Project

HCPL, with the assistance of RGS-Terrenus and Salva Resources, has developed a series of cross-sectional illustrations of the proposed open-pit area at the Alpha Coal Project. A plan view of the cross-section locations (layout) is provided at **Figure 9**, with a north-south cross section shown at **Figure 10** and a series of five west-east cross-sections shown at **Figures 11** to **15**. The data used to generate the cross-sections was obtained from the geological model developed for the Alpha Coal Project and geochemical data from the relevant drill-core samples which underwent geochemically test for the EIS. In addition, geochemical information from a further 24 samples from the C Upper coal seam (described in this Interim Report at **Section 3.1.1**) were included to provide a better representation of all of the mine materials and lithologies encountered in the stratigraphic profile at the proposed open-pit area.

The information presented in the cross-sections clearly demonstrates that PAF materials are limited to the coal seams and roof, floor and parting rock types in close proximity to the coal seams. This is typical of structurally simple coal deposits in Queensland, which have an absence of intrusions and an absence of significant faults. Weathered Tertiary sedimentary rock types vary in depth from greater than 60 m in places to less than 20 m in the north and south of the proposed open-pit area. These sediments are essentially barren of significant sulfur minerals and are classified as NAF.

Whilst Permian rock types are present at depth at the proposed open-pit area, most of these materials are also classified as NAF. The only PAF overburden materials appear to be specific rock types (*eg*. carbonaceous mudstone) located within, or in close proximity to, the coal seams, and for the C Upper coal seam, only in areas devoid of significant weathering features.

These overburden geochemical characteristics make the management of these materials relatively simple in that the bulk of the overburden is overwhelmingly NAF and from an Acid-Base (and neutral drainage metals) perspective will not need to be selectively handled. However, the Tertiary clay materials are likely to be (initially) saline and highly dispersive and should not report to the top cover and final batters of out-of-pit and in-pit overburden emplacement facilities. In the nearest comparable coal fields of the Bowen Basin, saline and/or sodic materials properties are addressed through appropriate material management and rehabilitation strategies.

If course reject and (after five years) tailings are encapsulated in overburden storage areas, the clay material could provide a useful interim cover material to seal PAF material and limit sulfide oxidation, until a final cover of more competent overburden and topsoil is placed over these material.

It should be noted that carbonaceous roof and floor and parting materials located directly adjacent to or within to the coal seams below the BoW are also likely to be PAF and will be required to be handled in a similar manner to PAF coarse reject materials at the project (*ie*. selective handling, compaction, alkaline amendment and encapsulation within a thick layer of NAF overburden). Visual identification of these materials through open-pit mining geological control coupled with pre-mining and ongoing geochemical sampling and testing of coal seam and near coal seam materials should be used to delineate the extent of any PAF overburden materials and ensure that these are selectively handled and managed in an appropriate manner, similar to PAF coarse coal reject materials generated at the Project.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

RGS-Terrenus has partially completed an on-going geochemical work program for the Alpha Coal and Alpha Bulk Sample Projects. The program of work completed to date has built upon the existing understanding of the geochemical characteristics of mining materials (overburden, coal and coal reject) and assisted in further clarifying the potential environmental geochemical risks associated with these materials. As such, the level of confidence in the management strategies proposed for the various mining materials at the Alpha Coal and Alpha Bulk Sample Projects has increased.

The geochemical work program has assisted in optimising the proposed management and monitoring strategies for mining waste materials at the Alpha Coal and Alpha Bulk Sample Projects. Specific knowledge gaps at the Alpha Coal Project have been filled and a targeted review of existing geochemical data and associated interpretations relied upon in the EIS has been completed.

Conclusions associated with specific areas of the ongoing geochemical work program include:

- The majority of the C Upper coal seam materials will be weathered, to some extent, and are expected to be NAF. However, a relatively small proportion of unweathered (fresh) C Upper coal seam materials below an unweathered overburden cover (*eg*. at the southern end of the proposed pit) may be PAF. It is expected that open-pit mining geological control coupled with pre-mining and ongoing geochemical sampling and testing of C Upper coal seam material can be used to delineate the extent of any PAF C Upper coal seam materials and ensure that these are selectively handled and managed in a similar manner to PAF coarse coal reject materials. At the current neutral pH value, metal and metalloids in the C Upper coal seam materials are likely to be sparingly soluble in any surface runoff and seepage.
- Some of the raw coal, tailings and most of the coarse reject materials have a low factor of safety in terms of potential for AMD[4], could be a potential source of acid generation, and will need to be managed at the Project. Overall, from a management perspective, the materials that are expected to present the most risk of acid generation are, in descending order from most risk to least risk: coarse rejects; tailings; raw coal and washed coal. Initially, inherent metal and metalloids (except Se) are expected to be sparingly soluble in any surface runoff and seepage. However, KLC results indicate that solubility of some metals will increase over time if materials remain exposed and potentially generate acid conditions.
- The KLC tests confirm the PAF nature of some of the coal and coal reject materials. In particular, some coarse reject materials are expected to generate relatively low pH, high acidity surface runoff and seepage conditions with elevated and potentially increasing salt, sulfate and dissolved metal concentration after prolonged exposure to oxidising conditions (more than a few weeks). Alkaline amendment of coarse reject with crushed limestone has some beneficial effect in terms of extending the lag-period preceding acid generation and improving leachate quality, but is unlikely to be as beneficial as an alternative fast acting lime product.
- The KLC tests confirm the NAF nature of the bulk overburden materials and indicate that inherent metal and metalloids in coal and coal reject materials will be sparingly soluble in any surface runoff and seepage. However, initial salinity levels, particularly for Tertiary clay materials, are elevated and will be managed at the Project by avoiding placement of Tertiary clay materials in the final cover or batters of overburden storage areas and also by using surface sediment ponds. Salinity levels in overburden are expected to diminish over time as a result of surface exposure and ongoing flushing (rainfall) events.
- A Mining Waste Management Plan has been developed and is being used by HCPL at the Alpha Bulk Sample Test Pit Project, as required under Section F16 of the EA. The Plan is a 'live' document that is being updated as a result of ongoing communications between RGS-Terrenus and the site Geologist. The outcomes of the geochemical monitoring program described in the Plan will be included in a more complete version of this Interim Report, in the second half of 2011, when all of the geochemical test results are available.
- A targeted review of the Canadian NPR method, one of two geochemical classification methods relied upon for classifying mining materials in the EIS, has been completed. The review demonstrated that whilst the NPR provides a useful screening tool for the geochemical assessment

of mining materials, it can incorrectly classify samples with very low concentrations of oxidisable sulfur as potentially acid forming (PAF), when there is negligible oxidisable sulfur present and there is negligible risk of acid generation. Essentially the review has demonstrated that overburden located away from the coal seams at the Alpha Coal Project is likely to be NAF and/or have negligible to very low risk of acid generation.

- A geochemical sampling and testing program associated with in-fill drilling and future drilling programs at the Project has been developed by HCPL based on the geostatistical model findings described in the EIS.
- Cross-sectional diagrams through the proposed Alpha Coal Project open-pit area have been developed to illustrate the geochemical nature of the coal and overburden materials. These cross-sections clearly demonstrate that, similar to most other Permian-age coal deposits in eastern Australia, PAF materials will predominantly occur in coal seam roof, floor and significant coal seam band materials.

RGS-Terrenus will continue to work closely with HCPL/URS to ensure that approval commitments made in the Alpha Bulk Sample Project and proposed commitments made as part of the Alpha Coal Project remain appropriate to manage the identified environmental geochemical risks associated with the various mining materials.

4.2 Recommendations

As a result of the current findings of the geochemical assessment programs described in this Interim Report, it is recommended that HCPL considers:

- Future sampling and geochemical testing of mining materials at the Alpha Coal Project, completed as per the infill drilling and future drilling programs described in this Interim Report.
- Open-pit mining geological control coupled with pre-mining and ongoing geochemical sampling and testing of mining materials. This strategy will be used to delineate the extent of any PAF materials associated with coal seams and ensure that these are selectively handled and managed in a similar manner to PAF coarse coal reject materials (described below).
- Placement of PAF coarse reject materials in the open-pit (when sufficient capacity is available after one year) and compaction prior to alkaline amendment with a lime product to extend the lag period preceding acid generation. Overlay of exposed PAF coarse reject with at least a one metre clay layer within a period of four weeks and material scheduling optimisation to ensure covering with a thick layer of NAF overburden material within three months.
- Clay isolation of PAF coarse reject materials placed in the out-of-pit overburden emplacement facility during the first year of operation within a period of four weeks and material scheduling optimisation to ensure encapsulation with a thick layer of NAF overburden material within three months.
- Selective handling of PAF materials located close to or within the coal seams and similar management as proposed for PAF coarse reject materials at the Project (*ie*. selective handling, compaction, alkaline amendment and encapsulation within a thick layer of NAF overburden).
- Consideration of lime amendment of PAF tailings materials if the occurrence of PAF materials is more widespread than currently thought and tailings materials generate pH values less than five.
- Placement of tailings in the open-pit after five years depending on the outcomes of studies associated with the feasibility of this option.
- Appropriate management of any surface runoff and seepage from ROM coal materials to minimise any potential for acidic, metalliferous and/or saline runoff/seepage to interact with surface water and groundwater environments.
- Avoiding placement of saline and dispersive Tertiary clay materials at the top cover and final batters of out-of-pit and in-pit overburden emplacement facilities.
- Continuation of KLC tests on selected mining materials (potentially to 40 weeks) depending on the outcomes of a planned review of available KLC test data after 20 weeks of operation.

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6.0 LIMITATIONS AND SIGN-OFF

This Interim Report documents the work undertaken through a joint collaboration by RGS Environmental (RGS) Pty Ltd and Terrenus Earth Sciences (Terrenus), herein called RGS-Terrenus.

This document contains confidential information that is intended only for the use by RGS-Terrenus's Client, as named in this report. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or RGS-Terrenus. The concepts and information contained in this document are the property of RGS-Terrenus. Use or copying of this document in whole or in part without the written permission of RGS-Terrenus constitutes an infringement of copyright.

This Interim Report should be read in full and with full cognisance that the geochemical assessment is incomplete. This Interim Report contains all available information at the date of this report. The level of assessment provided to this data and contained within this Interim Report has been undertaken based on the available data, however as the geochemical assessment work is incomplete RGS-Terrenus reserves the right to withdraw and/or revaluate findings and conclusions contained herein once the complete dataset is available. The complete report is expected to be produced in the second half of 2011.

While the interim findings presented in this report are based on information that RGS-Terrenus considers reliable unless stated otherwise, the accuracy and completeness of source information cannot be guaranteed. RGS-Terrenus has made no independent verification of this information beyond the agreed scope of works and RGS-Terrenus assumes no responsibility for any inaccuracies or omissions outside of RGS-Terrenus's direct control. Furthermore, the information compiled in this Interim Report addresses the specific needs of the client, so may not address the needs of third parties using this report for their own purposes. Thus, RGS-Terrenus and their employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.

This Interim Report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

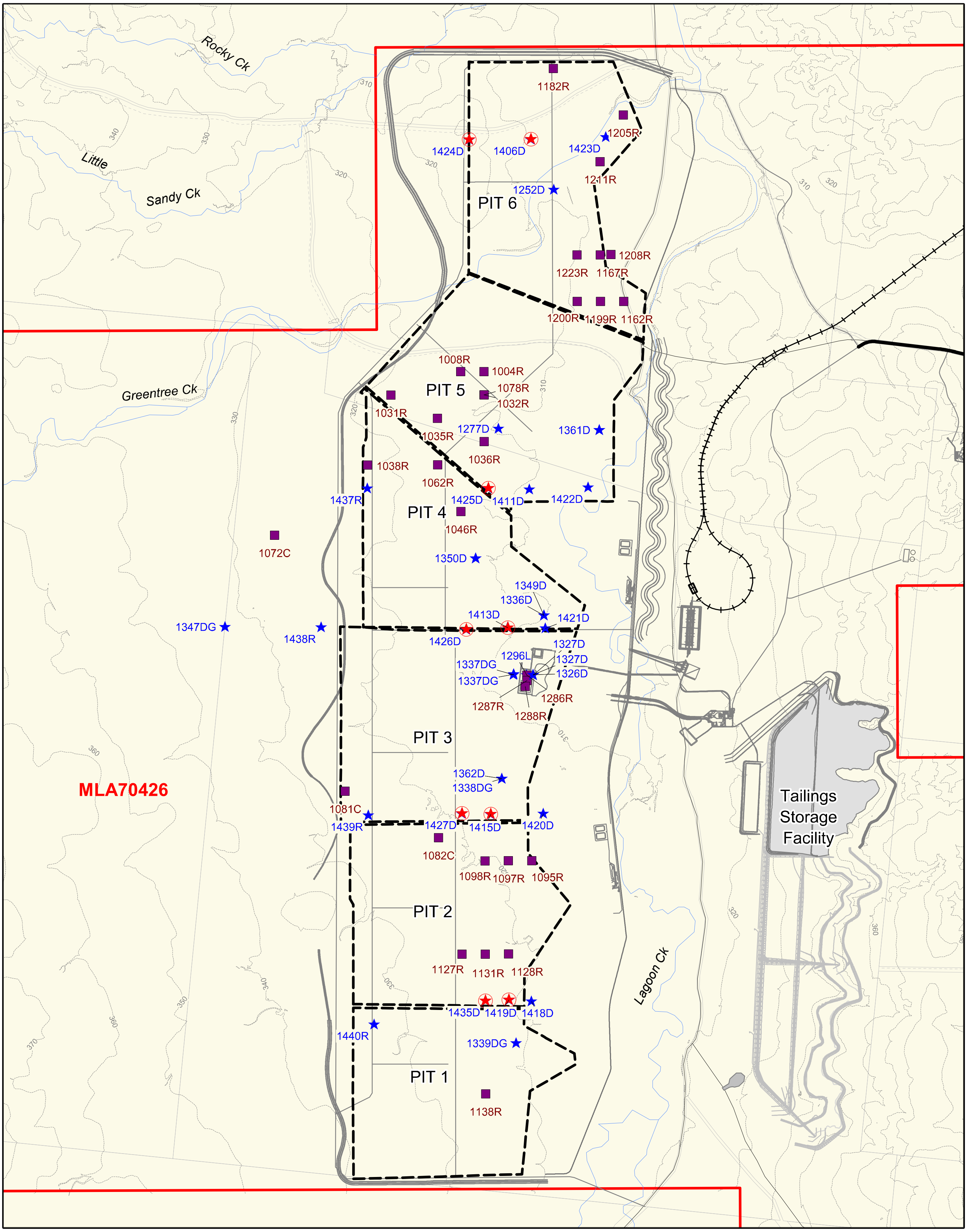
We trust that this Interim Report meets your requirements and expectations for the time being and we look forward to continuing to work closely with you on geochemical aspects of the Alpha Coal Project.

Best regards,

Dr. Alan Robertson
Director and Principal Geochemist
RGS Environmental

Dr. Ian Swane
Director and Principal Consultant
Terrenus Earth Sciences

Figures 1 to 15



Mining Lease Application (MLA70426) Boundary

Contour (10m interval)

Pit Outline

C Upper Coal Seam Drill Hole Sample

Additional Drill Hole Location

HyChips Hole Location

Draft

Source: See Copyright Details below and for full disclosure Please Refer to the SEIS *Volume 2, Appendix B for Queensland Datasets and Volume 2, Appendix S for Mine dataset sources.*

0 1.25 2.5km

Scale 1:110 000 (A4)

Datum: GDA94, MGA Zone55

N W E S

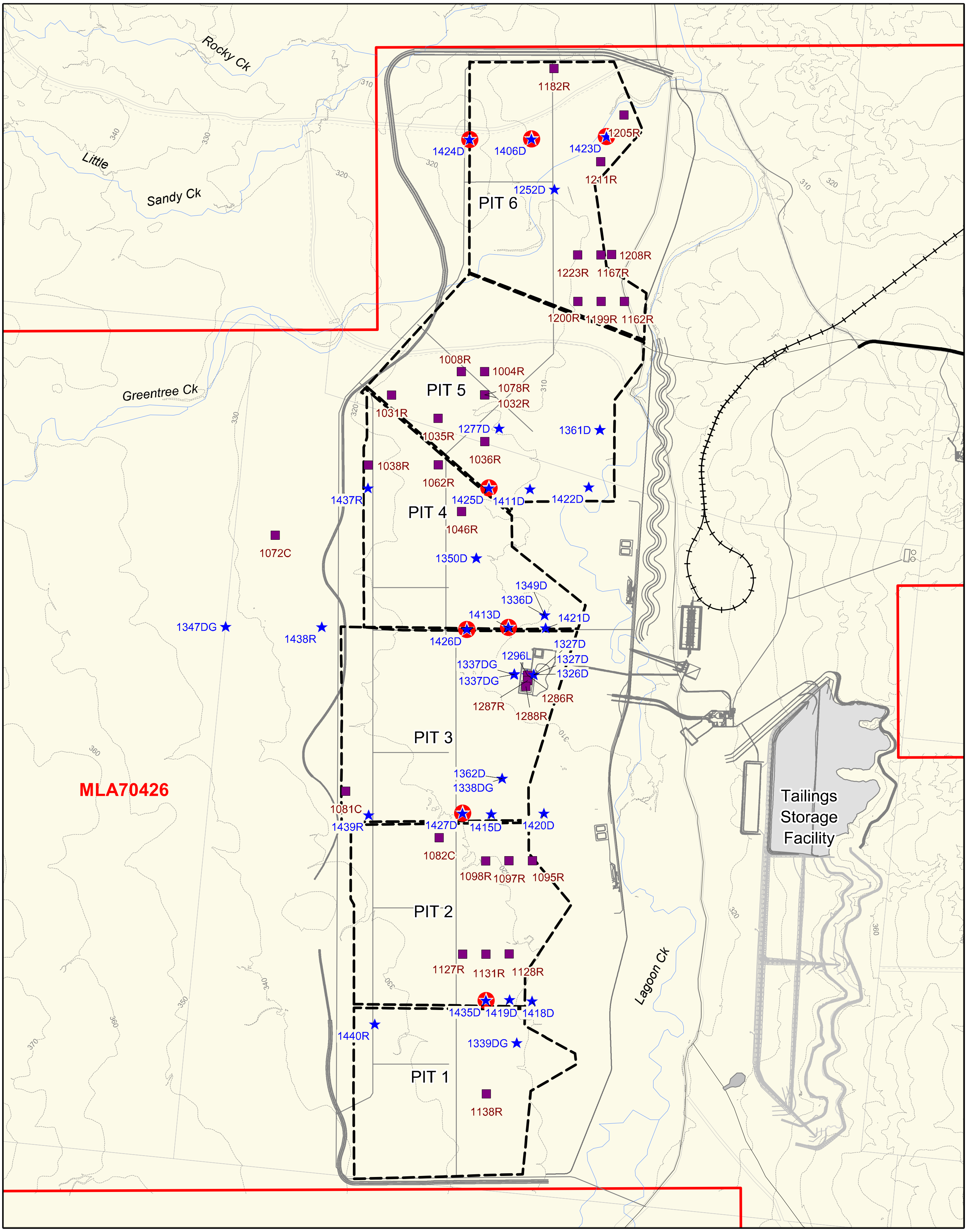
RGS TERRENUS EARTH SCIENCES

DRILL HOLES SELECTED FOR SAMPLING C UPPER COAL SEAM AT ALPHA COAL PROJECT (MINE)

Job Number	4262 6680
Revision	A
Date	04-03-2011

Figure: 1

File No: 42626680-g-2020wor



Mining Lease Application (MLA70426) Boundary

Contour (10m interval)

Pit Outline

Drill Holes Selected Sampling Raw Coal

Additional Drill Hole Location

HyChips Hole Location

Draft

Source: See Copyright Details below and for full disclosure Please Refer to the SEIS *Volume 2, Appendix B for Queensland Datasets and Volume 2, Appendix S for Mine dataset sources.*

0 1.25 2.5km

Scale 1:110 000 (A4)

Datum: GDA94, MGA Zone55

N W E S

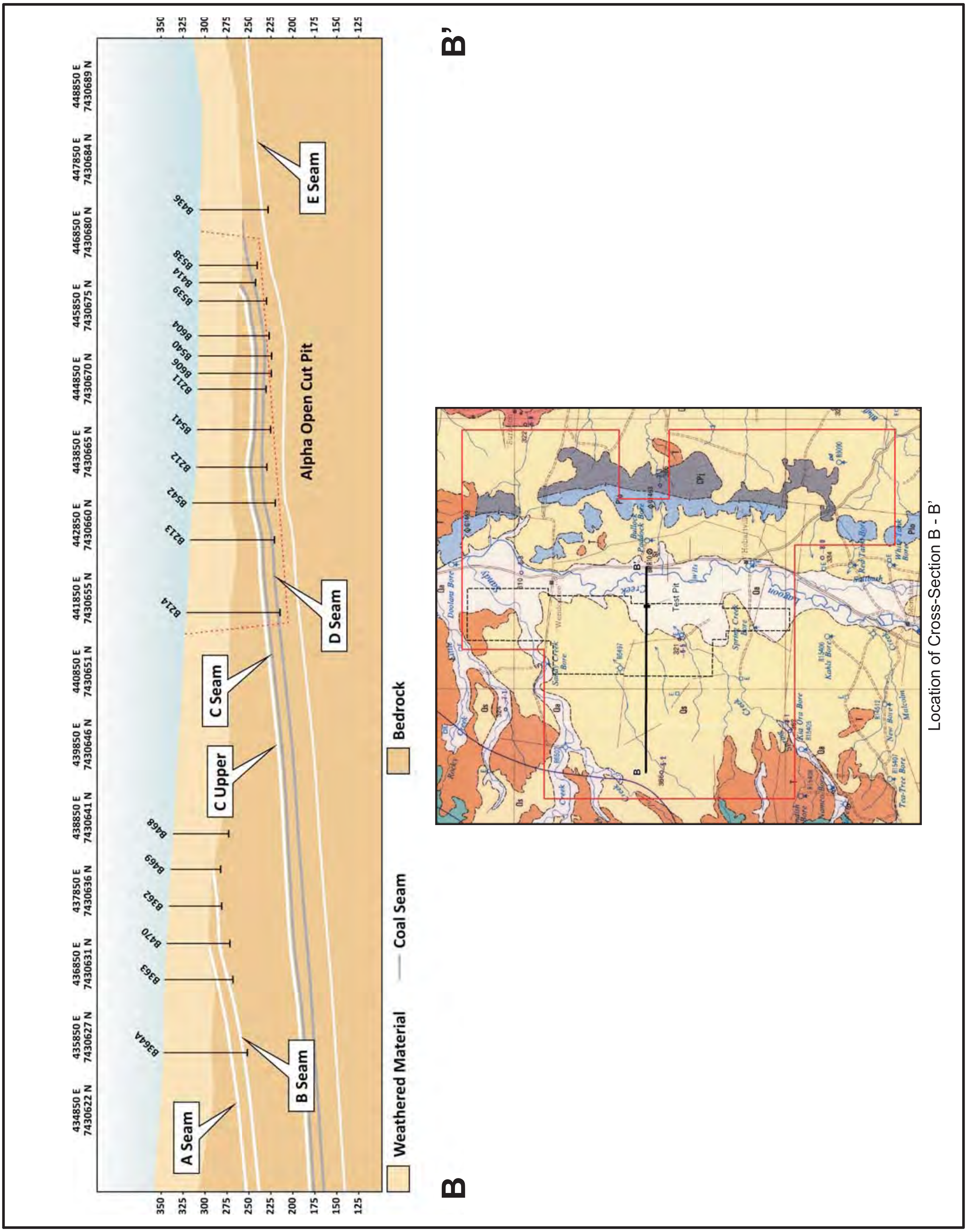
RGS TERRENUS EARTH SCIENCES

DRILL HOLES SELECTED FOR SAMPLING RAW COAL AT ALPHA TO GENERATE WASHED COAL, COARSE REJECT AND TAILINGS SAMPLES

Job Number	4262 6680
Revision	A
Date	04-03-2011

Figure: 2

File No: 42626680-g-2021wor



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N W E S

RGS TERRENUS EARTH SCIENCES

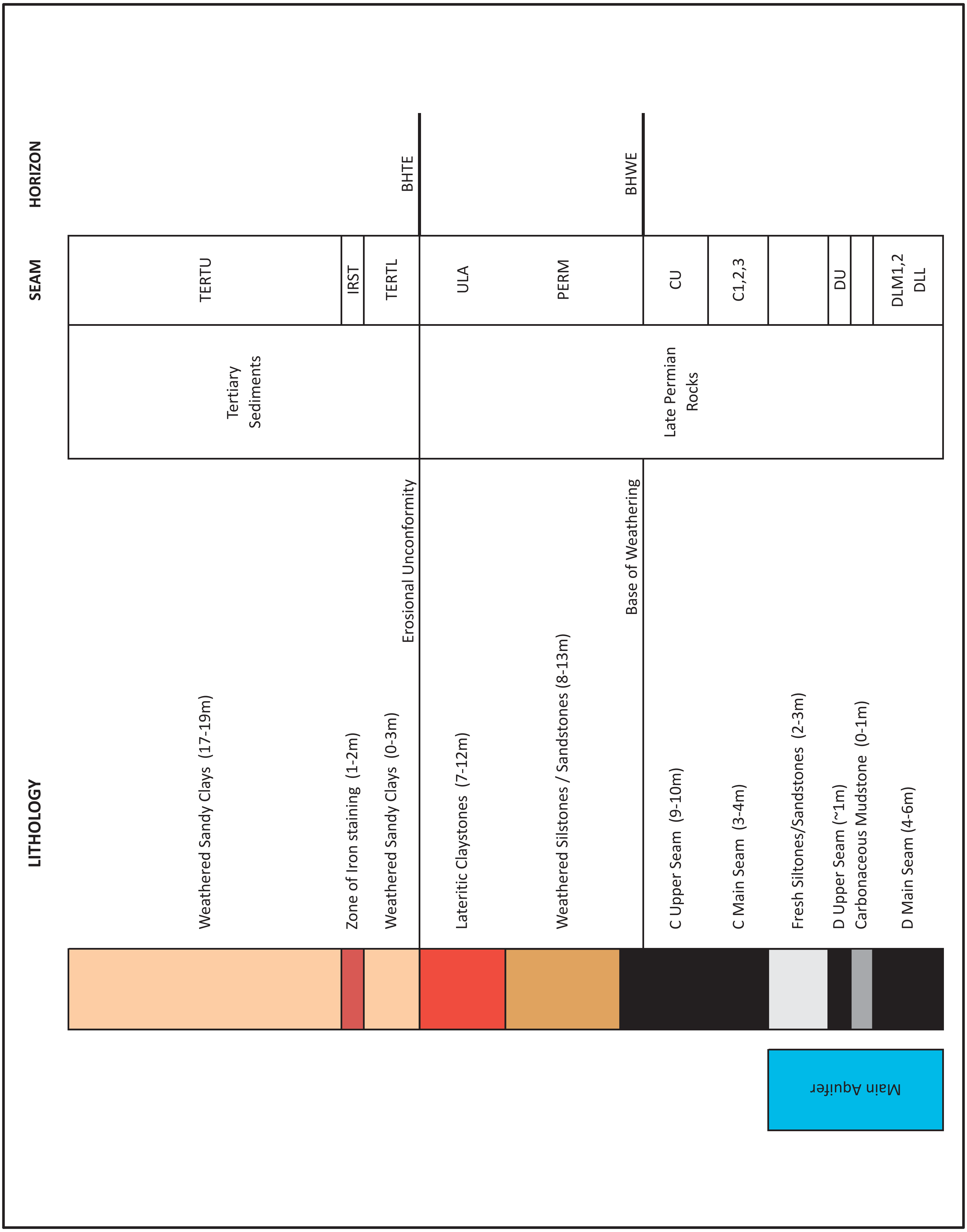
GEOLOGICAL WEST -EAST CROSS-SECTION B - B' THROUGH MINING LEASE APPLICATION 70426

Job Number	4262 6680
Revision	A
Date	04-03-2011

Figure: 3

Datum: GDA94, MGA Zone55

File No: 42626680-g-2008.cdr



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Datum: GDA94, MGA Zone55

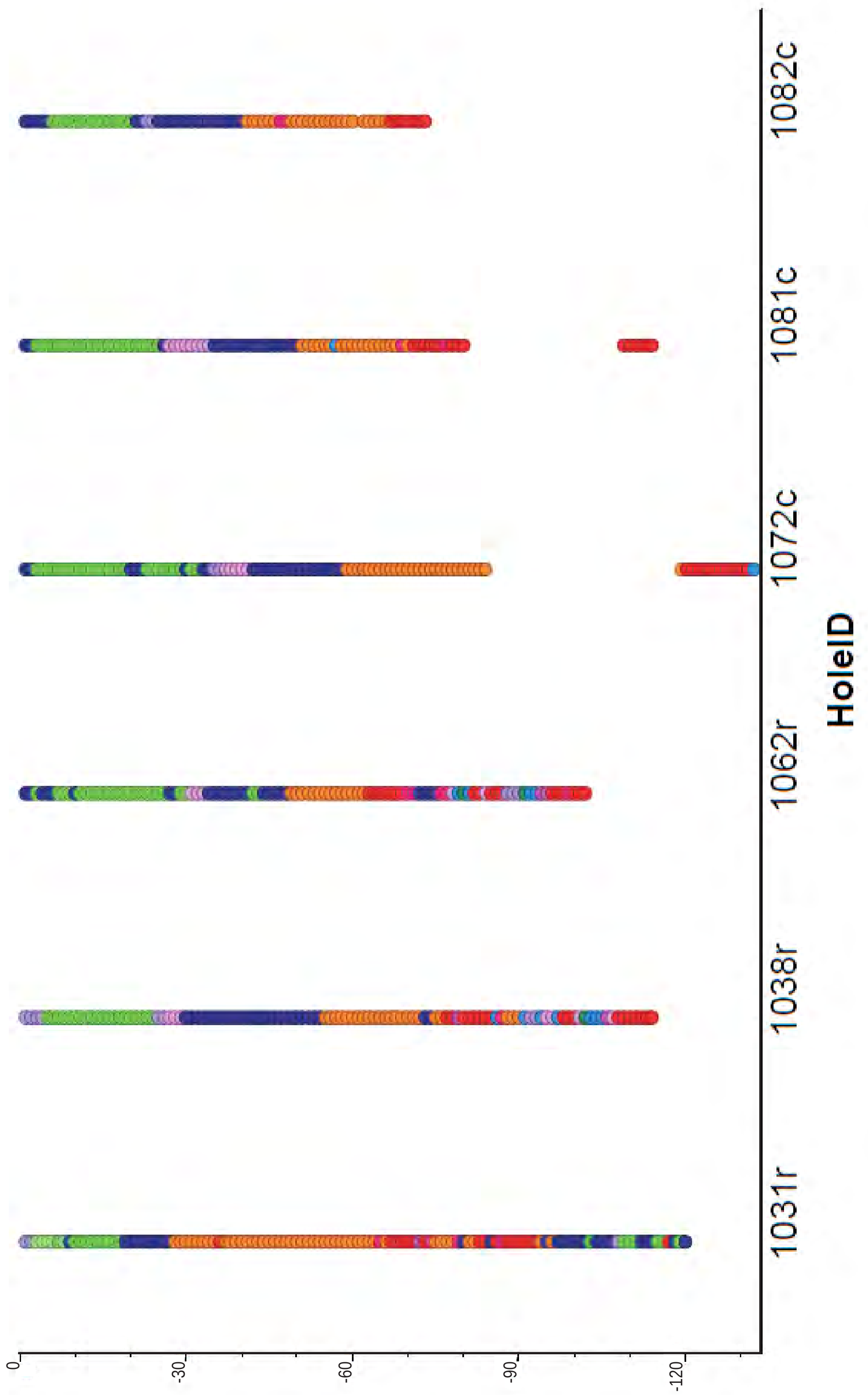
RGS TERRENUS EARTH SCIENCES

SCHEMATIC STRATIGRAPHIC SECTION IN THE ALPHA COAL PROJECT(MINE) AREA

Job Number	4262 6680
Revision	A
Date	04-03-2011

Figure: 4

File No: 42626680-g-2022.cdr



Red and orange sections showing the thickly bedded sandstone and the upper fine grained in orange to blue sections tertiary sections in green

Draft

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Datum: GDA94, MGA Zone55

N W E S

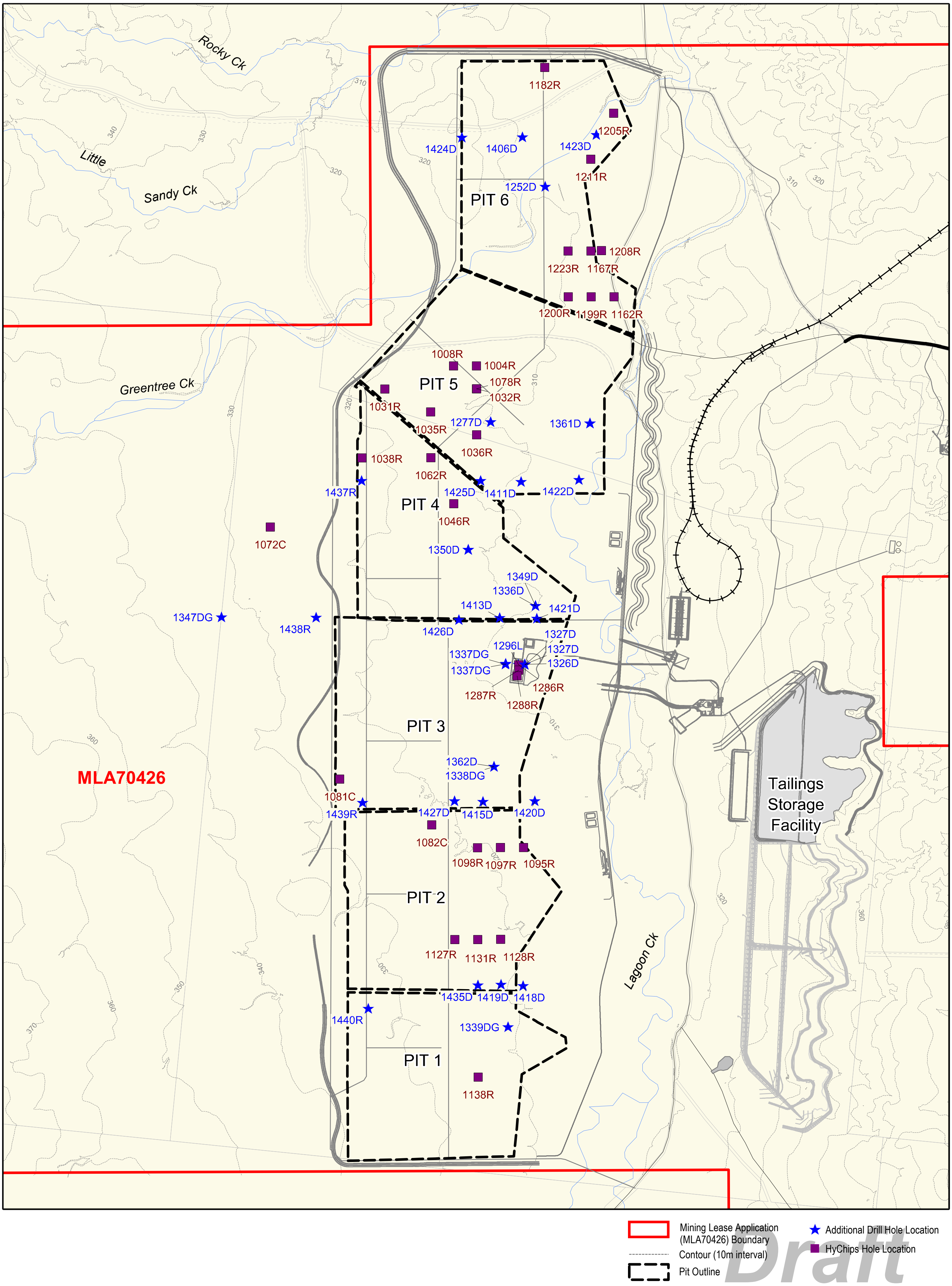
RGS TERRENUS EARTH SCIENCES

ALPHA COAL PROJECT (MINE)
MINERAL ASSEMBLAGES
ACROSS SIX HYCHIP DRILL HOLES

Job Number	4262 6680
Revision	A
Date	04-03-2011

Figure: 5

File No: 42626680-g-2010.cdr



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Scale 1:110 000 (A4)
Datum: GDA94, MGA Zone55

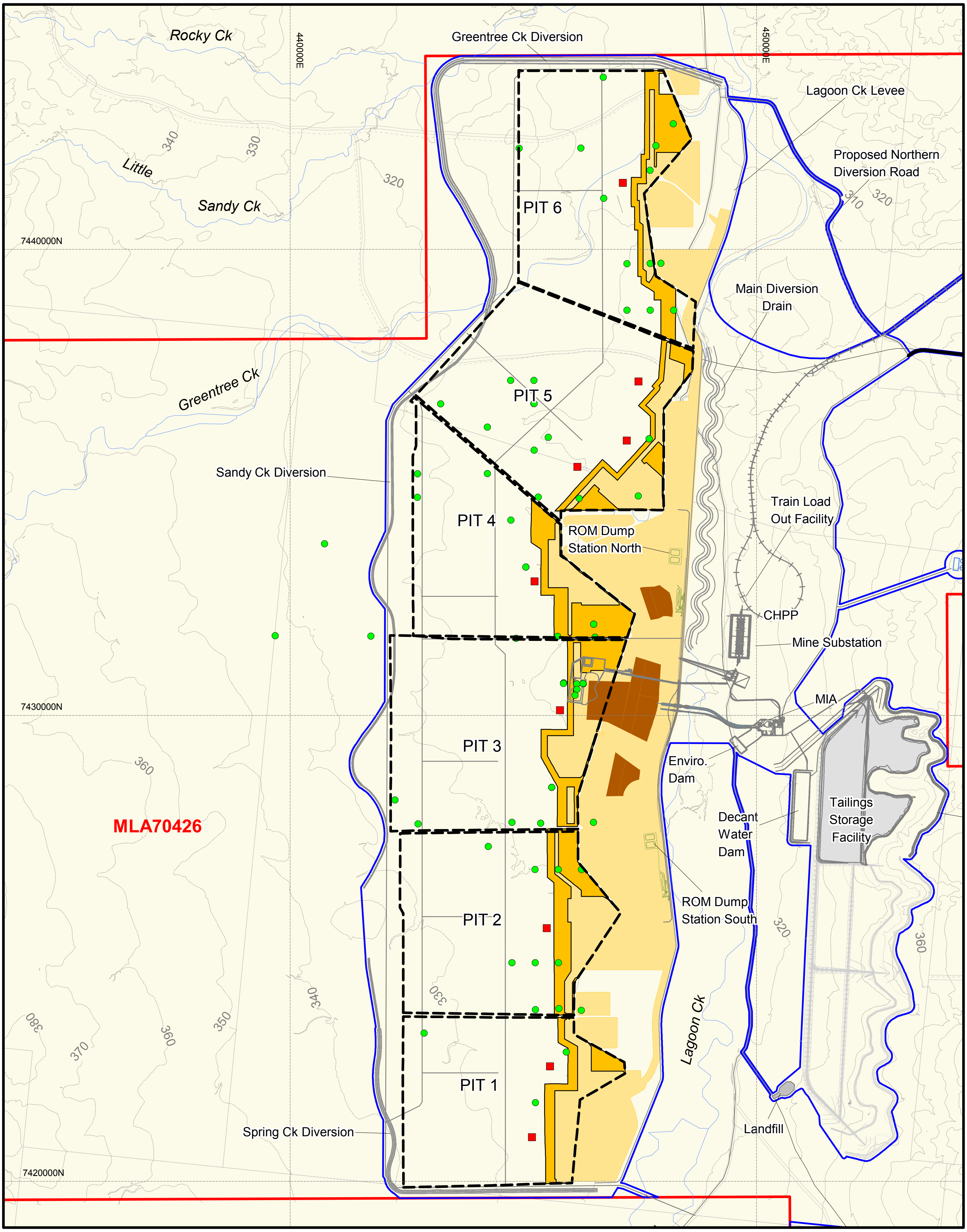
RGS TERRENUS EARTH SCIENCES

ALPHA COAL PROJECT(MINE)
DRILL HOLES USED TO PROVIDE
LITHOLOGICAL AND GEOCHEMICAL
INFORMATION IN EIS

Job Number	4262 6680
Revision	A
Date	04-03-2011

Figure: 6

File No: 42626680-g-2011.wor



Additional Drill Hole Locations for SEIS

Drill Hole Locations for EIS

Mining Lease Application (MLA70426) Boundary

Disturbance Area

Pit Outline

Working Face and Void

Spoil Dump Area

Rejects

Draft

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0 1.25 2.5km

Scale 1:110 000 (A4)

Datum: GDA94, MGA Zone55

N W E S

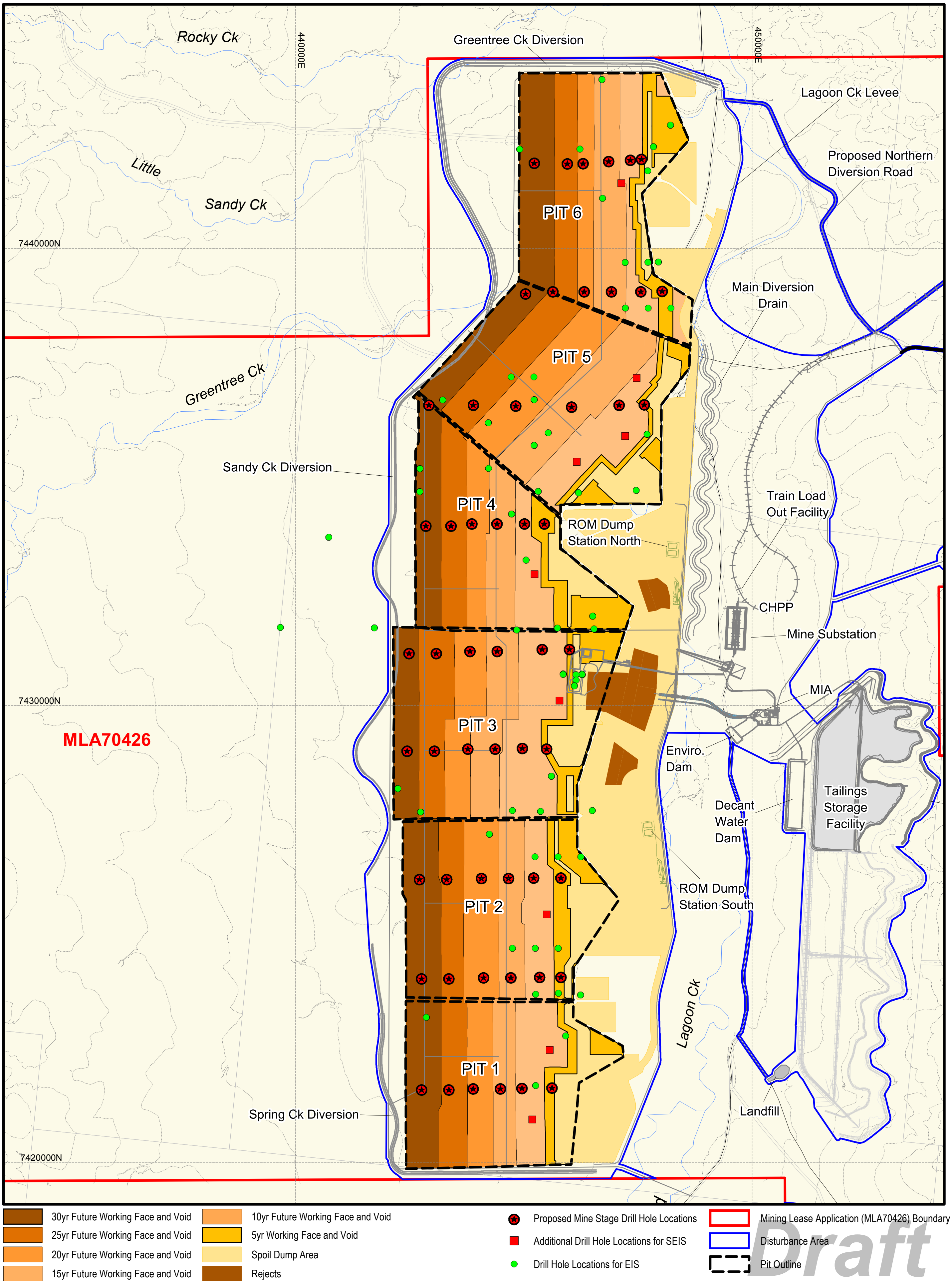
RGS TERRENUS EARTH SCIENCES

PLANNED MINING AREA FOR FIRST FIVE YEARS AND LOCATION OF ADDITIONAL INFILL DRILL CORE HOLES FOR GEOCHEMICAL SAMPLING

Job Number	4262 6580
Revision	A
Date	07-03-2011

Figure: 7

File No: 42626680-g-2012.wor



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0 1.25 2.5km
Scale 1:110 000 (A4)
Datum: GDA94, MGA Zone55

N W E S

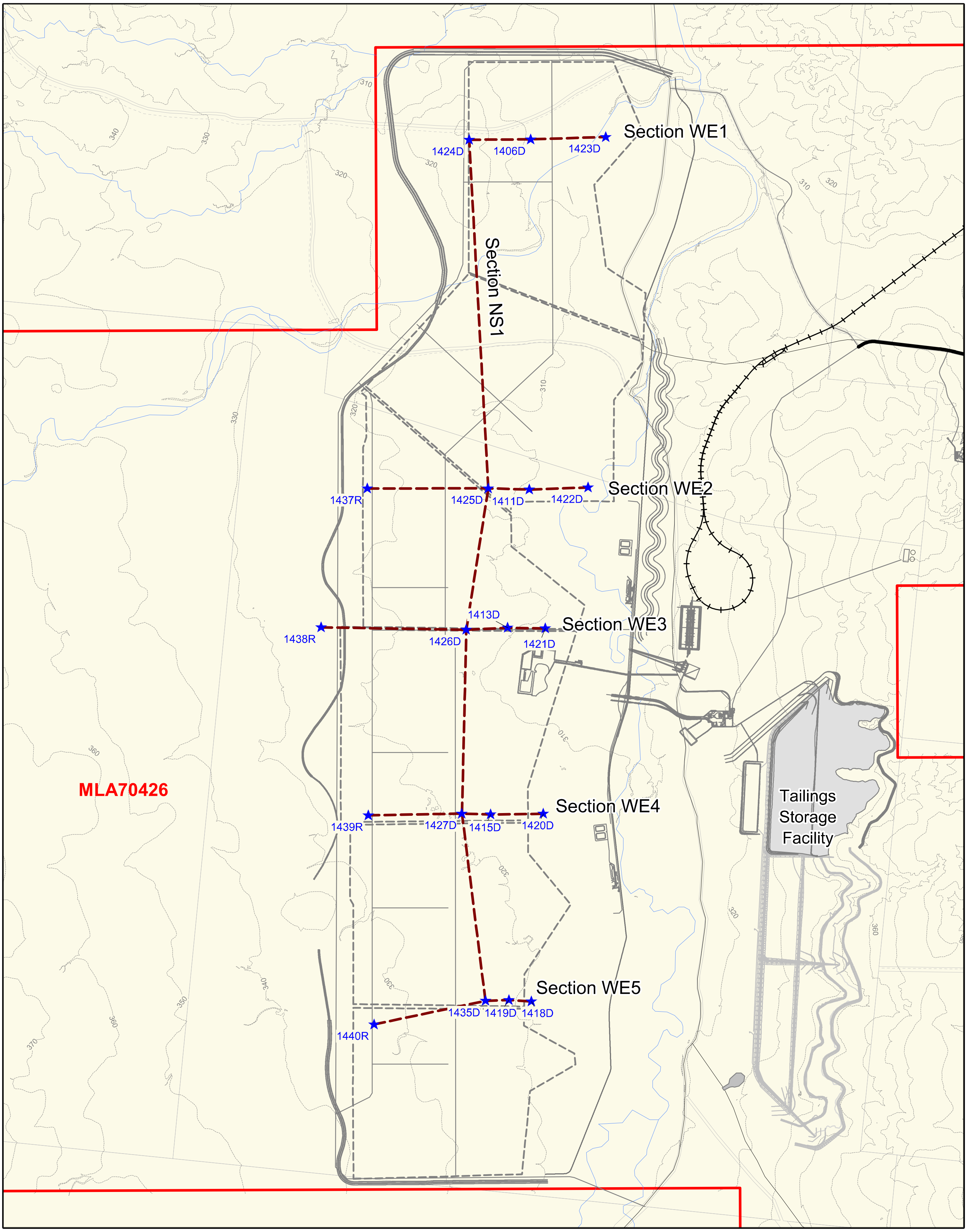
RGS TERRENUS EARTH SCIENCES

PLANNED LIFE OF MINE MINING AREA AND LOCATION OF ADDITIONAL INFILL DRILL CORE HOLES FOR GEOCHEMICAL SAMPLING

Job Number	4262 6580
Revision	A
Date	08-03-2011

Figure: 8

File No: 42626680-g-2013.wor



Mining Lease Application (MLA70426) Boundary

Contour (10m interval)

Pit Outline

Cross-Section Drill Hole Locations

Location of Cross-Section

Draft

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0 1.25 2.5km

Scale 1:110 000 (A4)

Datum: GDA94, MGA Zone55

N W E S

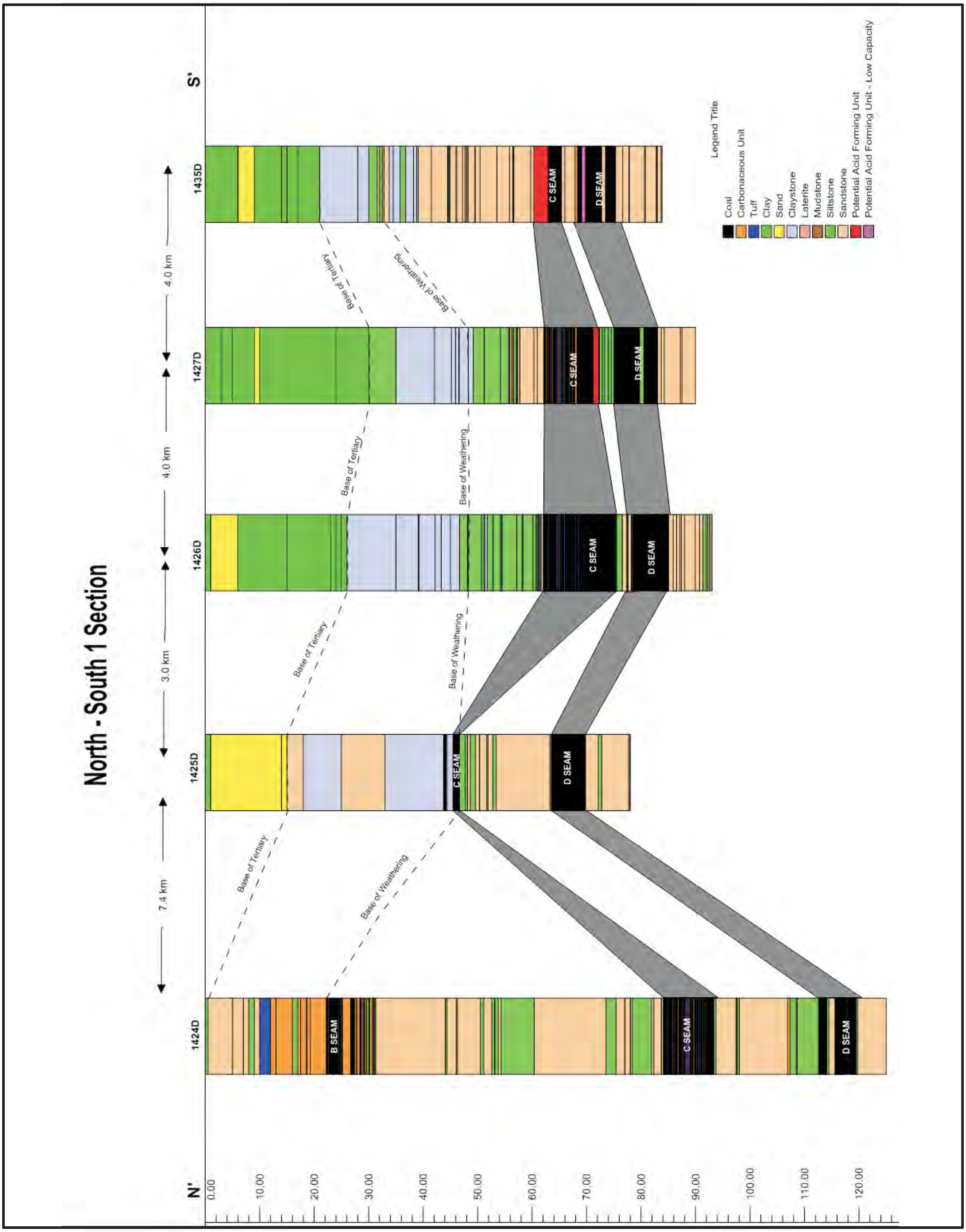
RGS TERRENUS EARTH SCIENCES

ALPHA COAL PROJECT (MINE)
MINE SITE CROSS-SECTION LOCATIONS

Job Number	4262 6680
Revision	A
Date	11-03-2011

Figure: 9

File No: 42626680-g-2023.wor



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Datum: GDA94, MGA Zone55

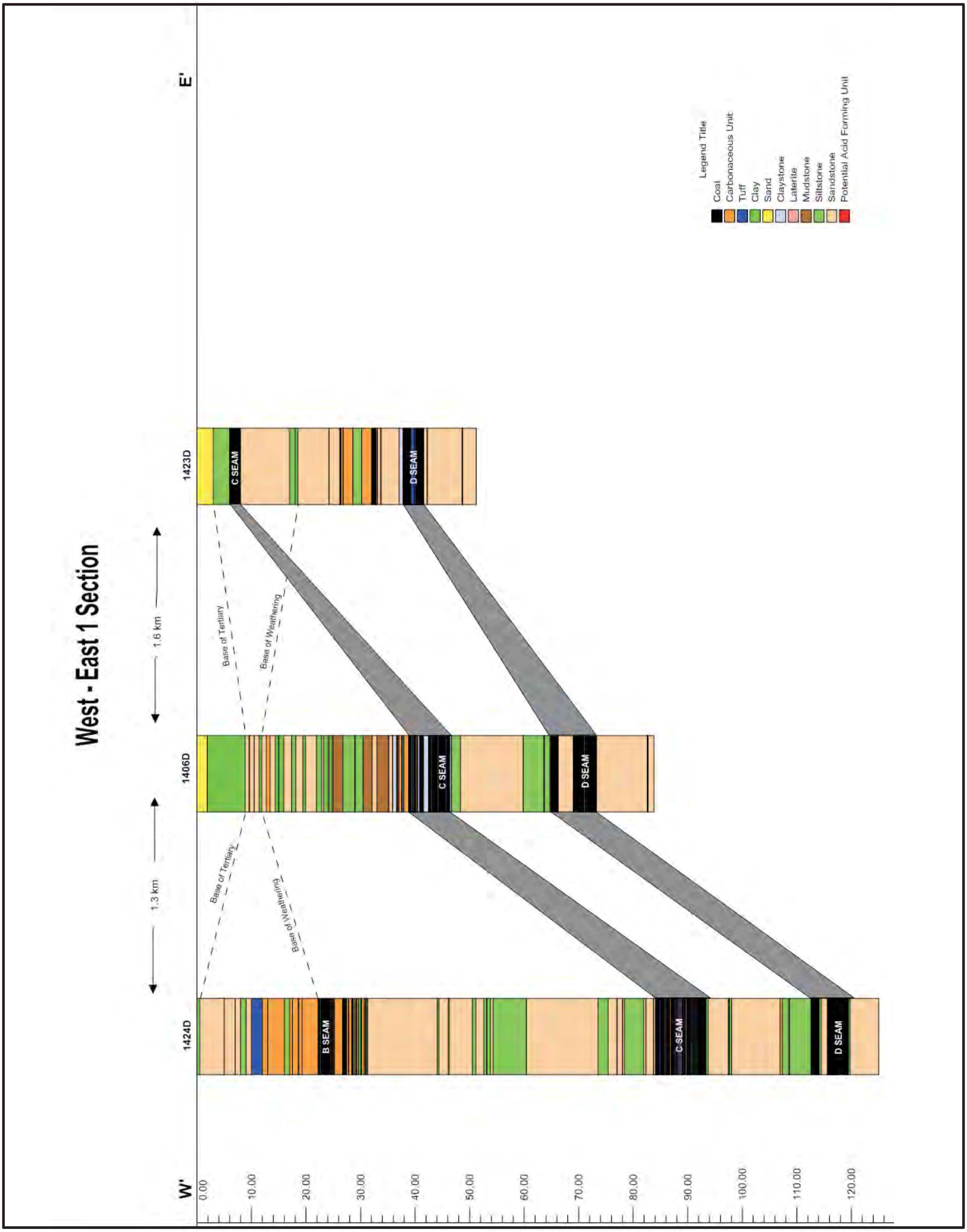
RGS TERRENUS EARTH SCIENCES

N-S CROSS-SECTION OF PROPOSED ALPHA PIT ILLUSTRATING UNIFORM GEOLOGY AND LOCATION OF PAF MATERIALS CLOSE TO COAL SEAMS

Job Number	4262 6680
Revision	A
Date	11-03-2011

Figure: 10

File No: 42626680-g-2014.cdr



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Datum: GDA94, MGA Zone55

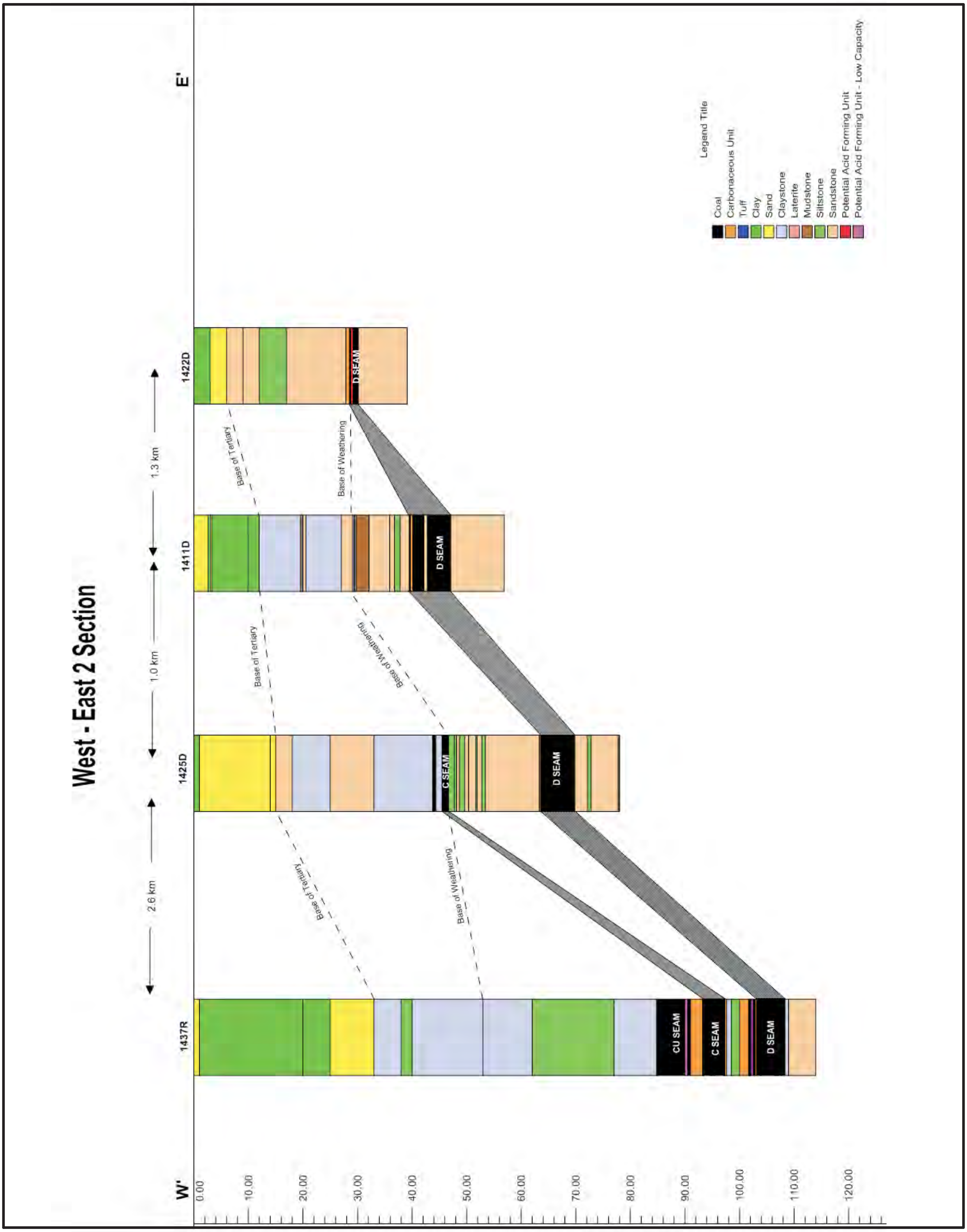
RGS TERRENUS EARTH SCIENCES

E-W CROSS-SECTION OF PROPOSED ALPHA PIT ILLUSTRATING UNIFORM GEOLOGY AND LOCATION OF PAF MATERIALS CLOSE TO COAL SEAMS

Job Number	4262 6680
Revision	A
Date	11-03-2011

Figure: 11

File No: 42626680-g-2015.cdr



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Datum: GDA94, MGA Zone55

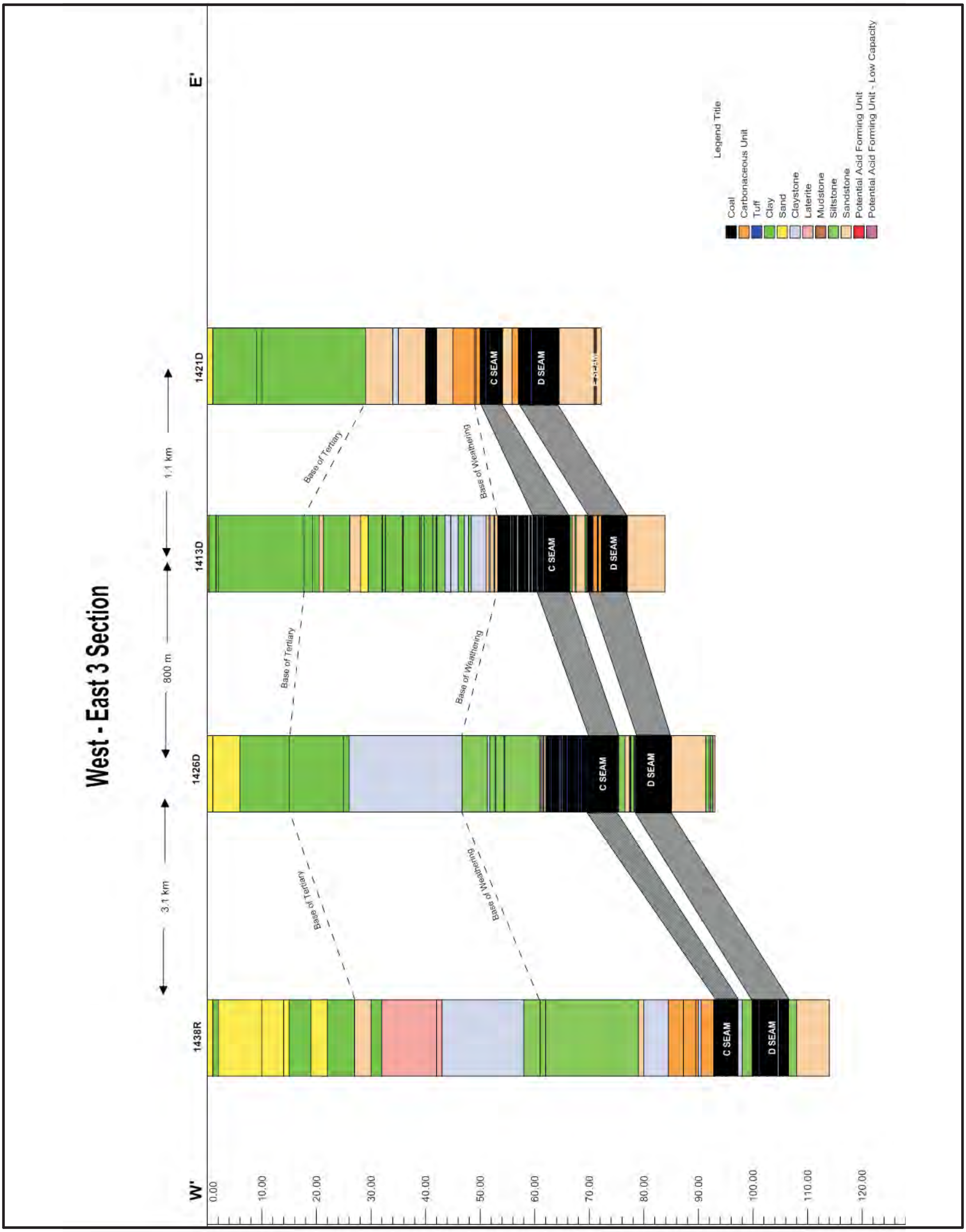
RGS TERRENUS EARTH SCIENCES

E-W CROSS-SECTION OF PROPOSED ALPHA PIT ILLUSTRATING UNIFORM GEOLOGY AND LOCATION OF PAF MATERIALS CLOSE TO COAL SEAMS

Job Number	4262 6680
Revision	A
Date	11-03-2011

Figure: 12

File No: 42626680-g-2016.cdr



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RGS TERRENUS EARTH SCIENCES

E-W CROSS-SECTION OF PROPOSED ALPHA PIT ILLUSTRATING UNIFORM GEOLOGY AND LOCATION OF PAF MATERIALS CLOSE TO COAL SEAMS

Job Number	4262 6680
Revision	A
Date	11-03-2011

Figure: 13

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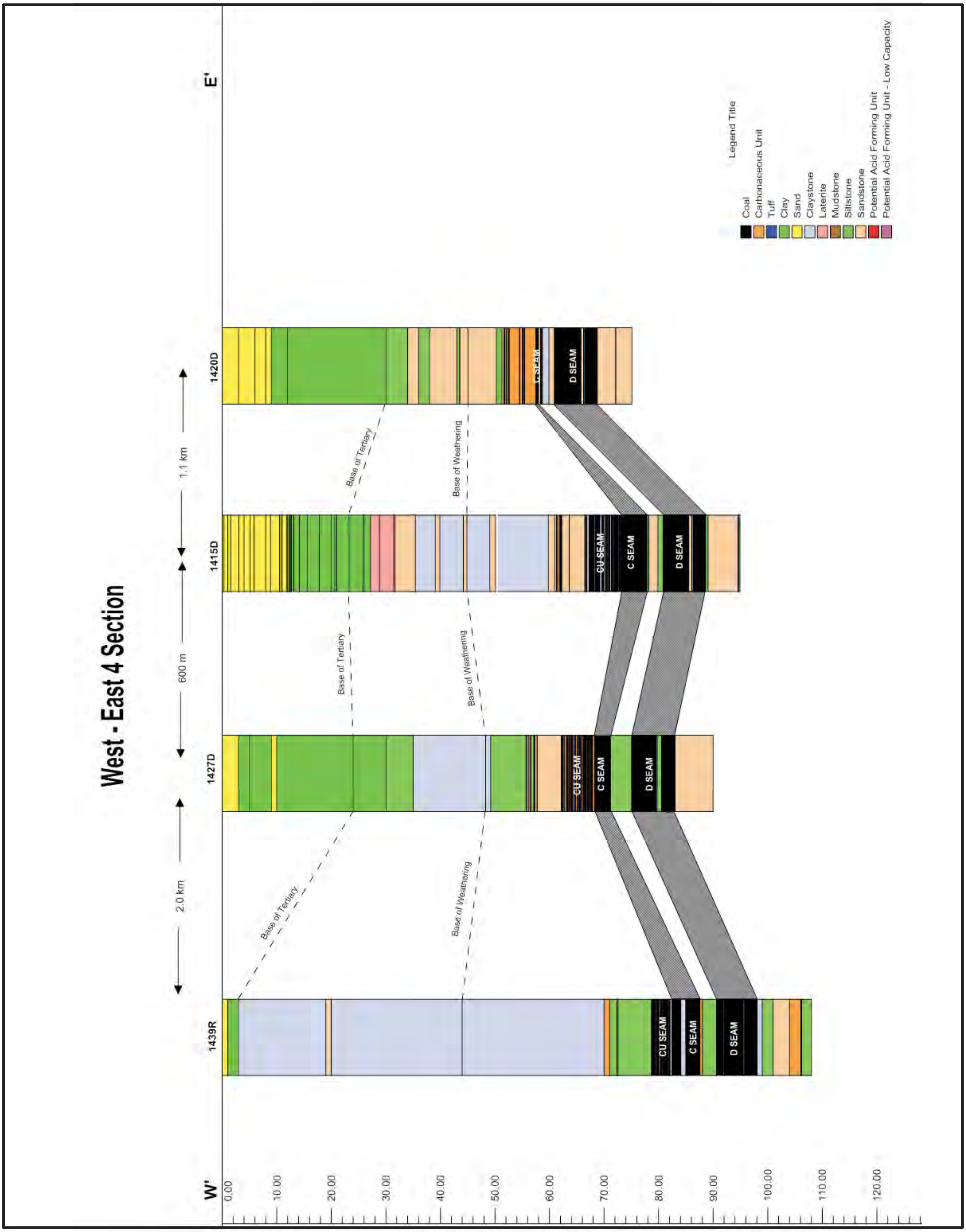

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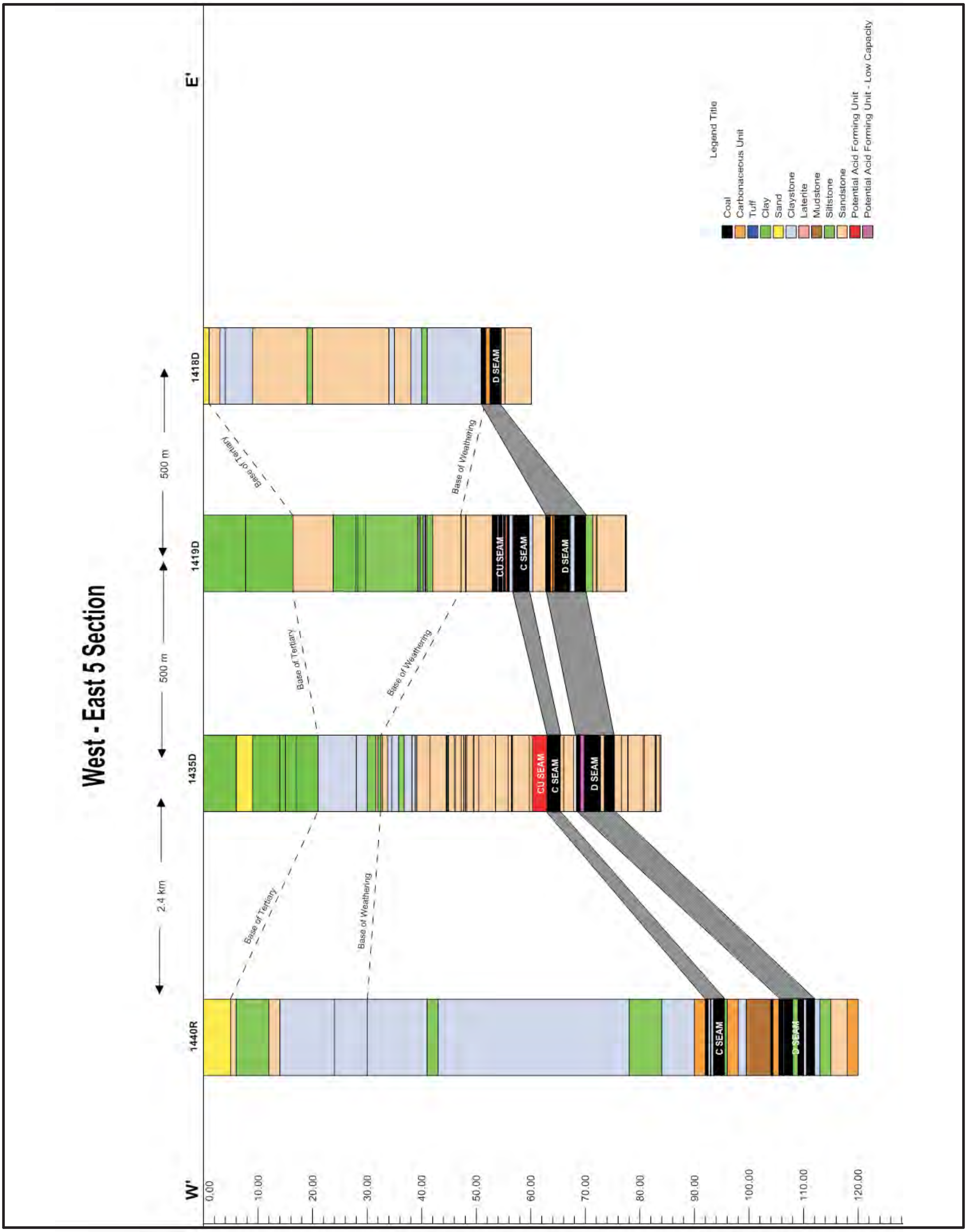
RGS TERRENUS EARTH SCIENCES

E-W CROSS-SECTION OF PROPOSED ALPHA PIT ILLUSTRATING UNIFORM GEOLOGY AND LOCATION OF PAF MATERIALS CLOSE TO COAL SEAMS

Job Number	4262 6680
Revision	A
Date	11-03-2011

Figure:14

File No: 42626680-g-2018.cdr



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Datum: GDA94, MGA Zone55

RGS TERRENUS EARTH SCIENCES

E-W CROSS-SECTION OF PROPOSED ALPHA PIT ILLUSTRATING UNIFORM GEOLOGY AND LOCATION OF PAF MATERIALS CLOSE TO COAL SEAMS

Job Number	4262 6680
Revision	A
Date	11-03-2011

Figure: 15

File No: 42626680-g-2019.cdr

Attachment A

Results of Kinetic Leach Column Test Programs

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Project Memo

Client:	Hancock Prospecting Pty Ltd	**Date:**	09 March 2011
Attention:	Paul Taylor	**From:**	Alex Watson
Project/Proposal No:	HCK002	**Revision No**	1
Project/Proposal Name:	Alpha Coal Project		
Subject:	Kinetic Leach Columns		

1 Introduction

Hancock Prospecting Pty Ltd (Hancock) has completed an Environmental Impact Statement (EIS) for the Alpha Coal Project. A component of the EIS study is a geochemical characterisation program to assess the potential for acid drainage and metal and salt leaching from possible mine waste materials.

Part of the characterisation program is to carry out kinetic test work on samples of raw coal, coarse coal rejects and fine coal rejects from the site. Samples of these types of material were not available from the Alpha Coal Project drilling program when the kinetic test work commenced. Therefore samples from an earlier drilling program (the Alpha Test Pit Project) were used. The samples are expected to be representative of the coal and coal reject wastes arising from the proposed project. Samples of blended raw coal, coarse coal rejects and fine coal rejects were placed in columns and column leaching began on 26 July 2010.

SRK has collated and interpreted the first 20 weeks of leach data from these column tests. The purpose of this memo is to report on outcomes to date and make recommendations on whether to continue the operation of each column.

2 Test Objectives

Kinetic column tests are used to estimate oxidation rates, determine acid generation and neutralisation rates, and identify which metals may leach from the wastes over longer time frames. In cases where effluents are expected to become acidic the tests can provide an indication of the time that could elapse before onset of acid conditions (ie. the lag period). Kinetic testing provides information on solute release rates that can provide an input into later water quality predictions.

Kinetic column tests should be carried out for sufficient time, such that:

- The column has reached a pseudo steady state (there is low variability in the chemistry of successive leachates).
- There is a low expectation that chemical conditions in the column will change within a laboratory accessible timescale.

Past experience indicates that column leach tests that exhibit slow rates of reaction may be required to operate for more than 20 weeks, unless fully acidic conditions have developed early in the test.

3 Sample Selection and Column Operating Conditions

The five samples selected for kinetic column leach testing are shown in Table 3-1.

Table 3-1: Samples selected for column test work

Column Number	Sample Description	Material	Class[1]
1	C_Seam_S1.60+0.250 mm	Coarse reject	PAF
2	Seam_DLL_S1.60+0.25	Coarse reject	PAF
3	Seam_DU_S1.60+0.250 mm	Coarse reject	PAF
4	Blended raw coal	Raw coal	PAF
5	Alpha_C-0.250 mm, Alpha_DLL-0.250 mm and Alpha_DU-0.250 mm	Fine reject composite	PAF

Notes: [1] The classification system used for the samples was that provided in the AMIRA ARD Test Handbook, 2002 except for blended raw coal which was classified based on the Net Potential Ratio (NPR), where NPR = Acid Neutralising Capacity/Maximum Potential Acidity (Price, 2009); PAF – Potentially Acid Forming.

The samples were approximately six months old when the leach column tests started and may have reacted to some extent prior to leaching.

The column tests have operated for 20 weeks. The operation of the columns was similar to the method outlined in the AMIRA (2002) document, except that the columns are flushed on a weekly (rather than a monthly) basis. The columns were maintained at around 30°C between flushing to promote drying of the sample between flushing events, and allow free atmospheric oxygen access to column materials.

The leachates were analysed weekly for electrical conductivity (EC) and pH. Detailed chemical analyses (including sulphate, chloride, alkalinity/acidity and metals by inductively coupled plasma atomic emission spectroscopy (ICPAES)) were carried out consecutively for the first six weekly cycles, and then every third cycle thereafter.

The final flush (Week 20) took place on 14 December 2010. However the columns have been kept intact and weekly flushing has continued pending a decision from Hancock on whether to continue the test work beyond the initial 20 week test period.

4 Results and Discussion

4.1 Leachate pH and Sulphate Release Rates

The results of test work carried out to date have been plotted to show trends in solution composition with time. Plots of the leachate pH and sulphate release rate are shown in Figure 4-1 and Figure 4-2 respectively (note the release rate of sulphate in the initial flush is excluded from the plot as this was high compared to the rest of the test and reflected leaching of pre-existing soluble salts from the samples).

The plots indicate that two coarse reject samples (Seam_DLL_S1.60+0.25 and Seam_DU_S1.60+0.25mm) are generating acidic leachate (pH < 4.5). The pH of the leachate is still declining. The rate of sulphate production has not stabilised, and increased sharply in the most recent leachates suggesting maximum oxidation rates may not yet have been reached.

The pH of the leach solution from one coarse reject sample (C_Seam_S1.60+0.250 mm) and the fine reject composite is variable. At the start of the test the leachate pH was near neutral indicating buffered conditions, however the pH appears to be steadily declining with time and the sulphate release rate increasing. It is possible that these columns will start generating acidic leachate in the future.

The pH of the leachate from the blended raw coal sample has remained in the near neutral range for the duration of the test and the sulphate release rate has remained relatively constant.

4.2 Rates of Acid Generation and Neutralisation

Rates of sulphate release can be used to infer rates of sulphide oxidation (acid generation) within the sample, whilst rates of calcium and magnesium release can be used to infer neutralisation rates (on the premise that calcium and magnesium are released from the dissolution of reactive carbonates). These calculations should be carried out once release rates are stable. Recognizing that oxidation rates have not yet stabilised, calculated oxidation rates were based on the most recent cycles of sulphate release. These rates were then used to estimate the time for sulphide depletion from the sample.

The sulphate/(calcium+magnesium) molar ratio (Figure 4-1) provides an insight into the relative rate of acid production and acid neutralisation. For samples where the leachate pH is near neutral, a molar ratio between 0.5 and 1 is consistent with carbonate-based neutralisation processes, and suggests that neutralisation is occurring at the same rate as acid production.

For most samples, a molar ratio greater than 1 was calculated. This would suggest that either (i) sulphate generation (and hence acid production) is occurring at a more rapid rate than neutralisation, or (ii) that pre-existing sulphate salts are still being washed from the columns.

For samples that were acidic from the onset of test work, or become acidic shortly afterwards, the available neutralisation potential has already been depleted. For the remaining columns, the acid neutralisation rates can be used to estimate the time for depletion of neutralisation capacity from the sample.

Assuming that the current reaction rates will be maintained, the times to deplete acid potential (AP) and acid neutralising capacity (ANC) in the samples are summarised in Table 4-1.

Table 4-1: Summary of Column Data

Sample	Unit	Class[1]	Leachate pH Week 20	ANC	AP[2]	Neutralisation potential		Acid potential	
				kgH_2SO_4/t		Reaction rate	Time to deplete	Reaction rate	Time to deplete
						kgH_2SO_4/t/week	years	kgH_2SO_4/t/week	years
C_Seam_S1.60+0.250 mm	Coarse reject	PAF	5.4	5.4	8	0.013	8	0.04	3
Seam_DLL_S1.60+0.25	Coarse reject	PAF	3	2.1	34	0.03	0	0.15	4
Seam_DU_S1.60+0.250 mm	Coarse reject	PAF	3.8	1.2	14.7	0.026	0	0.039	7
Blended raw coal	Blended raw coal	PAF	6	4.8	1.8	0.0007	125	0.0014	25
19880-1-2-3-Comp	Fine reject composite	PAF	5	4.7	11	0.067	1.3	0.086	2.5

Notes: [1] The classification system used for the samples was that provided in the AMIRA ARD Test Handbook, 2002 except for blended raw coal which was classified based on the Net Potential Ratio (NPR), where NPR = Acid Neutralising Capacity/Maximum Potential Acidity (Price, 2009); PAF – Potentially Acid Forming

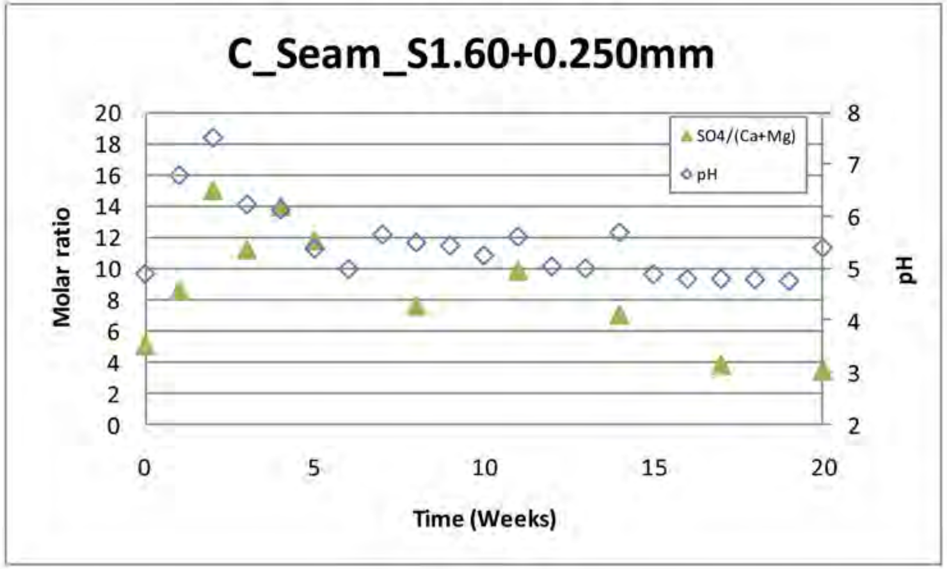
AP – Acid Potential; ANC – Acid Neutralising Capacity; [2] AP calculated from chromium reducible sulphur content; PAF - Potentially Acid Forming.

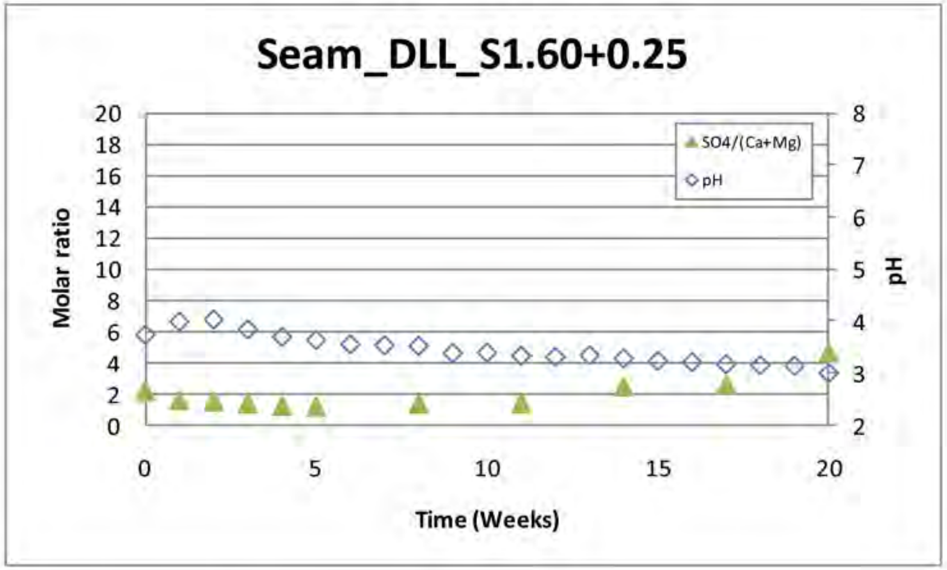
For two of the coarse reject samples (Seam_DLL_S1.60+0.25 and Seam_DU_S1.60+0.25mm) column leachates are already acidic, consistent with their potentially acid forming (PAF) classification. The pH plots for these columns show that the leachate was either acidic at the start of the test or became acidic shortly afterwards, supporting the finding that there was little or negligible neutralising potential present in the samples.

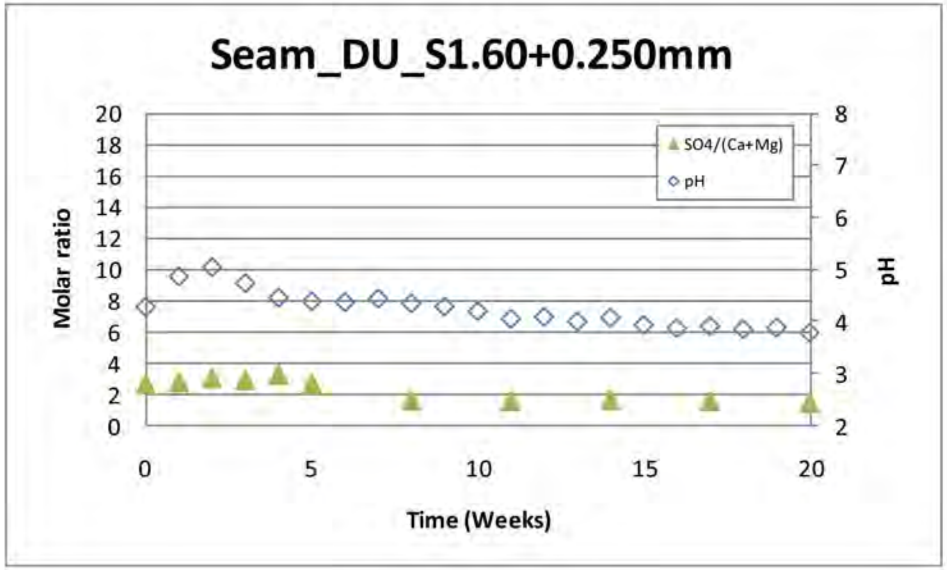
In the case of the blended raw coal sample, the data in Table 4-1, Figure 4-1 and Figure 4-2 suggest that column will stay neutral and sample will be non acid forming (NAF). This is contrary to the PAF classification determined using the NPR classification scheme.

In the NPR classification the total sulphur content is used to estimate the potential acidity. This gives the largest estimate of potential acidity. Estimates of potential acidity presented in Table 4-1 are based on the chromium reducible sulphur content. The chromium reducible sulphur is a reliable and direct measure of the reducible inorganic sulphur content (Ahern et al, 2004) and therefore provides a more likely estimate of the potential acidity than the total sulphur. For the blended raw coal sample the quantity of sulphur that could contribute to the acid potential (chromium reducible sulphur) is sufficiently less than total sulphur, leading to the reclassification of the sample.

There is still some uncertainty related to the interpretation of the data for the remaining coarse reject sample (C_Seam_S1.60+0.250 mm) and the fine reject composite. There is the possibility that both samples may generate low pH leachate at some time in the future. This may occur in the coarse reject sample (C_Seam_S1.60+0.250 mm) if not all of the ANC is sufficiently reactive to buffer the acidity generated. For the fine tailings composite, the initial indications are that the ANC will be consumed before the AP is exhausted, leading to the potential onset of acidic conditions. At this stage these samples would be classified as Uncertain.


C_Seam_S1.60+0.250mm
Molar ratio
pH
Time (Weeks)
SO4/(Ca+Mg)
pH
0
5
10
15
20
2
3
4
5
6
7
8
0
2
4
6
8
10
12
14
16
18
20


Seam_DLL_S1.60+0.25
Molar ratio
pH
Time (Weeks)
SO4/(Ca+Mg)
pH
0
5
10
15
20
2
3
4
5
6
7
8
0
2
4
6
8
10
12
14
16
18
20


Seam_DU_S1.60+0.250mm
Molar ratio
pH
Time (Weeks)
SO4/(Ca+Mg)
pH
0
5
10
15
20
2
3
4
5
6
7
8
0
2
4
6
8
10
12
14
16
18
20

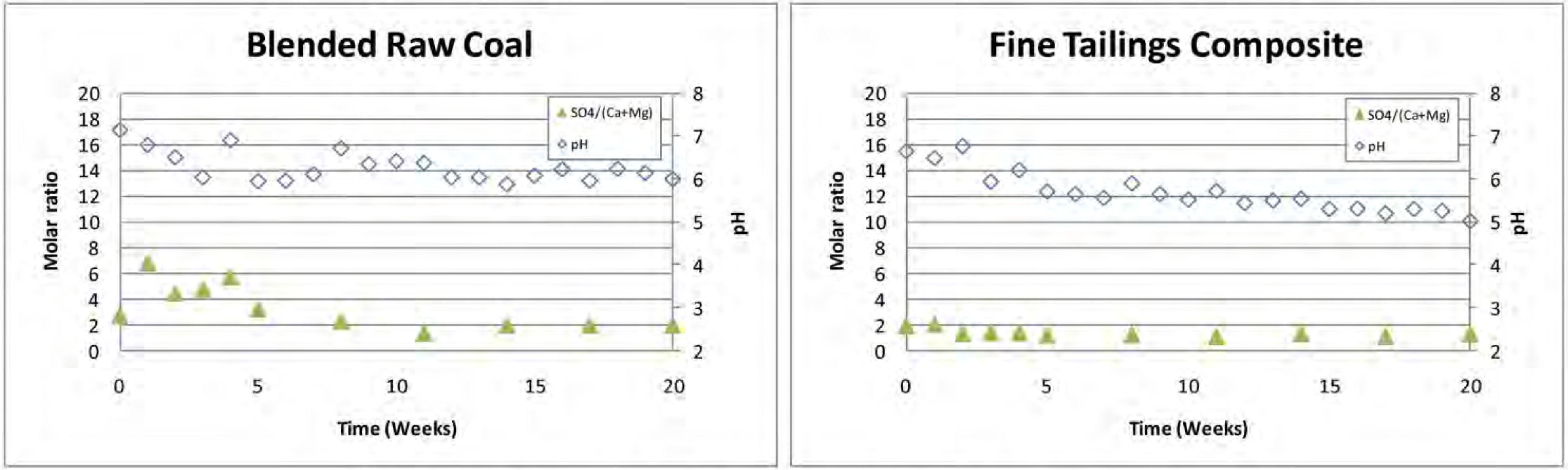
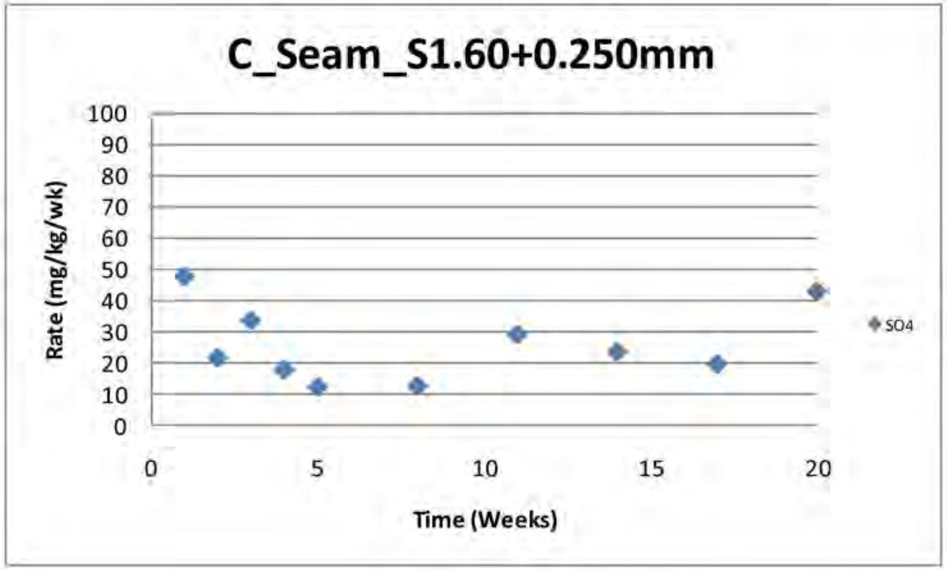
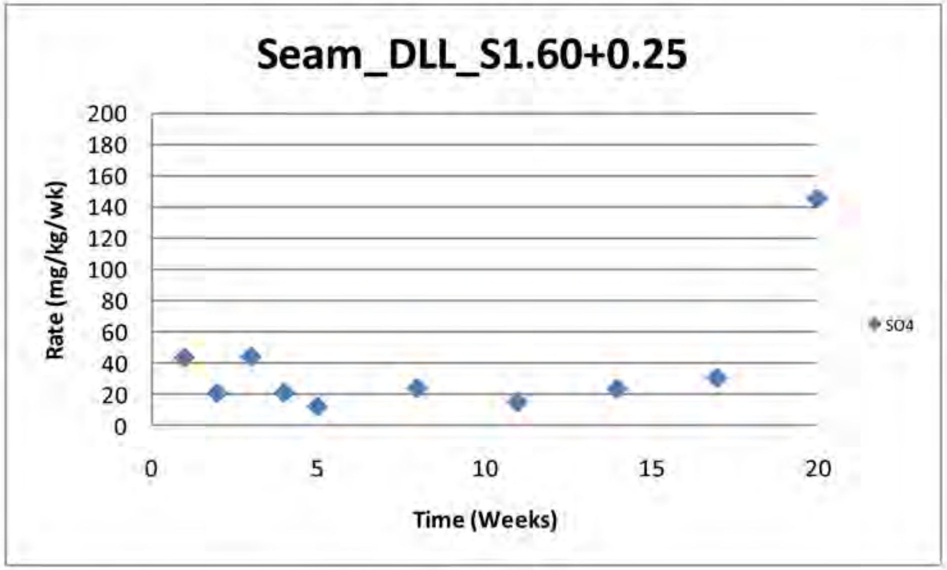
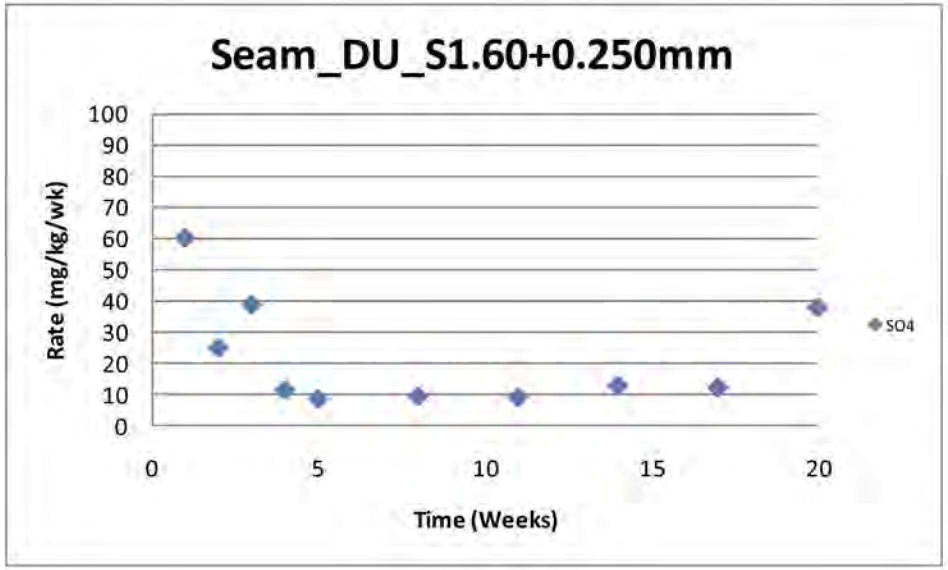
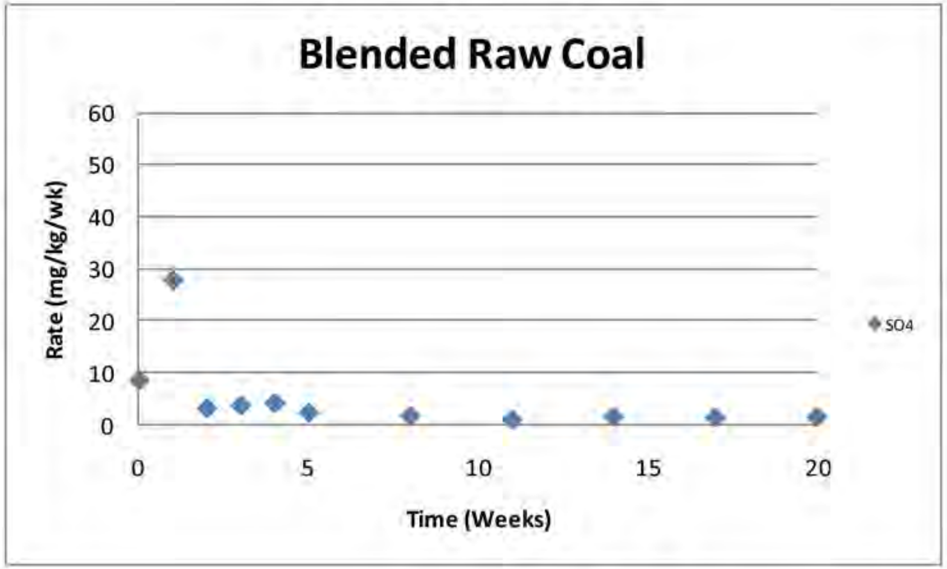


Figure 4-1: Variation of pH and SO_4/(Ca+Mg) molar ratio as a function of time


C_Seam_S1.60+0.250mm
Rate (mg/kg/wk)
100
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
Time (Weeks)
SO4


Seam_DLL_S1.60+0.25
Rate (mg/kg/wk)
200
180
160
140
120
100
80
60
40
20
0
0
5
10
15
20
Time (Weeks)
SO4


Seam_DU_S1.60+0.250mm
Rate (mg/kg/wk)
100
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
Time (Weeks)
SO4



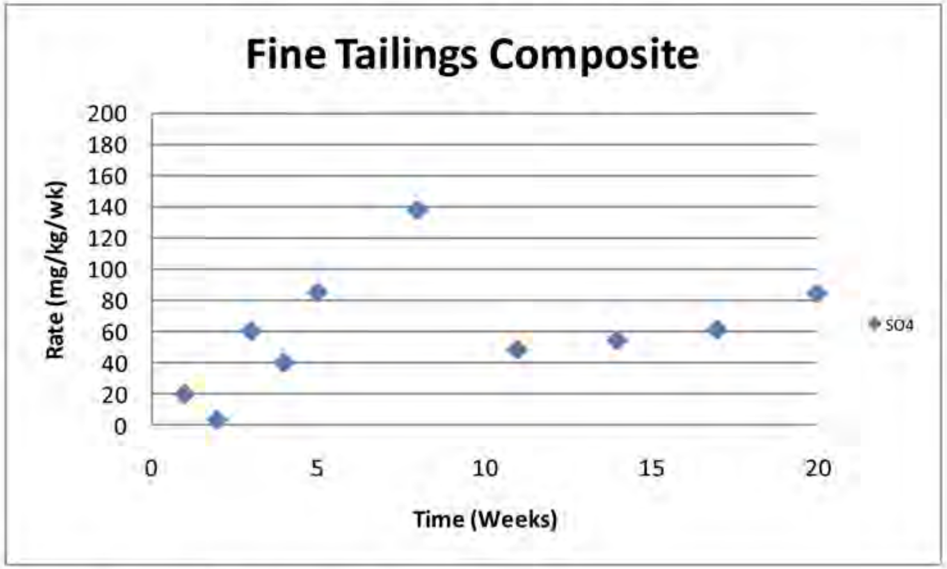
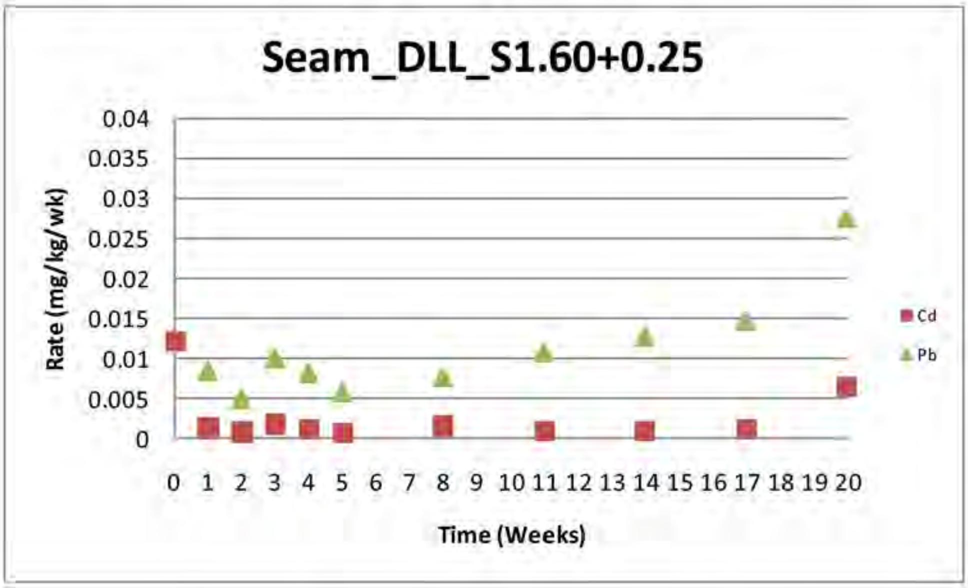


Figure 4-2: Variation in sulphate release rate as a function of time

4.3 Metal Release Rates

For the two coarse reject samples where the column leachate was acidic (Seam_DLL_S1.60+0.25 and Seam_DU_S1.60+0.25mm) there was an increase in the release rate of a number of elements towards the end of the test period - aluminium, cadmium, copper, iron, lead and zinc. The plots for cadmium and lead and copper and zinc are shown in Figure 4-3.



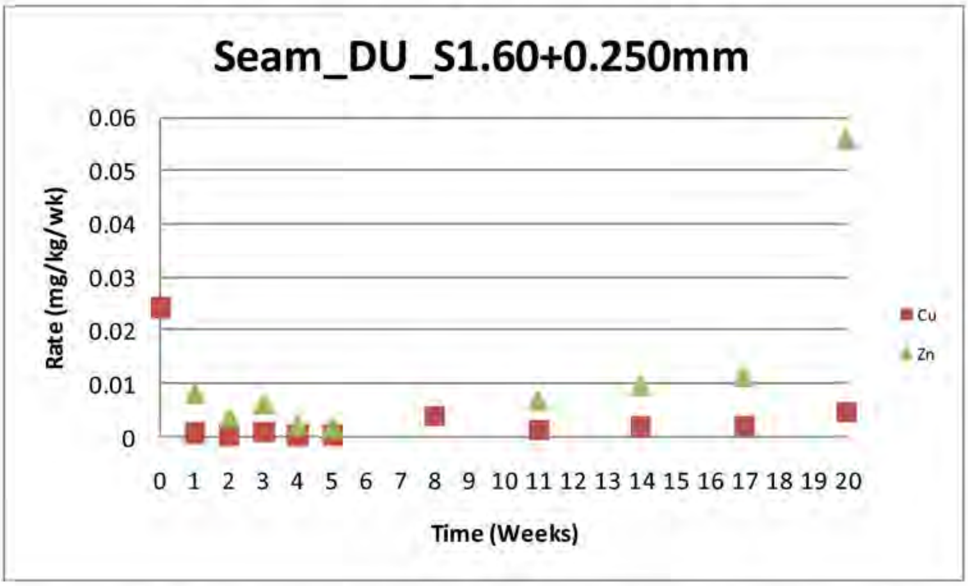


Figure 4-3: Variation in trace metal release rate as a function of time

Some variability in leachate composition (particularly calcium, cadmium, copper, magnesium and zinc) was noted for the coarse reject sample (C_Seam_S1.60+0.250 mm) and the fine tailings composite (cadmium, copper and zinc). For both samples, many elements were either below the limit of detection or close to it. Whilst this may be expected when the solution pH is circum neutral, the release rates would be expected to increase if the leachate becomes acidic.

The blended raw coal is not expected to become acidic. The majority of elements were leaching close to or below the limit of detection.

5 Summary

A summary of the findings from interpretation of the column data is provided in Table 5-1.

Table 5-1: Summary of Findings

Sample	Unit	Stability			Comments	Recommendation
		pH	SO_4/ (Ca+Mg)	Metals		
C_Seam_ S1.60+0.250 mm	Coarse reject	No	No	No	Currently ANC is sufficiently reactive to buffer acidity produced above pH4.5. Sustaining these conditions would result in consumption of AP before ANC and ARD will not occur. However the declining pH may be an indication that conditions are changing and any reactive carbonates that were present have been consumed. This column could generate ARD in future.	Continue
Seam_DLL_ S1.60+0.25	Coarse reject	No	No	No	Acidity expected to be generated well after all ANC is consumed. Potential maximum release rates not yet reached.	Continue
Seam_DU_ S1.60+0.250 mm	Coarse reject	No	Yes	No	Potential maximum release rates not reached yet.	Continue
Blended raw coal	Blended raw coal	Yes	Yes	Yes	Interpretation of data suggests column has reached a steady state. Continued operation of this column provides an opportunity to demonstrate that samples classed as low risk (Figure 4-14, SRK report of September 2010) are of very low risk.	Continue
19880-1-2-3-Comp	Fine reject composite	No	Yes	No	Currently ANC is buffering any acidity generated above pH 4.5. However, under these conditions the ANC will be exhausted before the AP. Thus onset of ARD may occur in the future.	Continue

6 Conclusions

The test data received to date indicates that:

- Two coarse reject samples (Seam_DLL_S1.60+0.25 and Seam_DU_S1.60+0.25mm) are confirmed as acid generating and have produced acidic leachate with a pH less than 4.5.
- The pH of the leach solution from each of the coarse reject sample (C_Seam_S1.60+0.250 mm) and the fine reject composite sample are variable but appear to be declining with time. These samples may generate acidic pH leachate in future.
- The pH of the leachate from the blended raw coal sample has remained in the near neutral range. It is considered that this sample has reached steady state.

The laboratory data indicates that there is still variability in the leaching rates of elements and salts from the columns (with the possible exception of the blended raw coal sample). Due to this variability a low degree of confidence can be placed on calculated reaction rates. Further leaching is required in order to confirm long-term trends and allow the leachate chemistries to stabilise. Only then will it be possible to place confidence in the calculated stable release rates, and provide more robust inputs into predictions of future water quality. Further operation of the five columns will yield data which can be used to provide an indication of the potential risks associated with the bulk coal and coal waste materials.

7 Recommendations

SRK recommend that column leaching continues for a further 20 weeks for four samples. Further column leaching will indicate whether:

- The maximum rate of acid production has been reached in samples Seam_DLL_S1.60+0.25 and Seam_DU_S1.60+0.25mm.
- The readily available neutralising potential of samples is C_Seam_S1.60+0.250 mm and the fine reject composite has been exhausted and the samples will become acid generating.

The blended raw coal composite sample has reached stability and further leaching would serve to confirm this. Continued operation of this column provides an opportunity to demonstrate that samples classed as low risk (Figure 4-14, SRK, 2010) are of low risk. If, however, Hancock is currently kinetically testing carbonaceous samples that are not raw coal that have similar low sulphur contents and therefore represent low sulphur waste then the blended raw coal column could be stopped.

8 References

SRK Consulting September 2010, Geochemical Characterisation of the Alpha Project, Project Number HCK002.

AMIRA International Limited, 2002. ARD Test Handbook: Project P387A Prediction and Kinetic Control of Acid Mine Drainage.

Price, 2009, Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials, MEND report 1.20.1 CANMET Mining and Mineral Sciences Laboratories

Ahern, CR, McElnea, AE and Sullivan, LA, June 2004 Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 (http://www.derm.qld.gov.au/land/ass/pdfs/lmg.pdf).

Table KLC1

KLC Test Results for Alpha Sample 1 (Coarse Reject 201119 R1290L DL Seam)

Sample Weight (kg)	2.0	**MPA (kg H_2SO_4/t)**	4.3
pH(1:5)	4.00	**ANC (kg H_2SO_4/t)**	2.4
EC(1:5) (μS/cm)	875	**NAPP (kg H_2SO_4/t)**	1.9
Total S (%)	0.14	**ANC:MPA ratio**	0.6

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.720	0.700	0.680	0.740	0.650	0.660	0.660	0.680		
Cum. Volume (L)	0.720	1.420	2.100	2.840	3.490	4.150	4.810	5.490		
Pore Volumes	0.5	1.1	1.6	2.1	2.6	3.1	3.6	4.1		
pH	4.08	3.49	3.73	3.67	3.78	3.69	3.92	3.9		
EC (μS/cm)	641	1,290	1,160	2,030	1,150	998	835	939		
Acidity (mg/L)*	24	41	19	29	19	23	16	20		
Alkalinity (mg/L)*	<1	<1	<1	<1	<1	<1	<1	<1		
Net Alkalinity (mg/L)*	-24	-41	-19	-29	-19	-23	-16	-20		
Dissolved elements (mg/L)										
Al	0.34	0.57	0.47	0.79	0.37	0.29	0.27	0.26		
As	0.004	0.214	<0.020	0.022	<0.020	0.005	<0.001	0.034		
B	<0.05	0.09	0.06	0.14	0.07	0.06	0.08	<0.05		
Ca	39	84	80	162	88	75	58	67		
Cd	0.0009	0.0029	0.002	0.0038	0.0022	0.0023	0.0019	0.0022		
Cl	171	483	432	843	371	348	235	292		
Co	0.017	0.068	0.056	0.122	0.053	0.044	0.032	0.035		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001		
Cu	0.016	0.031	0.029	0.029	0.018	0.012	0.01	0.02		
Fe	3.6	2.4	0.60	0.41	0.87	0.87	1.52	0.74		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	6	9	8	12	8	7	6	5		
Mg	6	15	14	30	16	14	11	13		
Mn	1.03	9.42	12.1	30.9	20.6	21.2	18.1	26.4		
Mo	<0.001	<0.001	0.003	0.007	0.003	<0.001	0.005	<0.001		
Na	66	86	75	141	71	53	38	37		
Ni	0.021	0.063	0.053	0.117	0.054	0.047	0.038	0.042		
Pb	0.009	0.054	0.037	0.062	0.03	0.014	0.013	0.016		
SO_4	39	27	30	45	43	60	60	66		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	0.02	0.83	<0.20	<0.20	<0.20	0.01	<0.01	0.13		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.085	0.466	0.343	0.598	0.264	0.254	0.212	0.227		
RESULTS**										
SO_4 Release Rate	14	9.5	10	17	14	20	20	22		
Cumulative SO_4 Release	14	23	34	50	64	84	104	126		
Ca Release Rate	14	29	27	60	29	25	19	23		
Cumulative Ca Release	14	43	71	131	159	184	203	226		
Mg Release Rate	2.2	5.3	4.8	11	5.2	4.6	3.6	4.4		
Cumulative Mg Release	2.2	7.4	12	23	28	33	37	41		
Residual ANC (%)	98	94	91	83	79	76	73	70		
Residual Sulfur (%)	100	99	99	99	98	98	98	97		
SO_4/(Ca+Mg) molar ratio	0.3	0.1	0.1	0.1	0.2	0.3	0.3	0.3		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

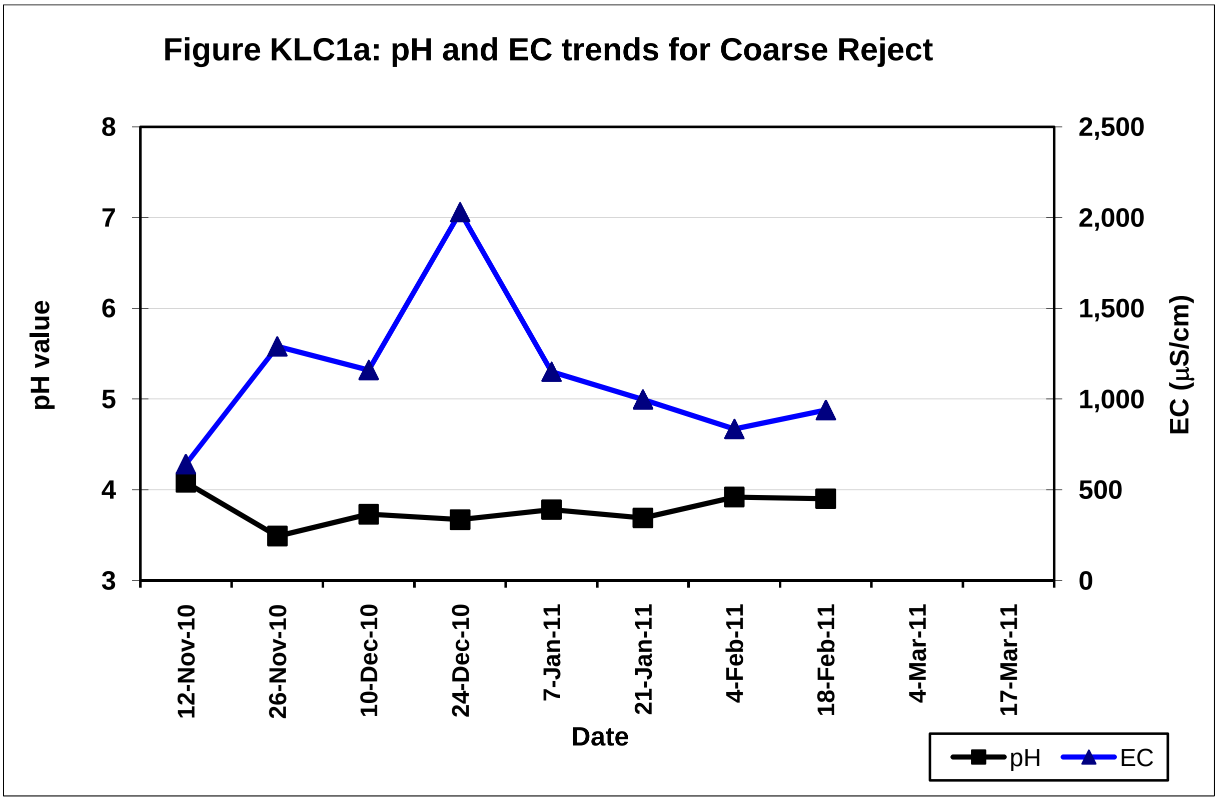


Figure KLC1a: pH and EC trends for Coarse Reject
pH value
EC (µS/cm)
8
7
6
5
4
3
2,500
2,000
1,500
1,000
500
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

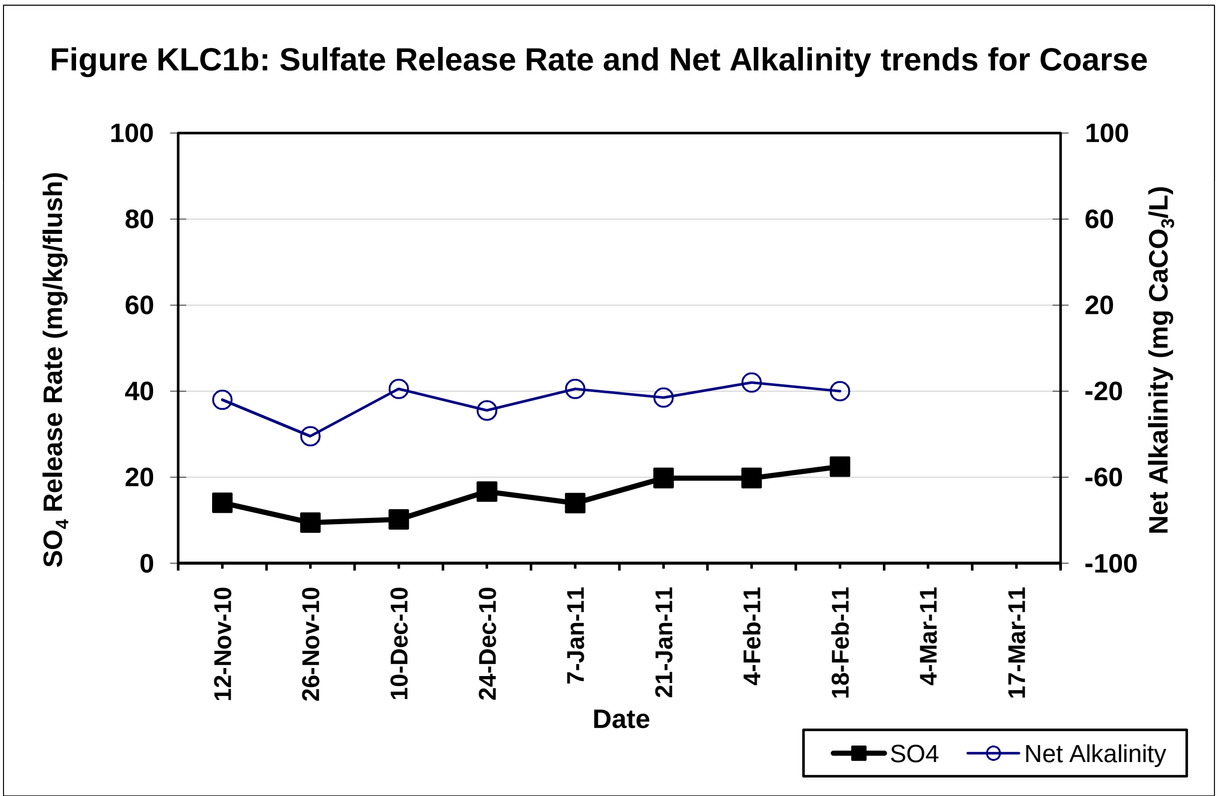


Figure KLC1b: Sulfate Release Rate and Net Alkalinity trends for Coarse
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
100
80
60
40
20
0
100
60
20
-20
-60
-100
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

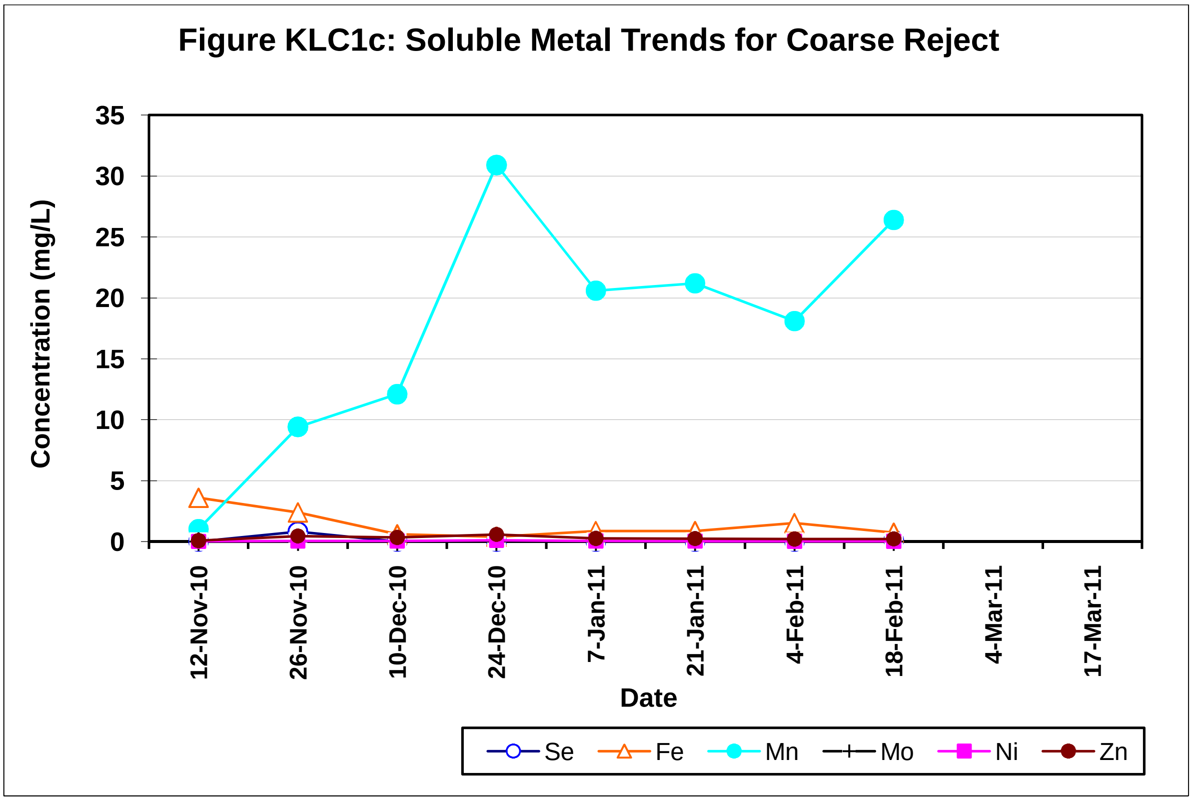


Figure KLC1c: Soluble Metal Trends for Coarse Reject
Concentration (mg/L)
35
30
25
20
15
10
5
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

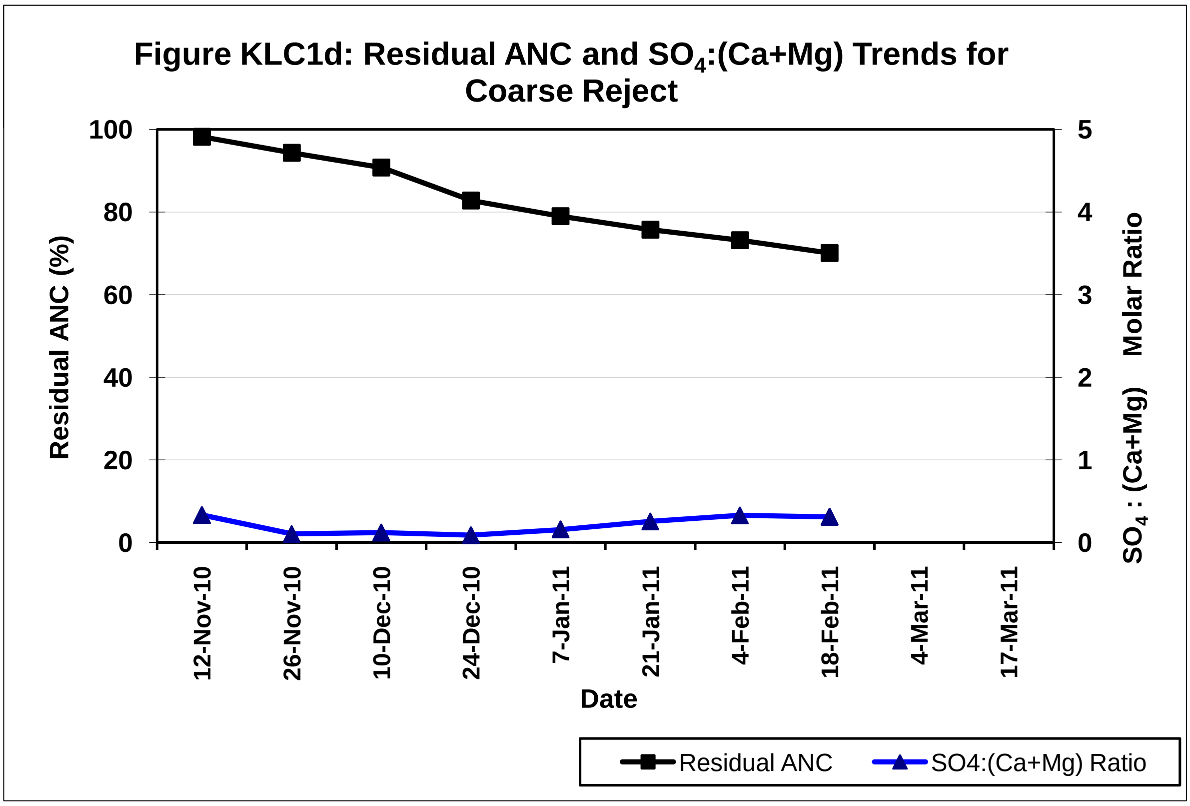


Figure KLC1d: Residual ANC and SO4:(Ca+Mg) Trends for Coarse Reject
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC2

KLC Test Results for Alpha Sample 2 (Coarse Reject 201099 R1290L DU Seam)

Sample Weight (kg)	2.0	**MPA (kg H_2SO_4/t)**	9.9
pH(1:5)	4.30	**ANC (kg H_2SO_4/t)**	1.8
EC(1:5) (μS/cm)	652	**NAPP (kg H_2SO_4/t)**	8.1
Total S (%)	0.32	**ANC:MPA ratio**	0.2

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.670	0.650	0.650	0.640	0.580	0.600	0.620	0.630		
Cum. Volume (L)	0.670	1.320	1.970	2.610	3.190	3.790	4.410	5.040		
Pore Volumes	0.5	1.0	1.5	1.9	2.4	2.8	3.3	3.7		
pH	4.27	4.09	4.03	3.93	3.93	3.96	3.85	3.87		
EC (μS/cm)	571	1,010	1,030	1,640	1,010	839	861	1,050		
Acidity (mg/L)*	23	6	10	14	19	13	13	17		
Alkalinity (mg/L)*	<1	<1	<1	<1	<1	<1	<1	<1		
Net Alkalinity (mg/L)*	-23	-6	-10	-14	-19	-13	-13	-17		
Dissolved elements (mg/L)										
Al	0.16	0.10	0.11	0.16	0.13	0.12	0.14	0.18		
As	0.004	0.149	<0.020	<0.020	<0.020	0.051	<0.001	0.028		
B	0.05	0.12	0.10	0.21	0.11	0.09	0.11	0.09		
Ca	34	59	61	94	61	54	53	65		
Cd	0.0006	0.0016	0.0012	0.0026	0.0014	0.0014	0.0016	0.0024		
Cl	129	483	315	553	276	208	184	260		
Co	0.043	0.132	0.114	0.253	0.129	0.114	0.111	0.152		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	0.036	0.028	0.026	0.043	0.028	0.023	0.021	0.034		
Fe	1.8	0.88	0.31	0.13	0.54	0.46	0.43	0.34		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001		
K	6	8	8	11	8	7	6	5		
Mg	6	14	14	27	17	14	14	18		
Mn	0.40	2.49	3.86	9.93	7.27	7.89	8.33	15.4		
Mo	<0.001	<0.001	0.002	0.005	0.002	<0.001	0.002	<0.001		
Na	62	99	102	169	103	72	60	64		
Ni	0.041	0.100	0.098	0.212	0.105	0.099	0.102	0.137		
Pb	0.002	0.002	0.002	0.003	0.002	<0.001	0.001	0.002		
SO_4	71	27	107	121	104	130	129	141		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	0.03	0.61	<0.20	<0.20	<0.20	0.20	<0.01	0.12		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.080	0.197	0.170	0.329	0.180	0.180	0.191	0.267		
RESULTS**										
SO_4 Release Rate	24	8.8	35	39	30	39	40	44		
Cumulative SO_4 Release	24	33	67	106	136	175	215	260		
Ca Release Rate	11	19	20	30	18	16	16	20		
Cumulative Ca Release	11	31	50	80	98	114	131	151		
Mg Release Rate	2.0	4.6	4.6	8.6	4.9	4.2	4.3	5.7		
Cumulative Mg Release	2.0	6.6	11	20	25	29	33	39		
Residual ANC (%)	98	94	91	85	81	78	75	71		
Residual Sulfur (%)	100	100	99	99	99	98	98	97		
SO_4/(Ca+Mg) molar ratio	0.7	0.1	0.5	0.4	0.5	0.7	0.7	0.6		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

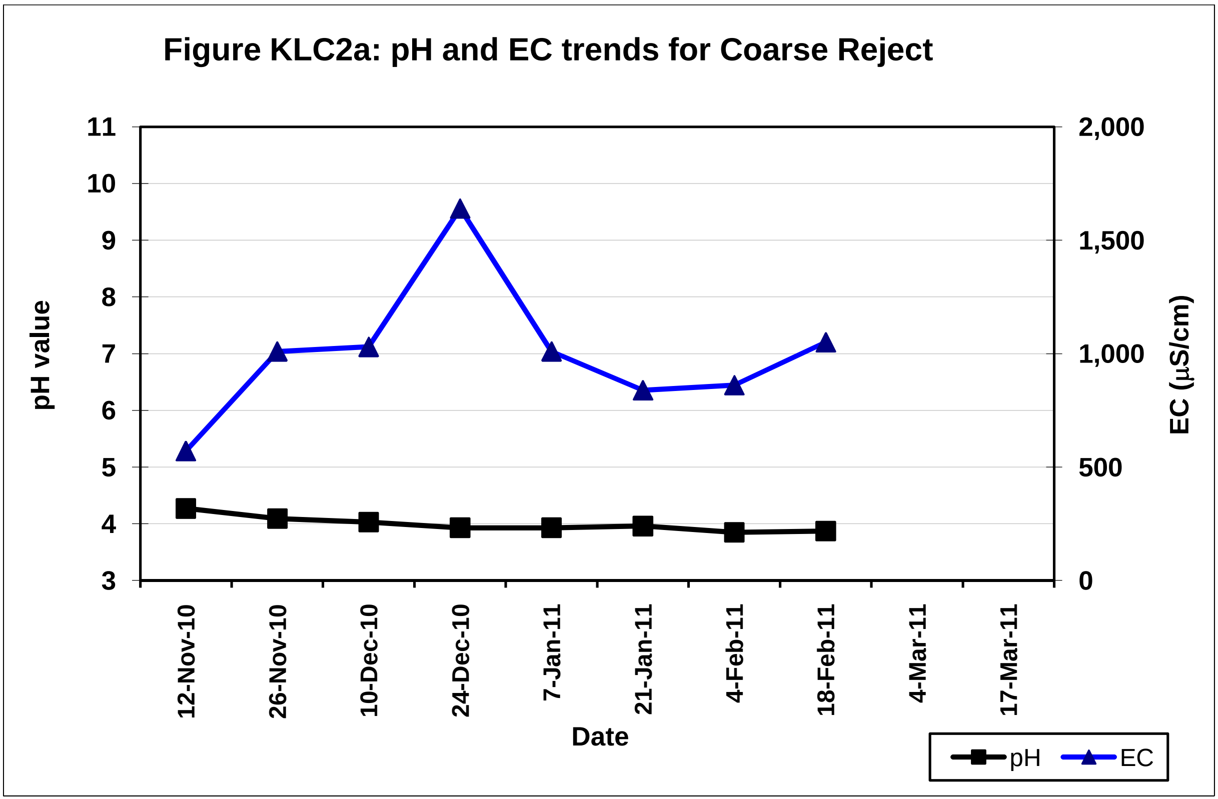


Figure KLC2a: pH and EC trends for Coarse Reject
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2,000
1,500
1,000
500
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

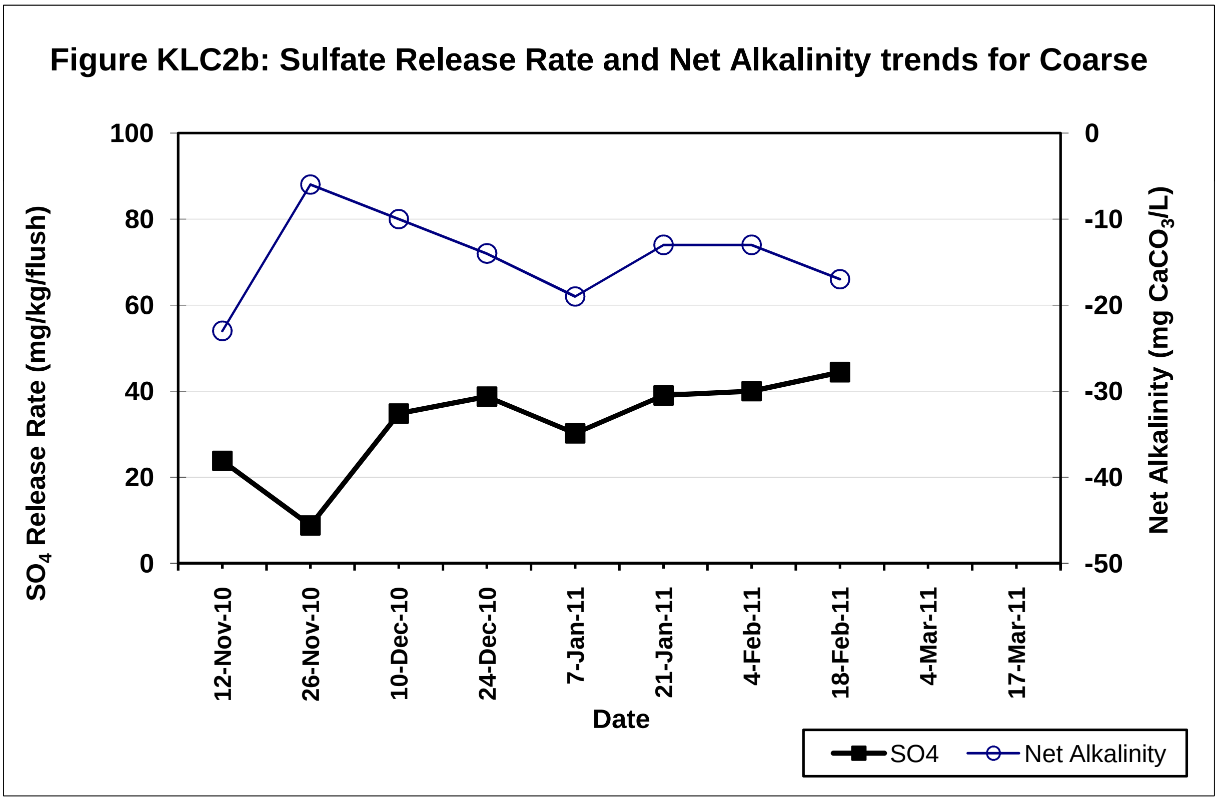


Figure KLC2b: Sulfate Release Rate and Net Alkalinity trends for Coarse
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
100
80
60
40
20
0
0
-10
-20
-30
-40
-50
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

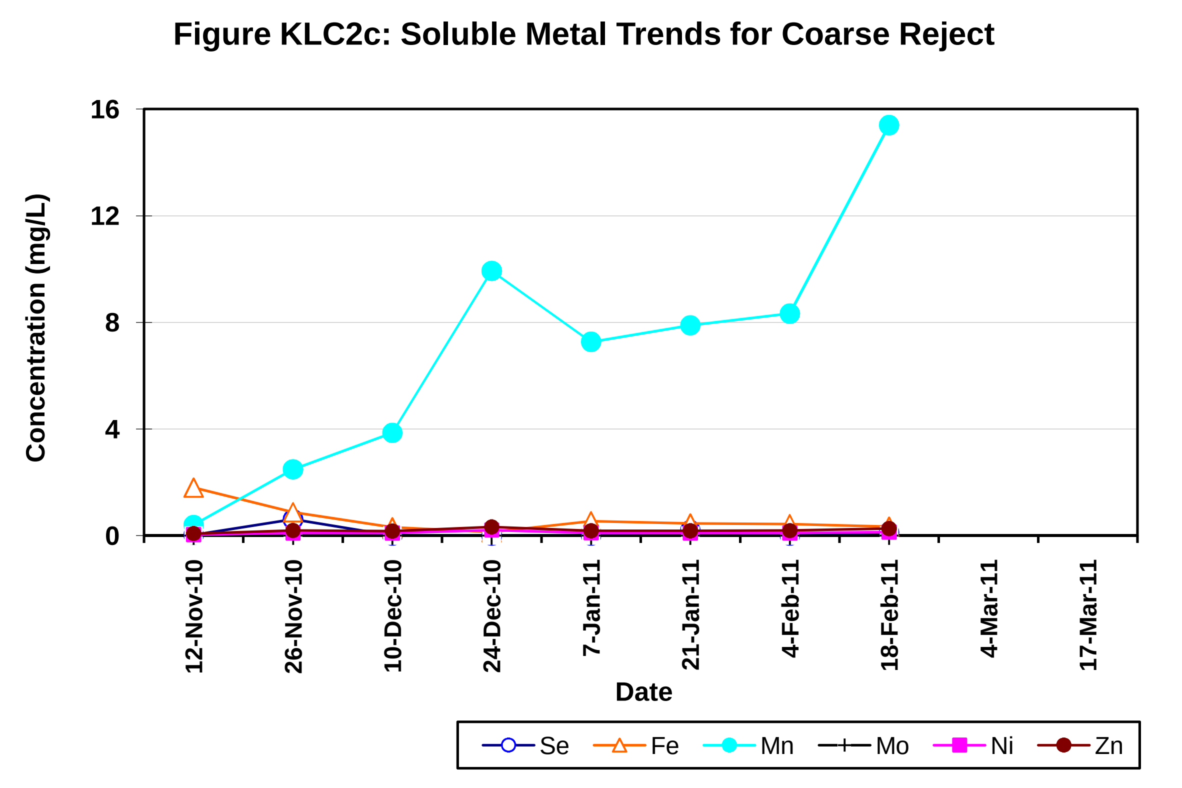


Figure KLC2c: Soluble Metal Trends for Coarse Reject
Concentration (mg/L)
16
12
8
4
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

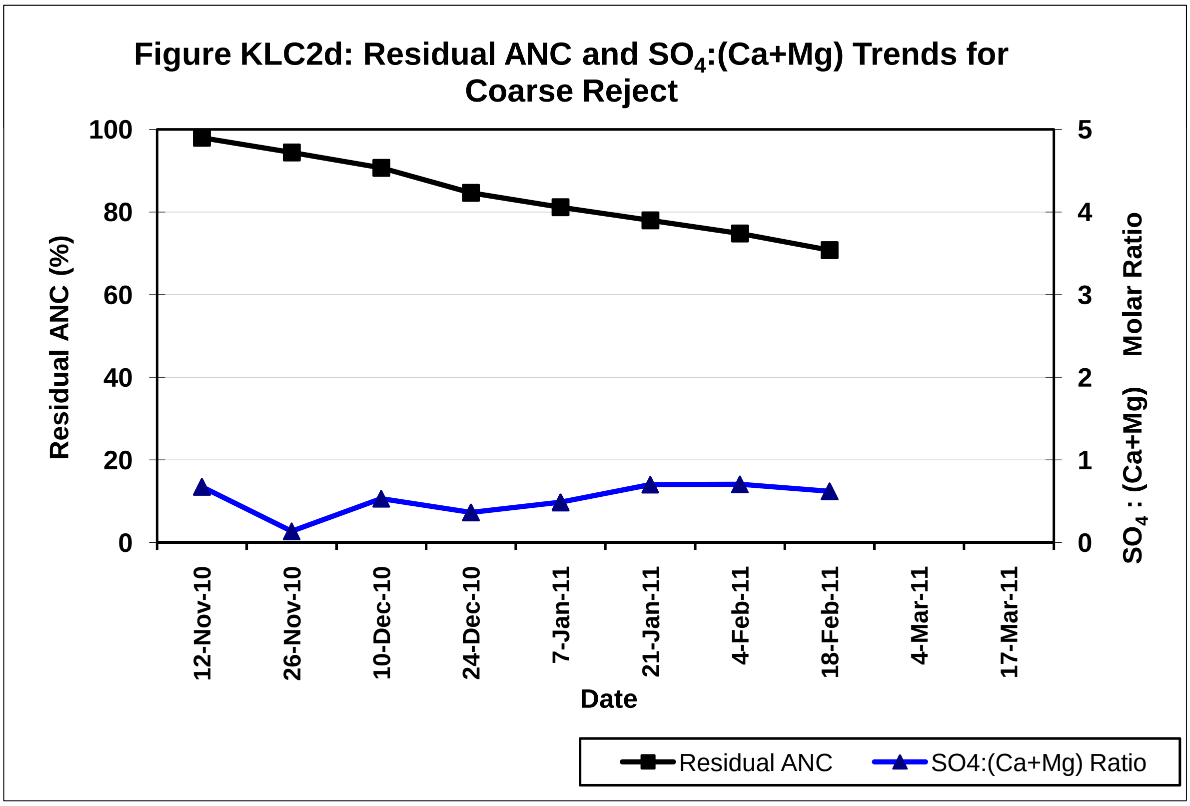


Figure KLC2d: Residual ANC and SO4:(Ca+Mg) Trends for Coarse Reject
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC3

KLC Test Results for Alpha Sample 3 (Coarse Reject 201077 R1290L DU Seam)

Sample Weight (kg)	2.0	**MPA (kg H_2SO_4/t)**	21.1
pH(1:5)	3.30	**ANC (kg H_2SO_4/t)**	0.3
EC(1:5) (μS/cm)	1,430	**NAPP (kg H_2SO_4/t)**	20.8
Total S (%)	0.69	**ANC:MPA ratio**	0.01

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.800	0.780	0.760	0.720	0.700	0.710	0.700	0.720		
Cum. Volume (L)	0.800	1.580	2.340	3.060	3.760	4.470	5.170	5.890		
Pore Volumes	0.6	1.2	1.7	2.3	2.8	3.3	3.8	4.4		
pH	2.54	2.66	2.72	2.69	2.67	2.57	2.56	2.52		
EC (μS/cm)	2,870	4,070	4,100	4,180	3,360	3,100	3,000	3,020		
Acidity (mg/L)*	222	462	480	518	442	477	509	560		
Alkalinity (mg/L)*	<1	<1	<1	<1	<1	<1	<1	<1		
Net Alkalinity (mg/L)*	-222	-462	-480	-518	-442	-477	-509	-560		
Dissolved elements (mg/L)										
Al	3.1	4.5	4.76	4.93	4.21	3.86	4.36	6.81		
As	0.001	0.101	0.024	<0.020	<0.001	0.068	<0.001	0.081		
B	0.18	0.21	0.08	0.1	<0.05	<0.05	<0.05	<0.05		
Ca	112	166	175	160	128	112	91	90		
Cd	0.0067	0.0096	0.0062	0.007	0.0061	0.0057	0.0064	0.0078		
Cl	835	954	1,850	1,780	1,090	977	745	749		
Co	0.678	0.91	0.967	0.951	0.754	0.766	0.664	0.761		
Cr	0.002	<0.02	<0.001	<0.001	<0.001	0.001	<0.001	0.003		
Cu	0.495	0.464	0.437	0.412	0.366	0.356	0.391	0.465		
Fe	28	177	160	173	150	157	124	211		
Hg	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	15	17	11	8	4	2	1	<1		
Mg	54	84	87	85	72	62	53	52		
Mn	2.37	11.10	15.7	18.7	19.2	22.9	16	26		
Mo	<0.001	<0.02	0.011	0.012	0.008	<0.001	0.005	<0.001		
Na	188	199	188	161	117	65	42	26		
Ni	0.261	0.320	0.375	0.387	0.331	0.310	0.310	0.350		
Pb	0.097	0.137	0.107	0.102	0.054	0.026	0.027	0.016		
SO_4	362	254	255	200	262	322	375	437		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001		
Se	0.02	0.42	<0.20	<0.20	<0.20	0.26	<0.01	0.30		
V	<0.01	<0.02	0.02	0.01	0.02	0.02	0.02	0.03		
Zn	1.01	4.16	4.00	4.2	3.36	3.14	2.59	3.23		
RESULTS**										
SO_4 Release Rate	145	99	97	72	92	114	131	157		
Cumulative SO_4 Release	145	244	341	413	504	619	750	907		
Ca Release Rate	45	65	67	58	45	40	32	32		
Cumulative Ca Release	45	110	176	234	278	318	350	382		
Mg Release Rate	22	33	33	31	25	22	19	19		
Cumulative Mg Release	22	54	87	118	143	165	184	203		
Residual ANC (%)	34	0	0	0	0	0	0	0		
Residual Sulfur (%)	99	99	98	98	98	97	96	96		
SO_4/(Ca+Mg) molar ratio	0.8	0.3	0.3	0.3	0.4	0.6	0.9	1.0		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

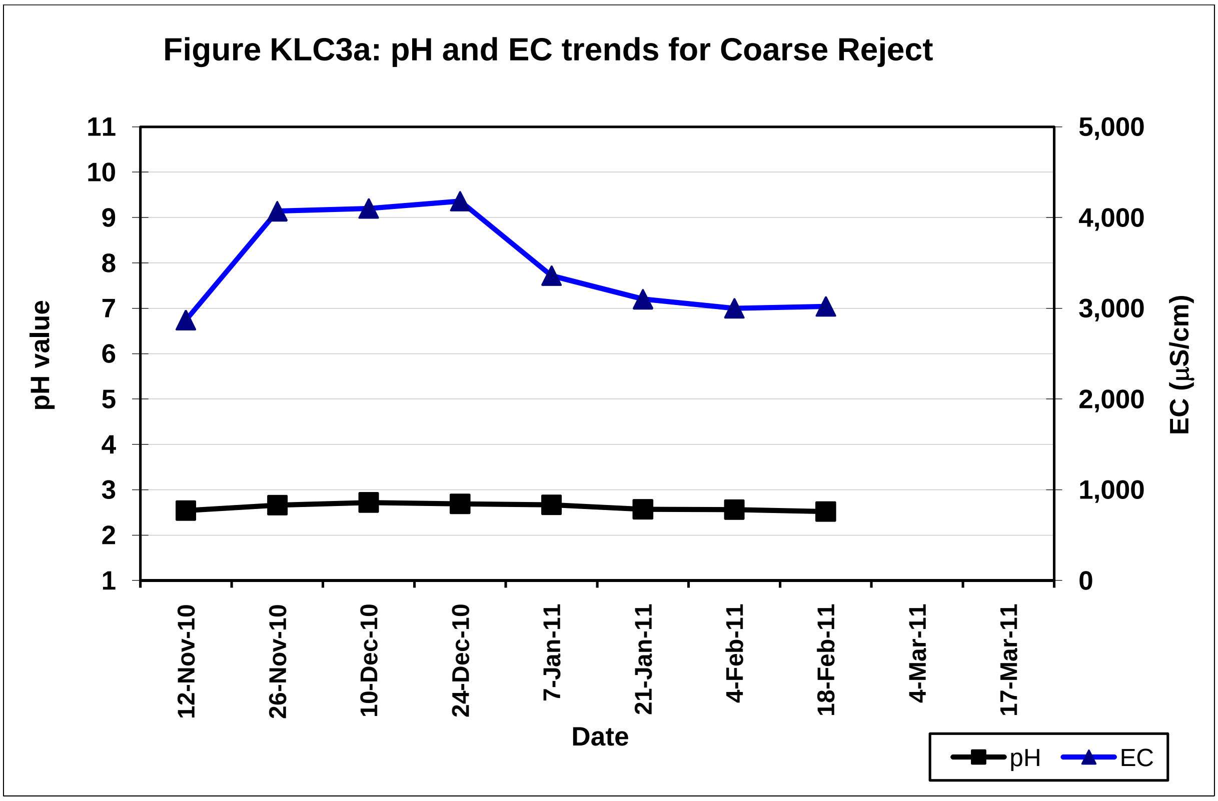


Figure KLC3a: pH and EC trends for Coarse Reject
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2
1
5,000
4,000
3,000
2,000
1,000
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

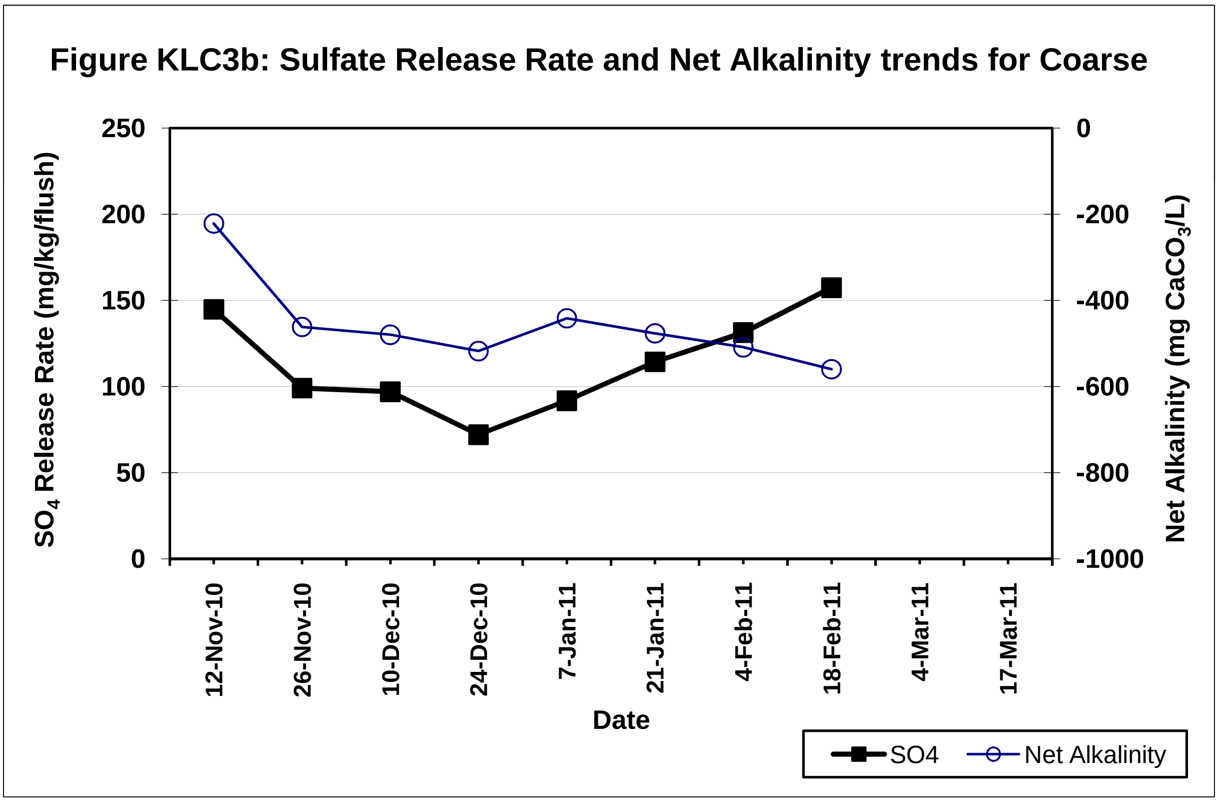


Figure KLC3b: Sulfate Release Rate and Net Alkalinity trends for Coarse
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
250
200
150
100
50
0
0
-200
-400
-600
-800
-1000
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

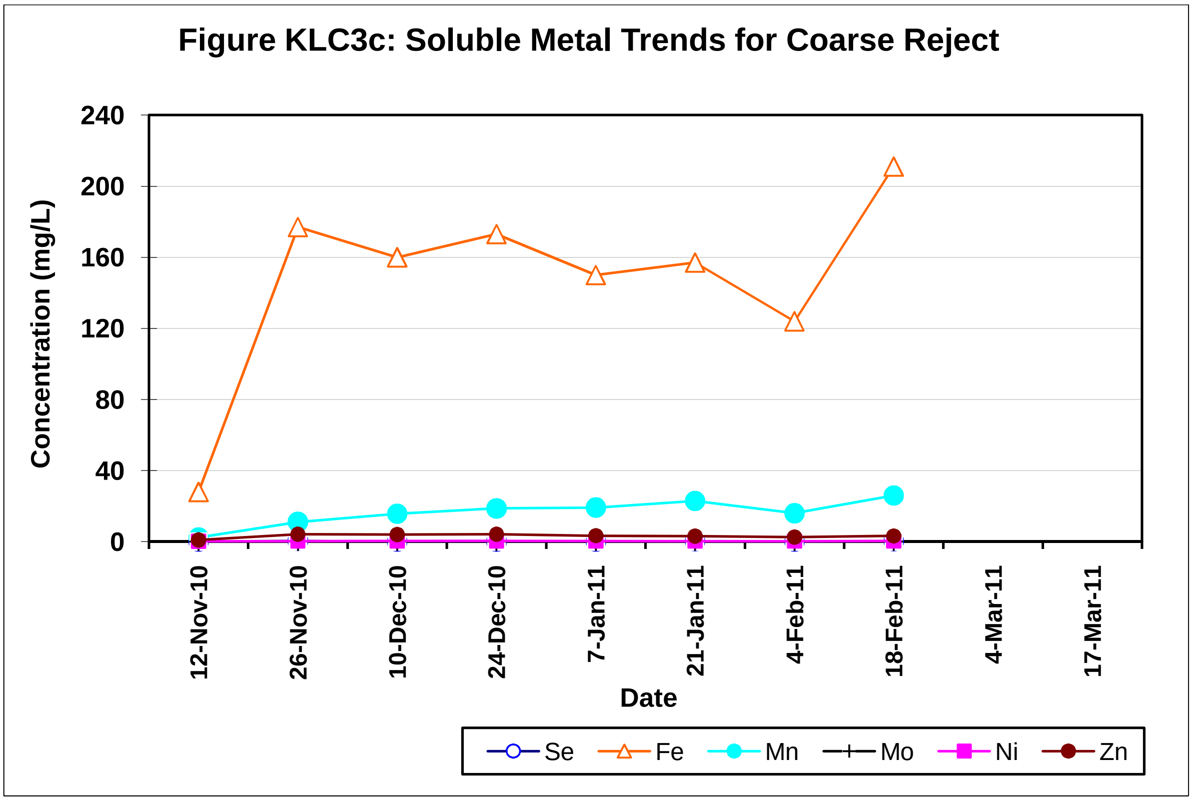


Figure KLC3c: Soluble Metal Trends for Coarse Reject
Concentration (mg/L)
240
200
160
120
80
40
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

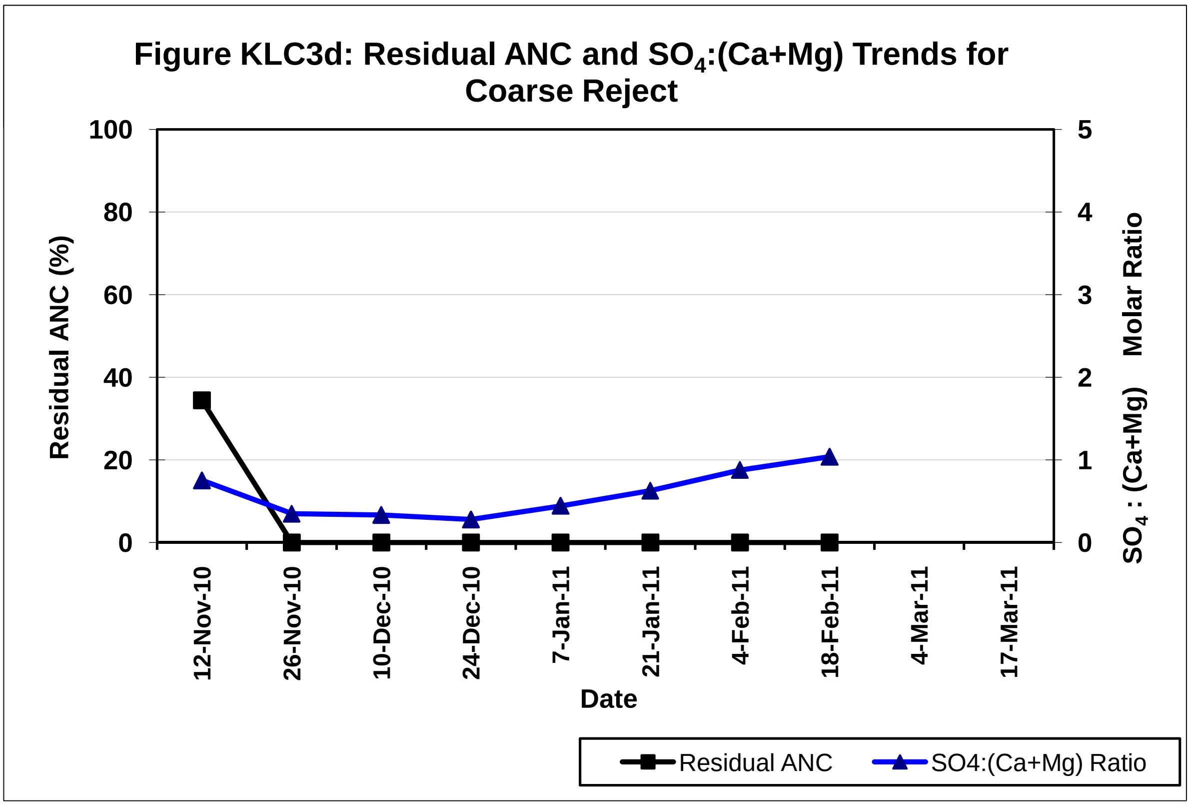


Figure KLC3d: Residual ANC and SO4:(Ca+Mg) Trends for Coarse Reject
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC4

KLC Test Results for Alpha Sample 4 (Tailings 201116 R1290L DL Seam)

Sample Weight (kg)	1.2	**MPA (kg H_2SO_4/t)**	13.5
pH(1:5)	7.00	**ANC (kg H_2SO_4/t)**	3.8
EC(1:5) (μS/cm)	231	**NAPP (kg H_2SO_4/t)**	9.7
Total S (%)	0.44	**ANC:MPA ratio**	0.3

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.450	0.600	0.600	0.650	0.600	0.620	0.600	0.580		
Cum. Volume (L)	0.450	1.050	1.650	2.300	2.900	3.520	4.120	4.700		
Pore Volumes	0.4	0.9	1.4	2.0	2.5	3.1	3.6	4.1		
pH	7.86	8.21	6.56	6.36	6.13	6.77	5.41	4.96		
EC (μS/cm)	1,680	500	173	104	215	115	1,350	858		
Acidity (mg/L)*	5	1	<1	<1	<1	5	2	3		
Alkalinity (mg/L)*	86	<1	2	<1	<1	2	1	1		
Net Alkalinity (mg/L)*	81	-1	2	0	0	-3	-1	-2		
Dissolved elements (mg/L)										
Al	0.07	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01		
As	<0.001	<0.001	<0.001	0.002	0.001	<0.001	<0.001	<0.001		
B	0.84	0.66	0.15	0.08	0.12	0.06	1	0.77		
Ca	69	14	11	5	20	6	109	50		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0001		
Cl	160	20	4	2	2	1	12	9		
Co	0.003	<0.001	<0.001	<0.001	0.002	0.002	0.013	0.007		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001		
Fe	<0.05	<0.05	<0.05	<0.05	<0.05	0.14	<0.05	0.08		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	15	5	2	1	2	1	13	8		
Mg	14	2	2	<1	2	1	18	8		
Mn	0.360	0.080	0.111	0.072	0.213	0.166	2.41	1.61		
Mo	0.013	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Na	294	78	17	11	16	13	148	101		
Ni	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	0.003		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	540	183	62	37	84	45	629	327		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	0.15	0.02	<0.01	<0.20	<0.01	<0.01	<0.01	<0.01		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.019	0.009	0.010	0.006	0.017	0.014	0.140	0.088		
RESULTS**										
SO_4 Release Rate	203	92	31	20	42	23	315	158		
Cumulative SO_4 Release	203	294	325	345	387	410	725	883		
Ca Release Rate	26	7.0	5.5	2.7	10	3.1	54.5	24.2		
Cumulative Ca Release	26	33	38	41	51	54	109	133		
Mg Release Rate	5.3	1.0	1.0	0.3	1.0	0.5	9.0	3.9		
Cumulative Mg Release	5.3	6.3	7.3	7.5	8.5	9.0	18.0	21.9		
Residual ANC (%)	98	97	97	97	96	96	91	89		
Residual Sulfur (%)	98	98	98	97	97	97	95	93		
SO_4/(Ca+Mg) molar ratio	2.4	4.4	1.8	2.7	1.5	2.5	1.9	2.2		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

Figure KLC4a: pH and EC trends for Tailings

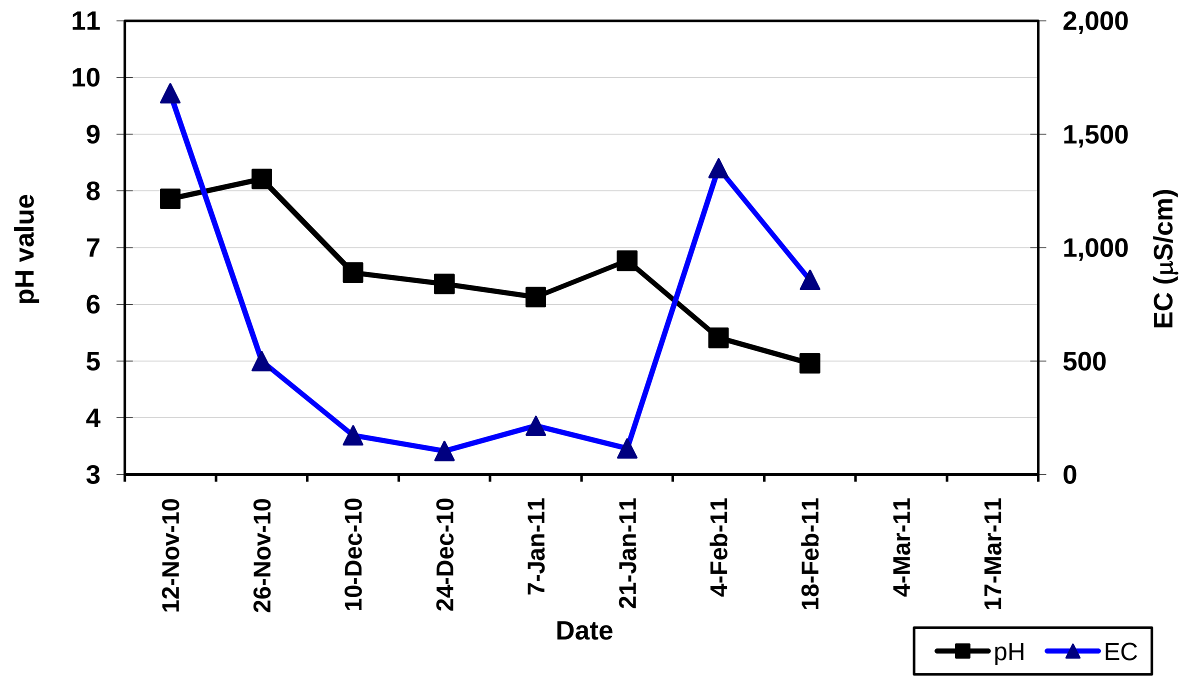
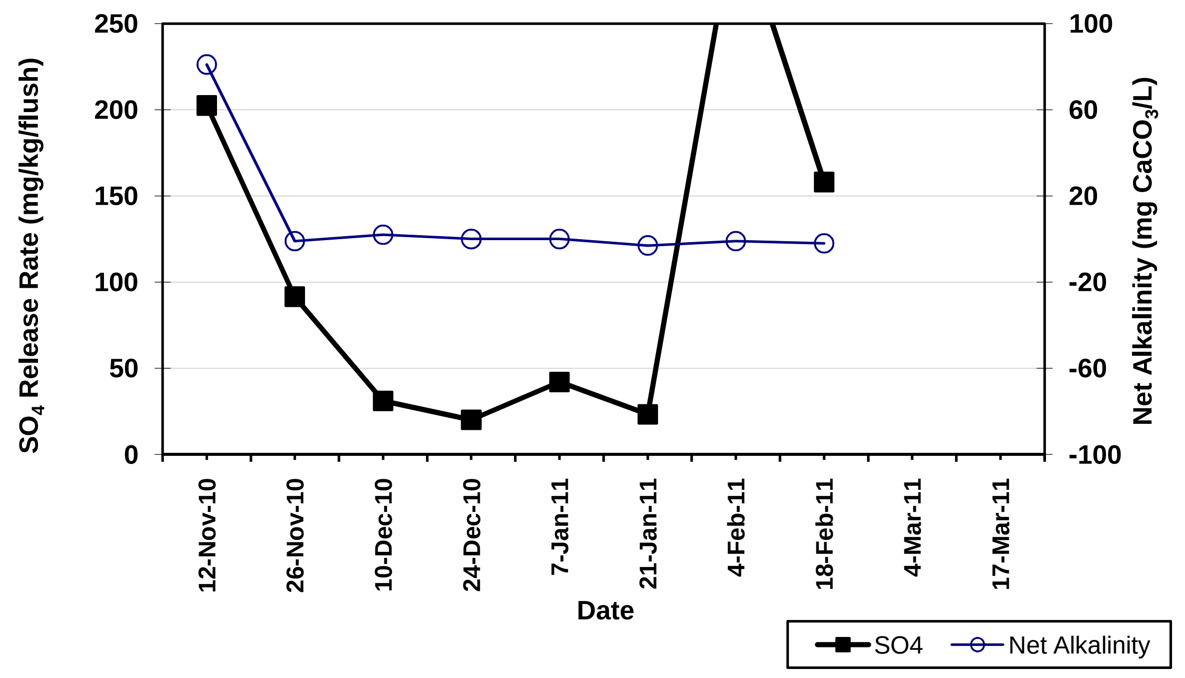


Figure KLC4b: Sulfate Release Rate and Net Alkalinity trends for



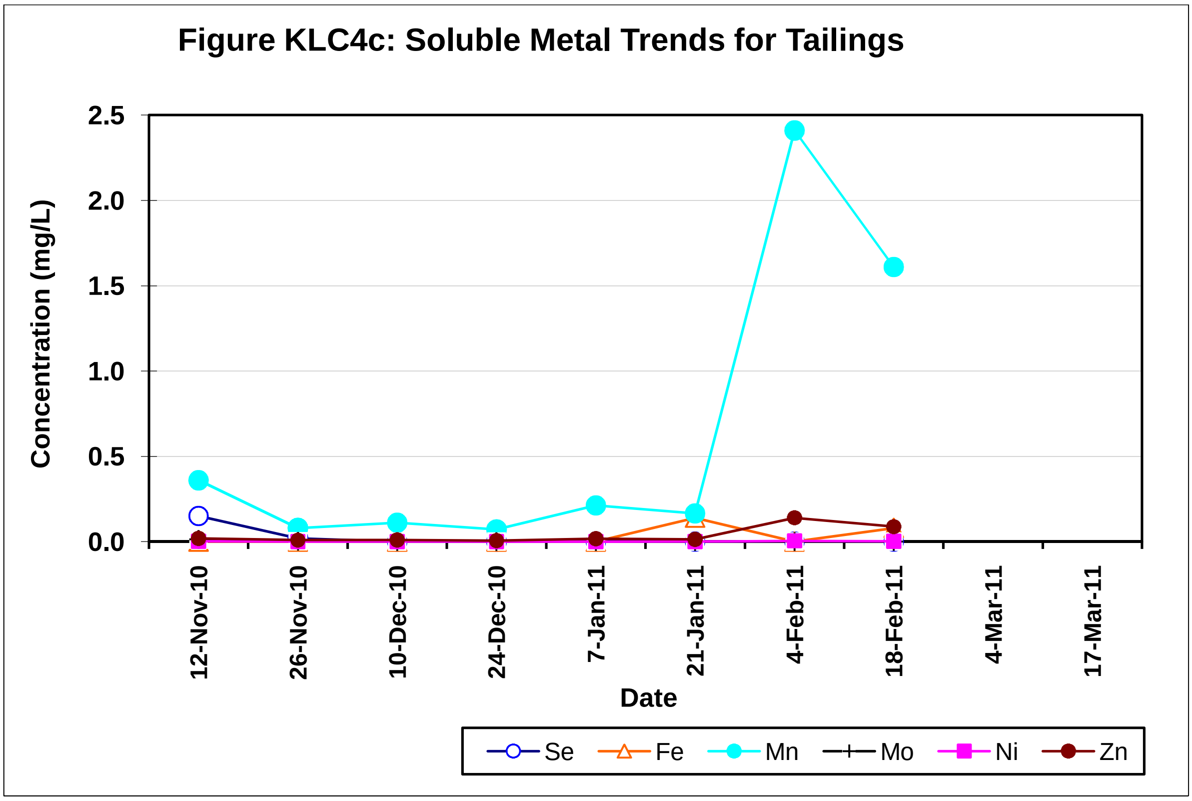


Figure KLC4c: Soluble Metal Trends for Tailings
Concentration (mg/L)
2.5
2.0
1.5
1.0
0.5
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

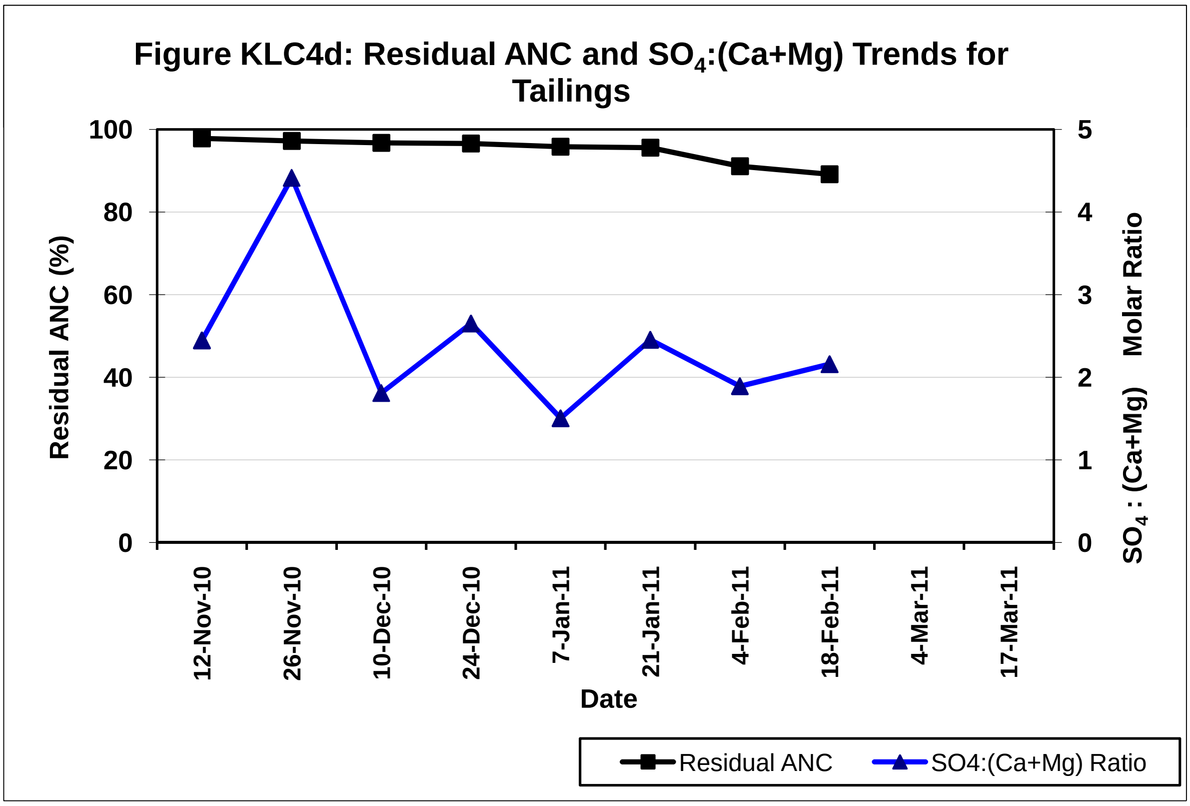


Figure KLC4d: Residual ANC and SO_4:(Ca+Mg) Trends for Tailings
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO_4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC5

KLC Test Results for Alpha Sample 5 (Tailings 201074 R1290L C Seam)

Sample Weight (kg)	1.3	**MPA (kg H_2SO_4/t)**	13.5
pH(1:5)	6.30	**ANC (kg H_2SO_4/t)**	2.8
EC(1:5) (µS/cm)	585	**NAPP (kg H_2SO_4/t)**	10.7
Total S (%)	0.44	**ANC:MPA ratio**	0.2

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.400	0.620	0.650	0.800	0.580	0.560	0.600	0.580		
Cum. Volume (L)	0.400	1.020	1.670	2.470	3.050	3.610	4.210	4.790		
Pore Volumes	0.3	0.9	1.5	2.1	2.7	3.1	3.7	4.2		
pH	7.46	7.46	5.71	5.21	5.11	4.66	4.89	4.27		
EC (µS/cm)	2,350	1,280	416	1400	856	728	167	666		
Acidity (mg/L)*	6	7	<1	10	<1	11	5	21		
Alkalinity (mg/L)*	23	3	<1	<1	<1	1	1	<1		
Net Alkalinity (mg/L)*	17	-4	0	-10	0	-10	-4	-21		
Dissolved elements (mg/L)										
Al	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02	0.23		
As	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001		
B	0.65	0.80	0.17	0.99	0.82	0.55	0.10	0.33		
Ca	125	76	28	91	54	55	10	53		
Cd	0.0007	0.0009	0.0004	0.0029	0.0026	0.0035	0.0009	0.0065		
Cl	87	23	4	26	6	3	<1	2		
Co	0.237	0.218	0.094	0.439	0.315	0.366	0.080	0.428		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	<0.001	<0.001	<0.001	0.004	0.006	0.012	0.010	0.123		
Fe	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.29		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	17	12	4	17	13	12	2	6		
Mg	67	31	10	45	27	26	5	25		
Mn	1.00	0.78	0.332	1.85	1.55	2.06	0.474	3.31		
Mo	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Na	294	166	33	184	93	52	6	19		
Ni	0.052	0.055	0.028	0.148	0.111	0.133	0.03	0.17		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002		
SO_4	367	626	178	793	426	372	64	277		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	0.24	0.11	0.02	0.1	0.04	0.02	<0.01	0.02		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.921	1.16	0.632	3.58	3.00	3.95	0.959	6.00		
RESULTS**										
SO_4 Release Rate	113	299	89	488	190	160	30	124		
Cumulative SO_4 Release	113	411	500	988	1,179	1,339	1,368	1,492		
Ca Release Rate	38	36	14	56	24	24	5	24		
Cumulative Ca Release	38	75	89	145	169	192	197	221		
Mg Release Rate	21	15	5.0	28	12	11	2	11		
Cumulative Mg Release	21	35	40	68	80	91	94	105		
Residual ANC (%)	94	88	86	78	74	70	69	66		
Residual Sulfur (%)	99	97	96	93	91	90	90	89		
SO_4/(Ca+Mg) molar ratio	0.7	2.1	1.7	2.0	1.8	1.6	1.5	1.2		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

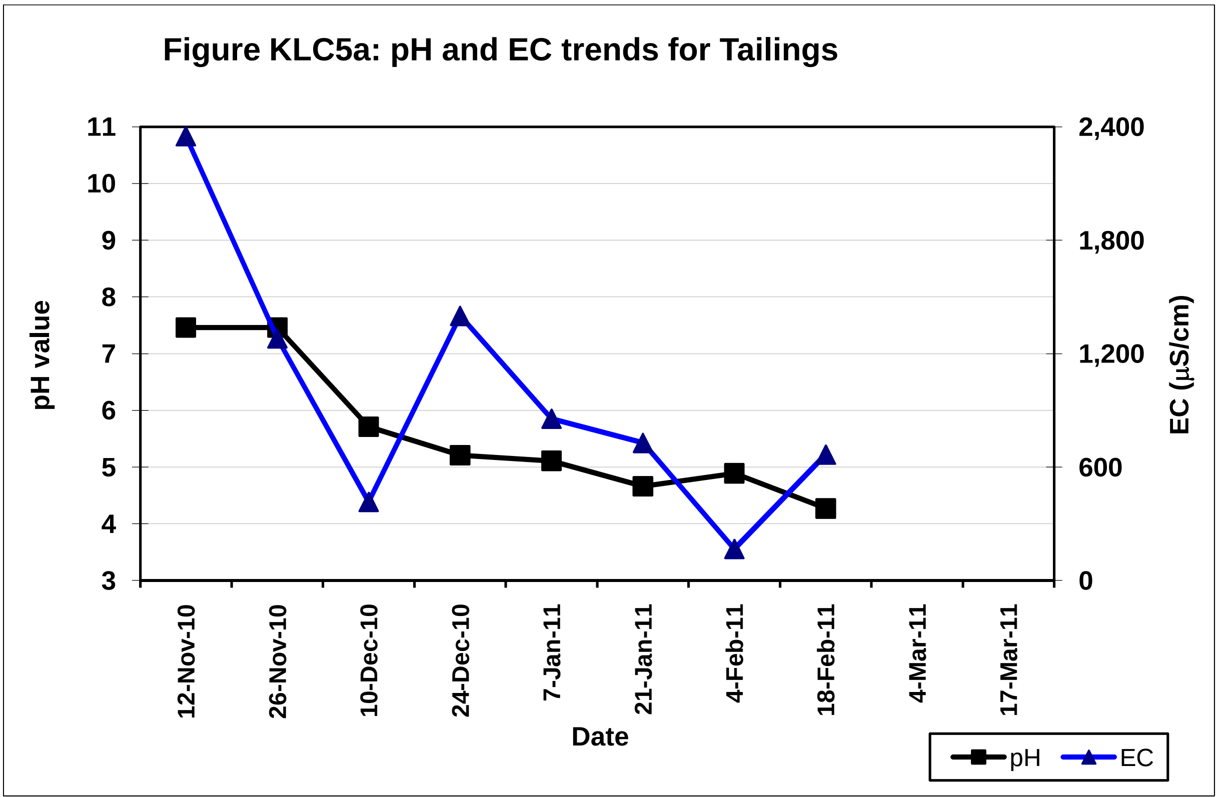


Figure KLC5a: pH and EC trends for Tailings
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

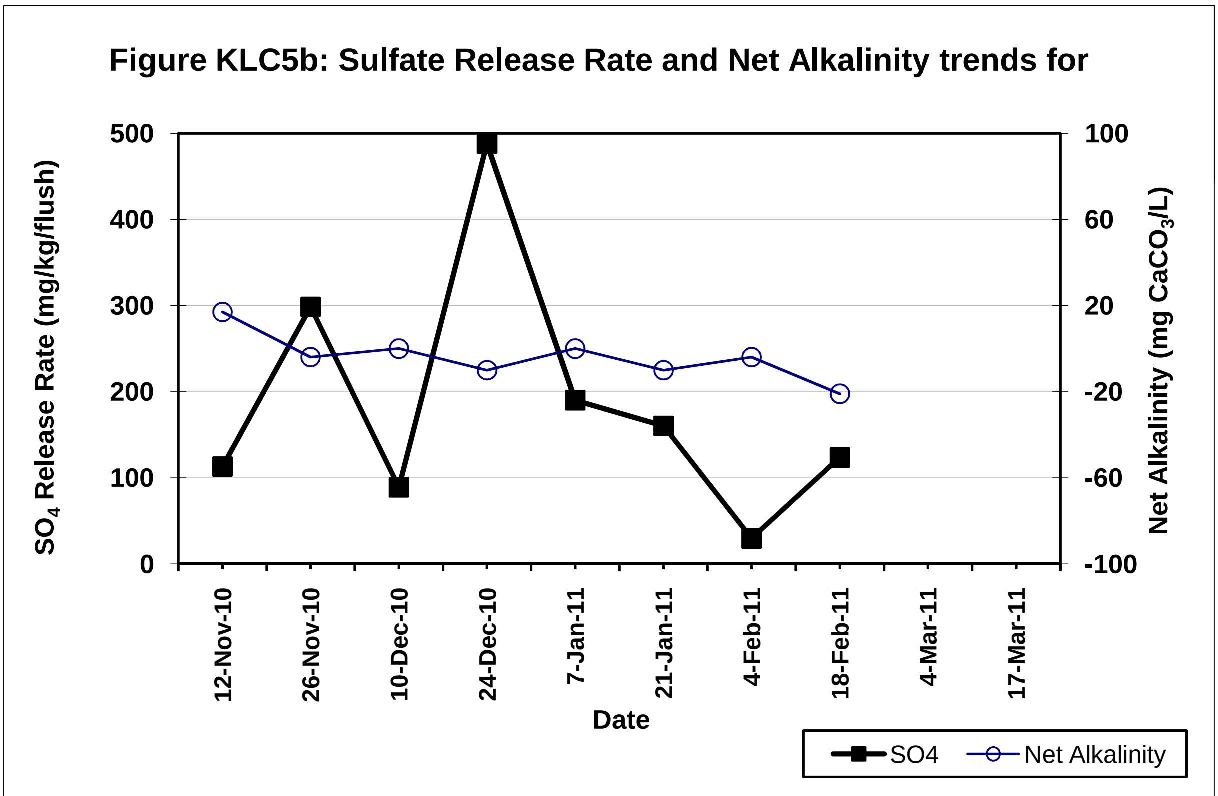


Figure KLC5b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
500
400
300
200
100
0
100
60
20
-20
-60
-100
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

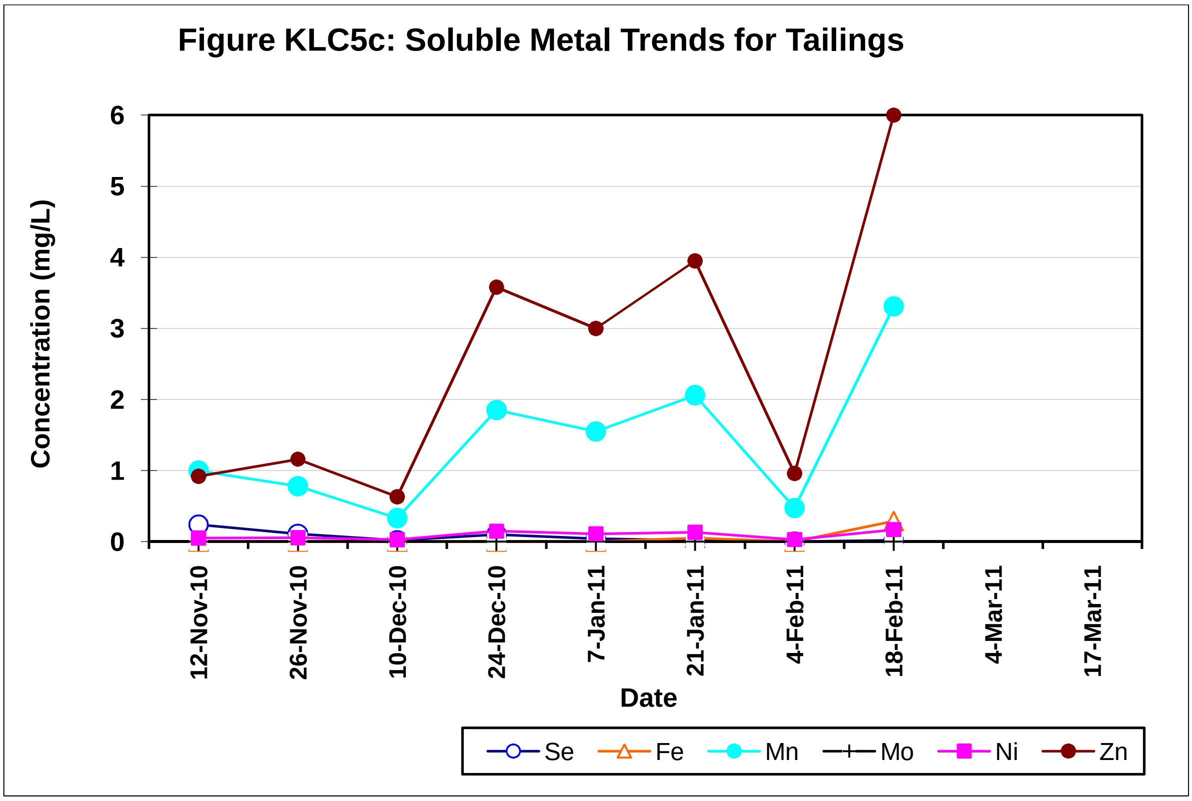


Figure KLC5c: Soluble Metal Trends for Tailings
Concentration (mg/L)
6
5
4
3
2
1
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

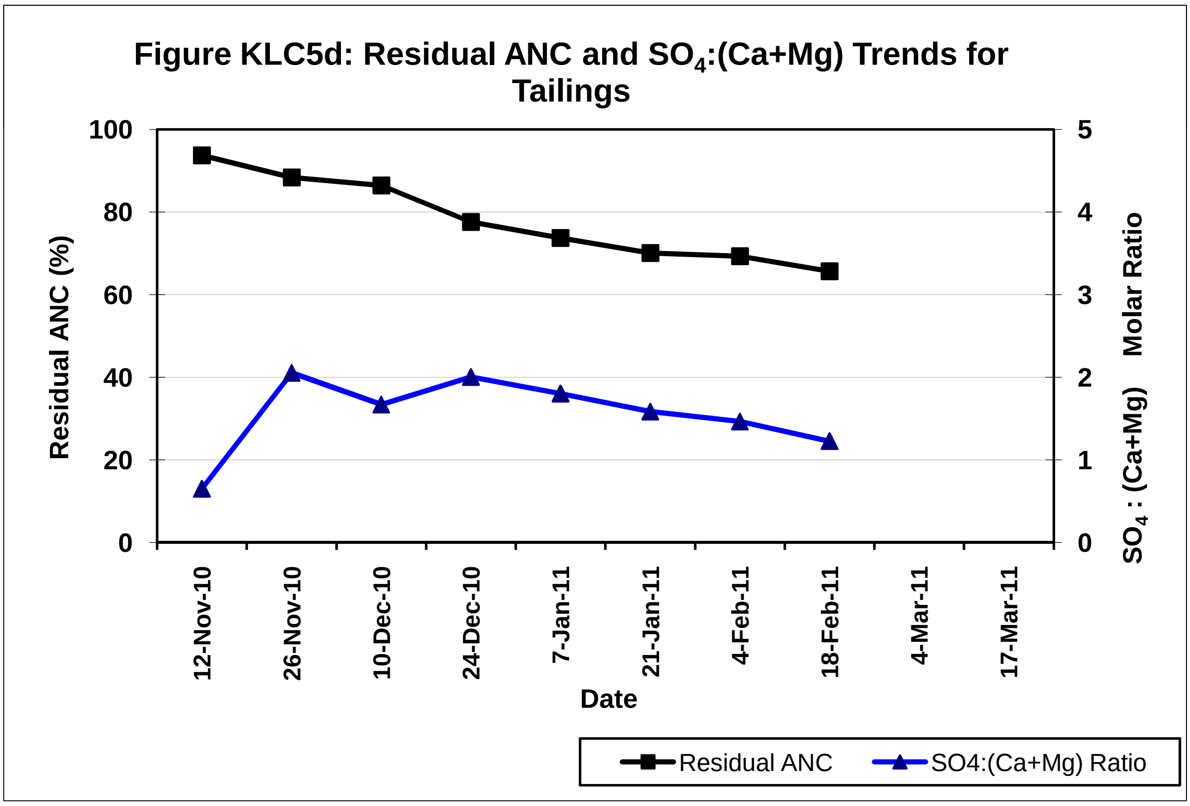


Figure KLC5d: Residual ANC and SO4:(Ca+Mg) Trends for Tailings
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC6

KLC Test Results for Alpha Sample 6 (High Sulfur Overburden 1435D ARD11 Carbonaceous Mudstone)

Sample Weight (kg)	2.0	**MPA (kg H_2SO_4/t)**	10.4
pH(1:5)	7.20	**ANC (kg H_2SO_4/t)**	1.3
EC(1:5) (µS/cm)	256	**NAPP (kg H_2SO_4/t)**	9.1
Total S (%)	0.34	**ANC:MPA ratio**	0.1

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.860	0.840	0.830	0.870	0.900	0.800	0.870	0.850		
Cum. Volume (L)	0.860	1.700	2.530	3.400	4.300	5.100	5.970	6.820		
Pore Volumes	0.6	1.3	1.9	2.5	3.2	3.8	4.4	5.1		
pH	8.18	4.47	4.71	4.93	4.53	4.34	4.38	4.42		
EC (µS/cm)	61	100	87	132	108	97	119	120		
Acidity (mg/L)*	2	10	<1	<1	5	19	12	12		
Alkalinity (mg/L)*	1	<1	<1	<1	<1	<1	<1	<1		
Net Alkalinity (mg/L)*	-1	-10	0	0	-5	-19	-12	-12		
Dissolved elements (mg/L)										
Al	0.50	0.06	0.01	0.01	0.01	0.02	0.04	0.04		
As	0.003	0.004	0.003	<0.001	<0.001	0.002	0.005	0.002		
B	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Ca	2	3	4	4	4	3	5	6		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	4	2	1	2	1	<1	<1	<1		
Co	0.007	0.011	0.003	0.003	0.003	0.005	0.004	0.004		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002		
Fe	0.15	2.62	0.68	0.82	1.80	4.23	4.92	3.38		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	<1	<1	<1	<1	<1	<1	<1	<1		
Mg	0.5	0.5	<1	<1	<1	<1	<1	<1		
Mn	0.02	0.01	0.008	0.013	0.011	0.009	0.012	0.02		
Mo	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Na	8	12	9	16	12	9	9	11		
Ni	0.003	0.003	0.001	<0.001	0.001	0.002	0.002	0.002		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	18	35	29	47	36	38	44	41		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	0.01	<0.01	0.02	0.02	<0.01	<0.01	0.01		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.032	0.01	0.007	0.006	<0.005	0.008	0.007	0.010		
RESULTS**										
SO_4 Release Rate	7.7	15	12	20	16	15	19	17		
Cumulative SO_4 Release	7.7	22	34	55	71	86	105	123		
Ca Release Rate	0.9	1.3	1.7	1.7	1.8	1.2	2.2	2.6		
Cumulative Ca Release	0.9	2.1	3.8	5.5	7.3	8.5	10.7	13.2		
Mg Release Rate	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
Cumulative Mg Release	0.2	0.4	0.6	0.9	1.1	1.3	1.5	1.7		
Residual ANC (%)	100	99	99	99	98	98	98	97		
Residual Sulfur (%)	100	100	100	99	99	99	99	99		
SO_4/(Ca+Mg) molar ratio	2.7	3.8	2.5	4.1	3.1	4.1	3.2	2.5		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

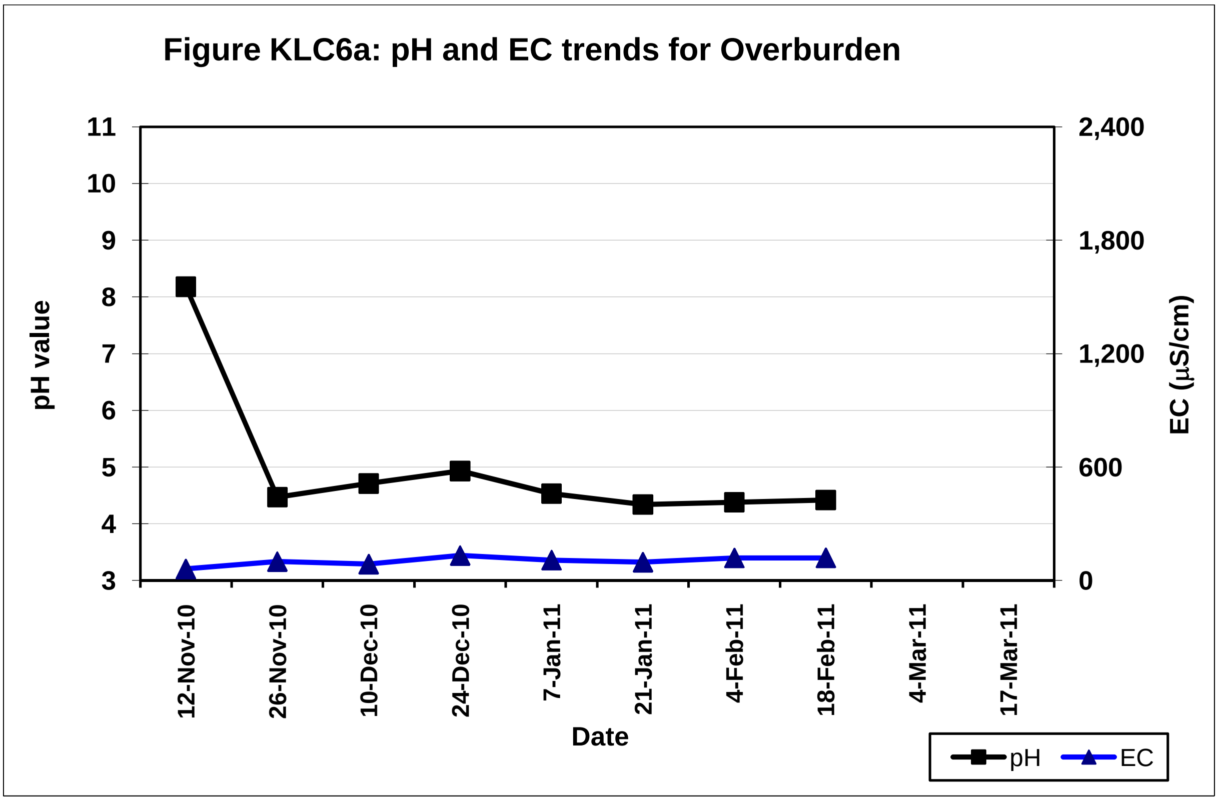


Figure KLC6a: pH and EC trends for Overburden
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

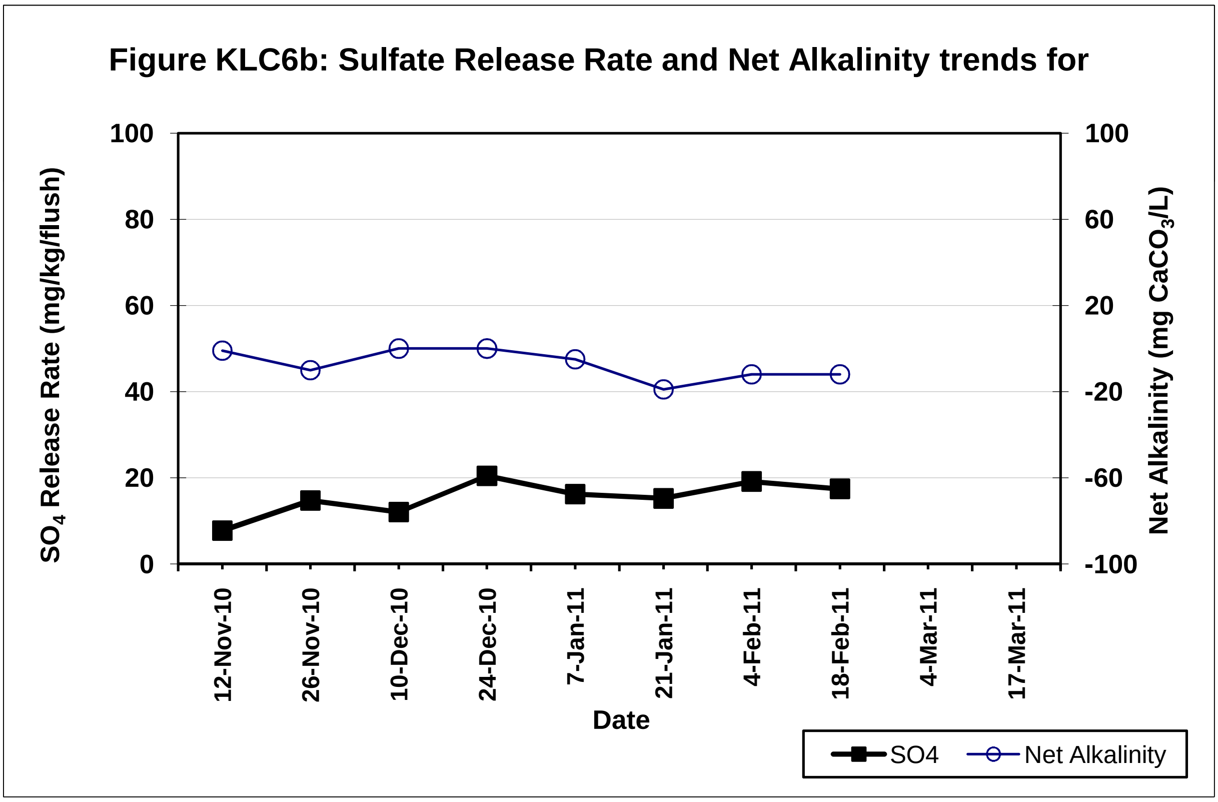


Figure KLC6b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
100
80
60
40
20
0
100
60
20
-20
-60
-100
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

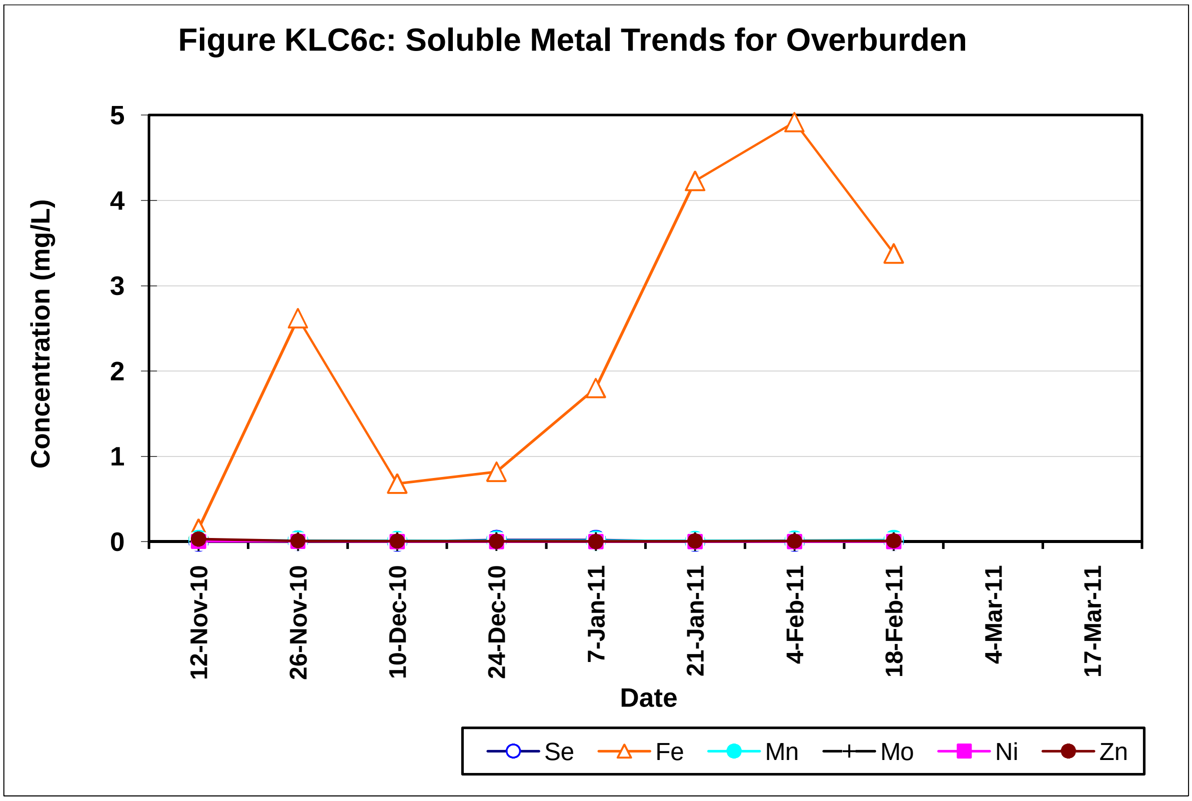


Figure KLC6c: Soluble Metal Trends for Overburden
Concentration (mg/L)
0
1
2
3
4
5
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

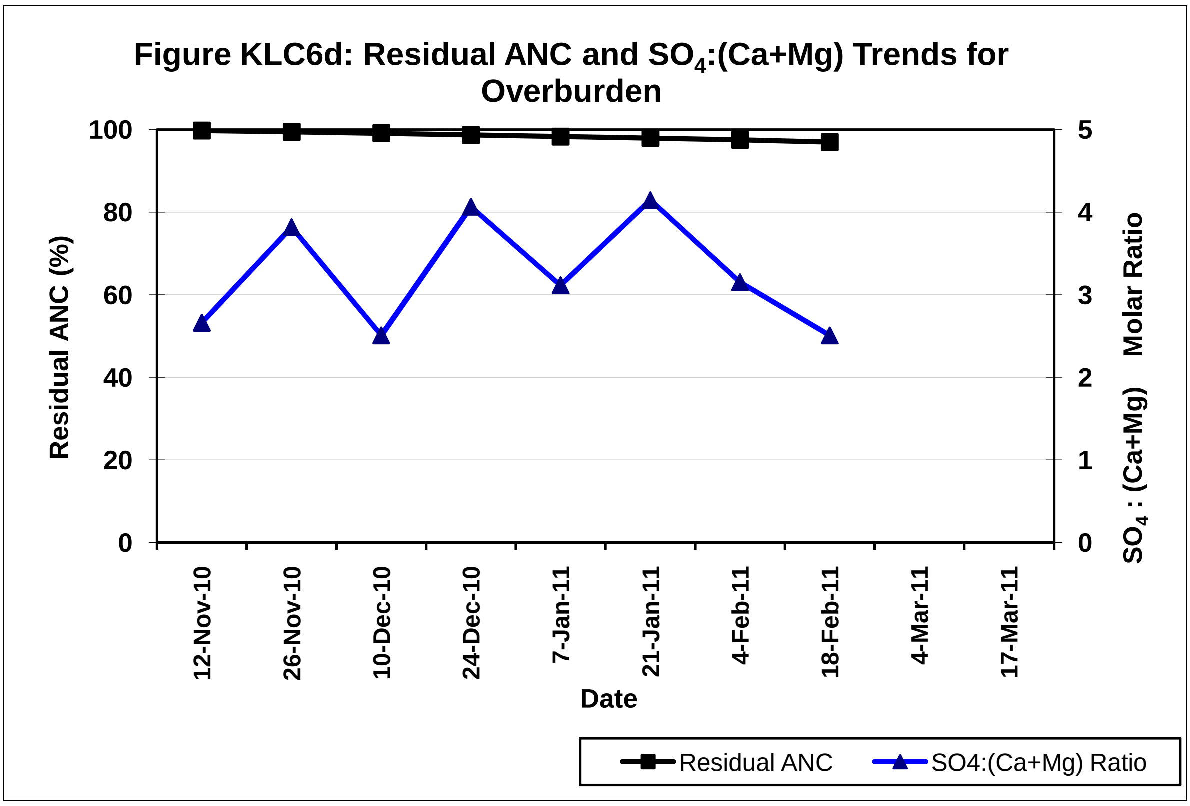


Figure KLC6d: Residual ANC and SO_4:(Ca+Mg) Trends for Overburden
Residual ANC (%)
0
20
40
60
80
100
SO_4 : (Ca+Mg) Molar Ratio
0
1
2
3
4
5
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC7

KLC Test Results for Alpha Sample 7 (Medium Sulfur Overburden 1406D ARD07 Siltstone)

Sample Weight (kg)	2.0	**MPA (kg H_2SO_4/t)**	1.84
pH(1:5)	8.00	**ANC (kg H_2SO_4/t)**	1.4
EC(1:5) (µS/cm)	242	**NAPP (kg H_2SO_4/t)**	0.4
Total S (%)	0.06	**ANC:MPA ratio**	0.8

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.920	0.900	0.920	0.930	0.900	0.880	0.900	0.880		
Cum. Volume (L)	0.920	1.820	2.740	3.670	4.570	5.450	6.350	7.230		
Pore Volumes	0.7	1.3	2.0	2.7	3.4	4.0	4.7	5.4		
pH	8.02	7.78	6.00	6.00	5.82	5.67	5.35	5.42		
EC (µS/cm)	38	174	25	21	21	15	15	5		
Acidity (mg/L)*	2	2	<1	<1	<1	2	1	2		
Alkalinity (mg/L)*	4	6	<1	<1	2	1	1	9		
Net Alkalinity (mg/L)*	2	4	0	0	2	-1	0	7		
Dissolved elements (mg/L)										
Al	0.20	0.20	0.12	0.09	0.02	0.16	0.10	0.04		
As	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
B	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Ca	1	3	2	1	1	1	1	1		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	4	1	<1	<1	<1	<1	<1	<1		
Co	0.001	0.001	0.002	0.002	0.002	0.001	0.002	0.001		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Fe	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	<1	<1	<1	<1	<1	<1	<1	<1		
Mg	0.5	0.5	<1	<1	<1	<1	<1	<1		
Mn	0.010	0.006	0.009	0.009	0.009	0.008	0.011	0.014		
Mo	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Na	6	12	2	2	2	2	2	2		
Ni	<0.001	<0.001	0.002	0.001	0.002	<0.001	0.002	0.001		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	9	8	9	7	8	8	8	6		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.018	0.022	0.028	0.018	0.021	0.015	0.023	0.016		
RESULTS**										
SO_4 Release Rate	4.1	3.6	4.1	3.3	3.6	3.5	3.6	2.6		
Cumulative SO_4 Release	4.1	7.7	12	15	19	22	26	28		
Ca Release Rate	0.5	1.4	0.9	0.5	0.5	0.4	0.5	0.4		
Cumulative Ca Release	0.5	1.8	2.7	3.2	3.6	4.1	4.5	5.0		
Mg Release Rate	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
Cumulative Mg Release	0.2	0.5	0.7	0.9	1.1	1.4	1.6	1.8		
Residual ANC (%)	100	100	99	99	99	99	99	99		
Residual Sulfur (%)	100	100	99	99	99	99	99	98		
SO_4/(Ca+Mg) molar ratio	2.1	0.9	1.3	1.6	1.8	1.8	1.8	1.4		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

Figure KLC7a: pH and EC trends for Overburden

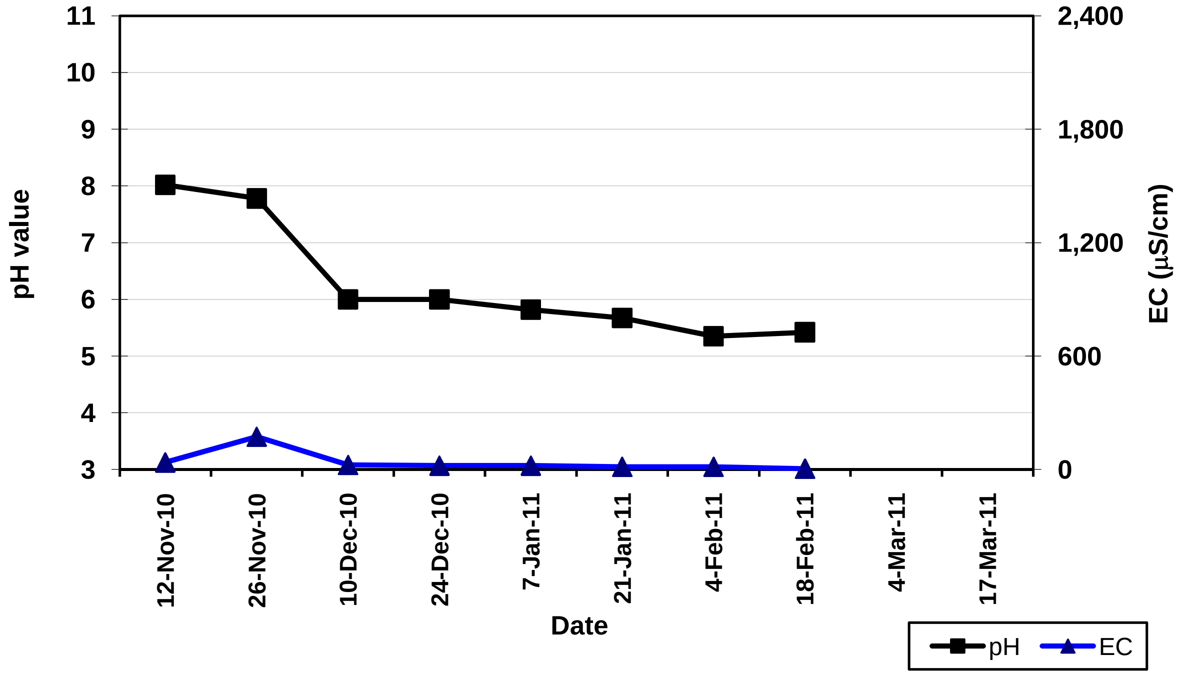
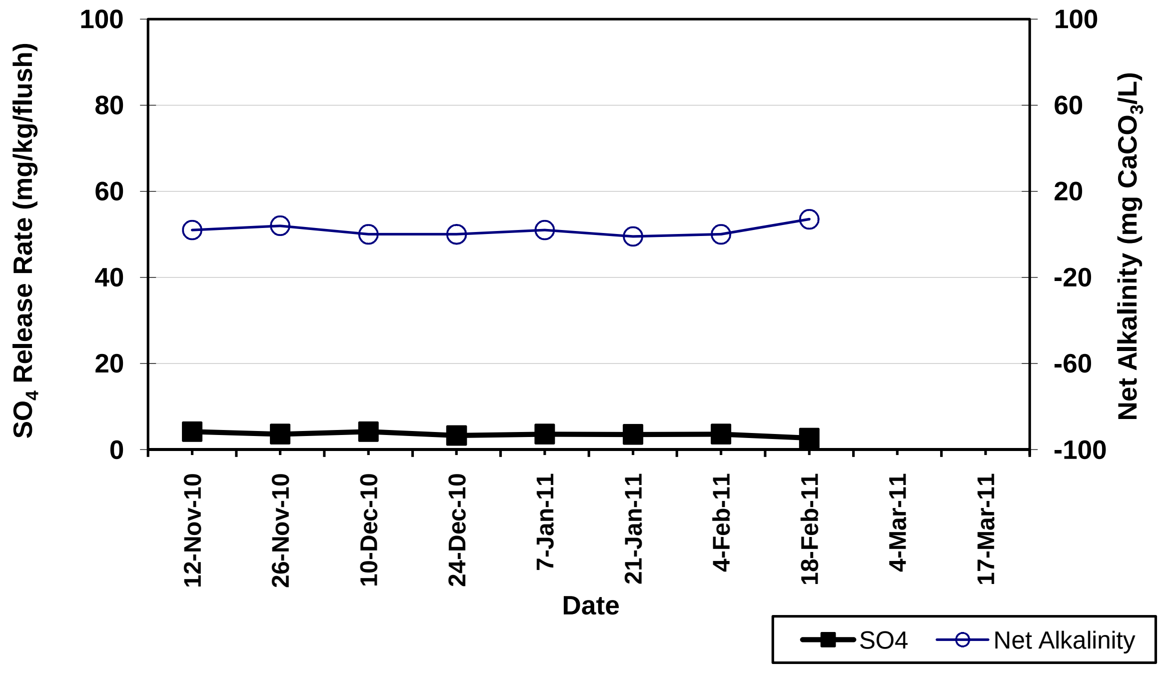


Figure KLC7b: Sulfate Release Rate and Net Alkalinity trends for



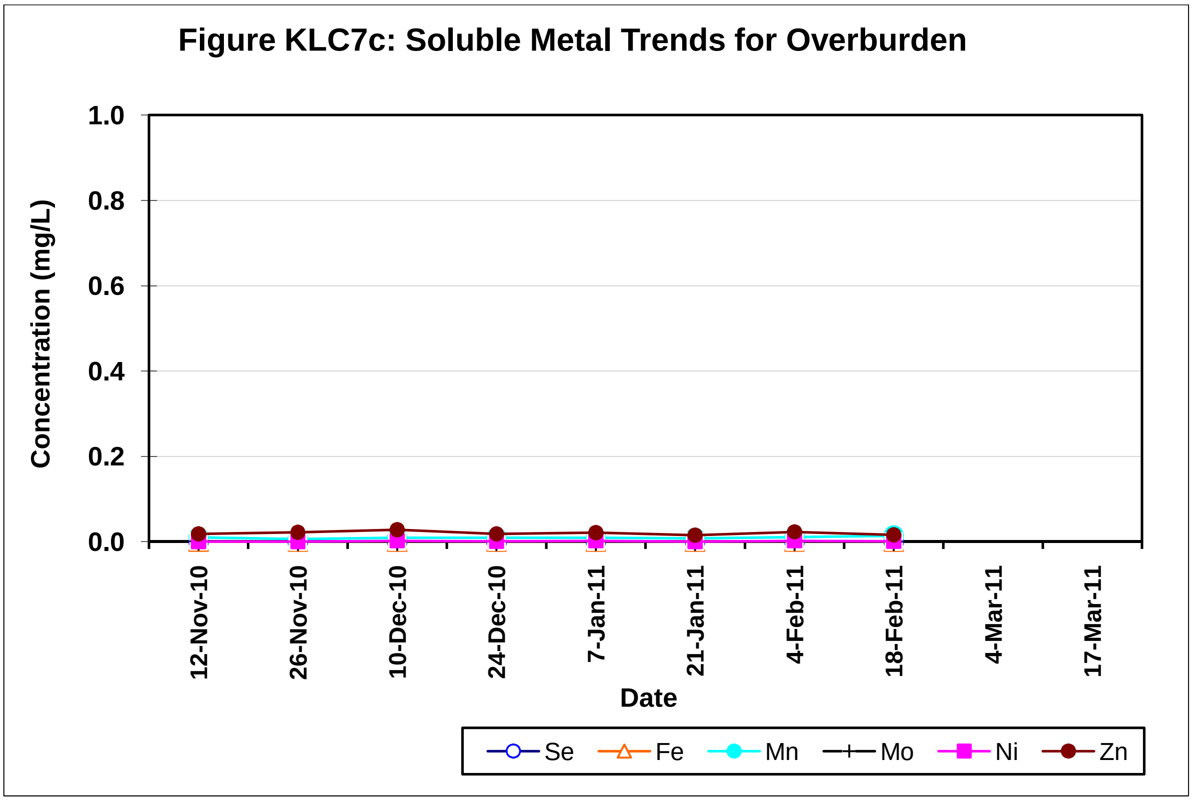


Figure KLC7c: Soluble Metal Trends for Overburden
Concentration (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

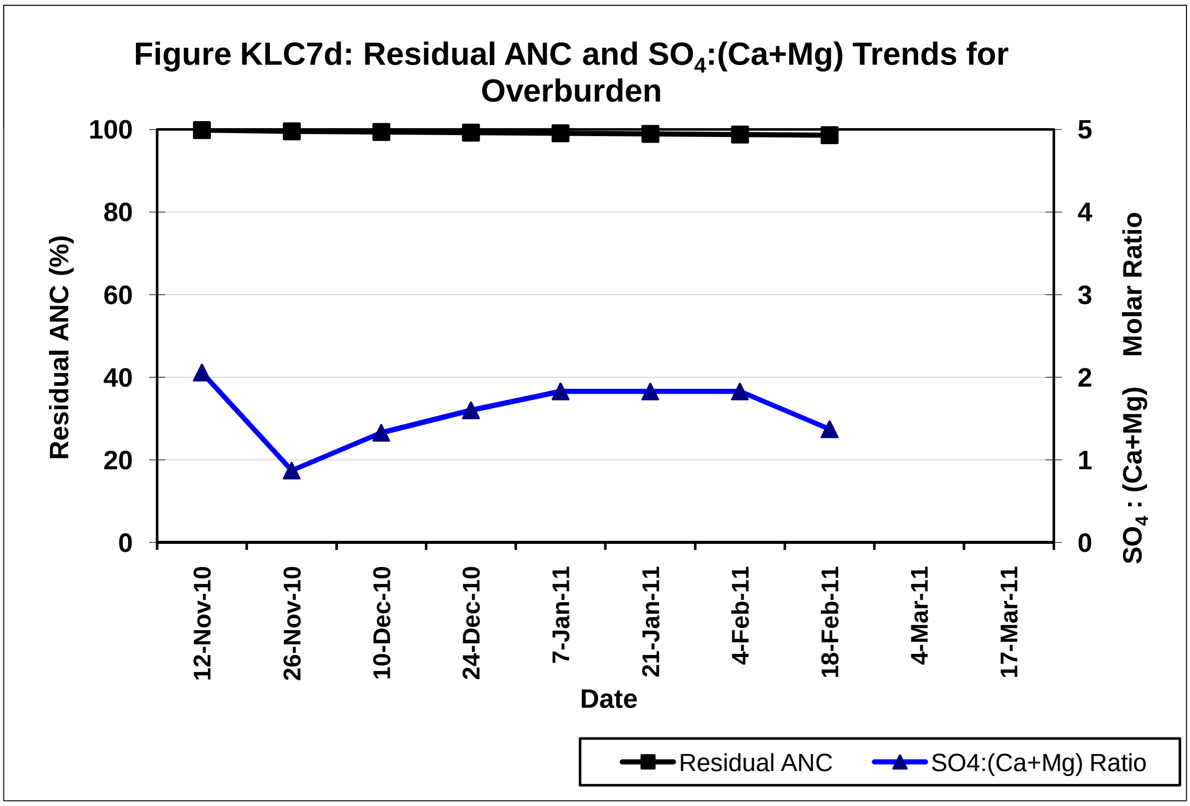


Figure KLC7d: Residual ANC and SO4:(Ca+Mg) Trends for Overburden
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC8

KLC Test Results for Alpha Sample 8 (Low Sulfur Overburden 1415D ARD07 Claystone)

Sample Weight (kg)	2.0	**MPA (kg H_2SO_4/t)**	0.6
pH(1:5)	6.90	**ANC (kg H_2SO_4/t)**	1.9
EC(1:5) (μS/cm)	1,360	**NAPP (kg H_2SO_4/t)**	-1.3
Total S (%)	0.02	**ANC:MPA ratio**	3.2

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.840	0.820	0.880	0.850	0.820	0.800	0.820	0.800		
Cum. Volume (L)	0.840	1.660	2.540	3.390	4.210	5.010	5.830	6.630		
Pore Volumes	0.6	1.2	1.9	2.5	3.1	3.7	4.3	4.9		
pH	6.34	7.86	6.49	6.29	6.46	6.36	6.38	6.35		
EC (μS/cm)	129	174	162	155	134	111	86	79		
Acidity (mg/L)*	4	2	<1	<1	<1	2	2	2		
Alkalinity (mg/L)*	8	6	2	<1	3	1	1	8		
Net Alkalinity (mg/L)*	4	4	2	0	3	-1	-1	6		
Dissolved elements (mg/L)										
Al	8.8	0.9	0.79	0.82	1.04	0.95	0.72	1.51		
As	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
B	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Ca	0.5	0.5	<1	<1	<1	<1	<1	<1		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	17	42	32	52	38	24	20	30		
Co	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cr	0.008	0.001	<0.001	0.001	0.001	0.001	<0.001	0.002		
Cu	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Fe	2.04	0.23	0.18	0.26	0.33	0.29	0.19	0.45		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	<1	<1	<1	<1	<1	<1	<1	<1		
Mg	0.5	0.5	<1	<1	<1	<1	<1	<1		
Mn	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002		
Mo	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Na	24	32	20	31	25	25	17	16		
Ni	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	11	1	3	6	6	8	6	5		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
V	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.029	0.007	0.011	0.011	0.009	0.007	0.006	0.007		
RESULTS**										
SO_4 Release Rate	4.6	0.2	1.3	2.6	2.5	3.2	2.5	2.0		
Cumulative SO_4 Release	4.6	4.8	6.1	8.7	11	14	17	19		
Ca Release Rate	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
Cumulative Ca Release	0.2	0.4	0.6	0.8	1.1	1.3	1.5	1.7		
Mg Release Rate	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
Cumulative Mg Release	0.2	0.4	0.6	0.8	1.1	1.3	1.5	1.7		
Residual ANC (%)	100	100	100	100	100	100	100	99		
Residual Sulfur (%)	99	99	99	99	98	98	97	97		
SO_4/(Ca+Mg) molar ratio	3.5	0.2	0.9	1.9	1.9	2.5	1.9	1.6		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

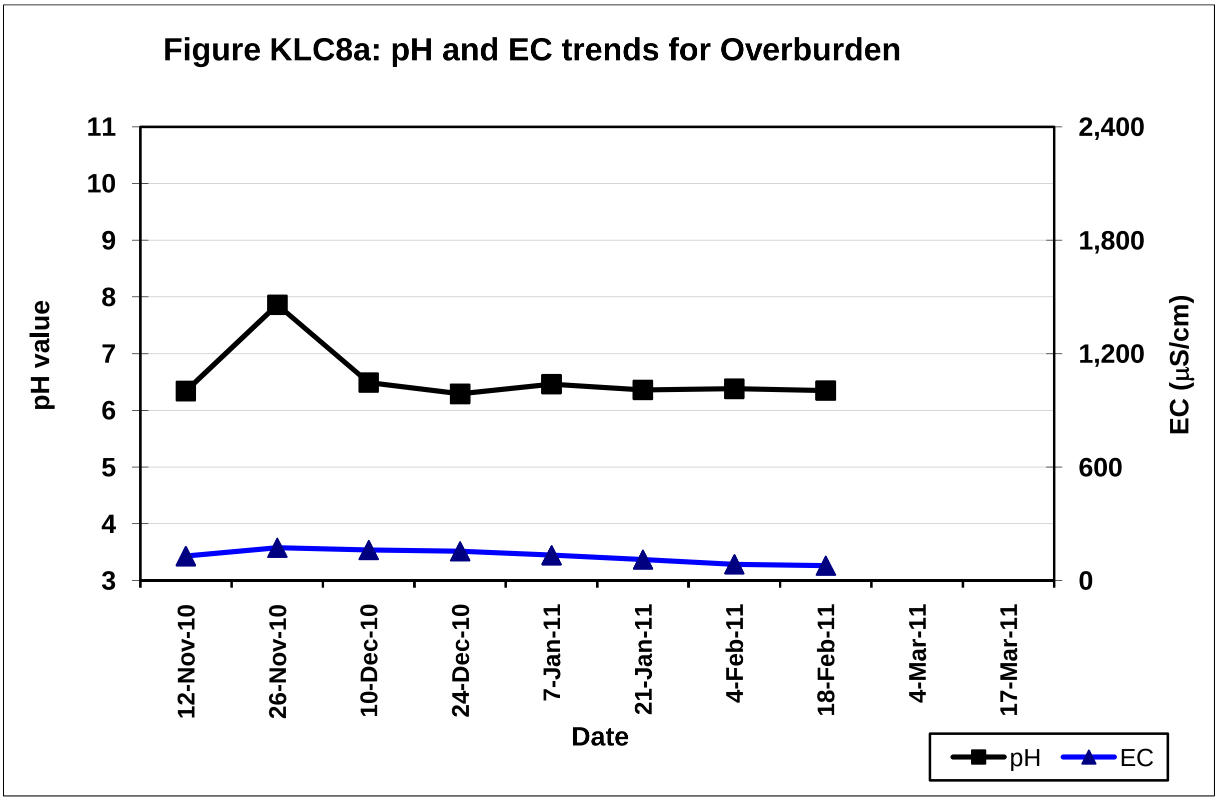


Figure KLC8a: pH and EC trends for Overburden
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

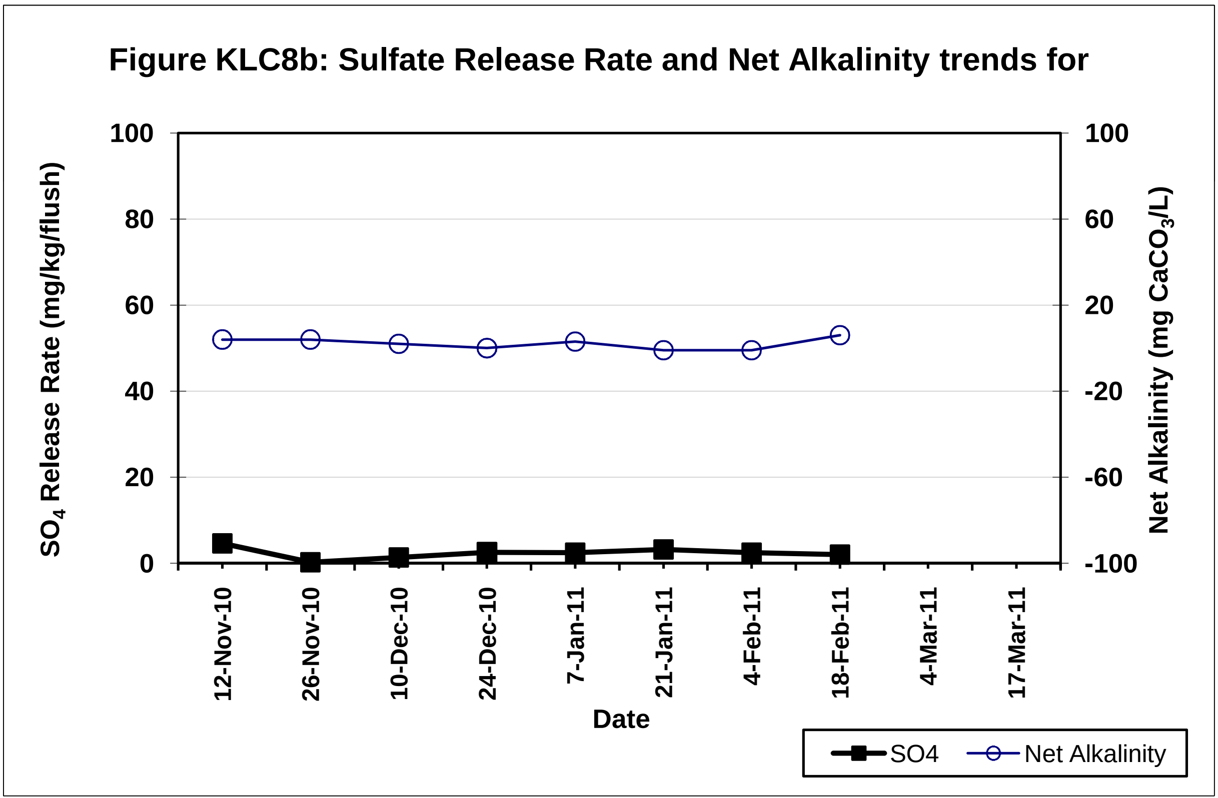


Figure KLC8b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
100
80
60
40
20
0
100
60
20
-20
-60
-100
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

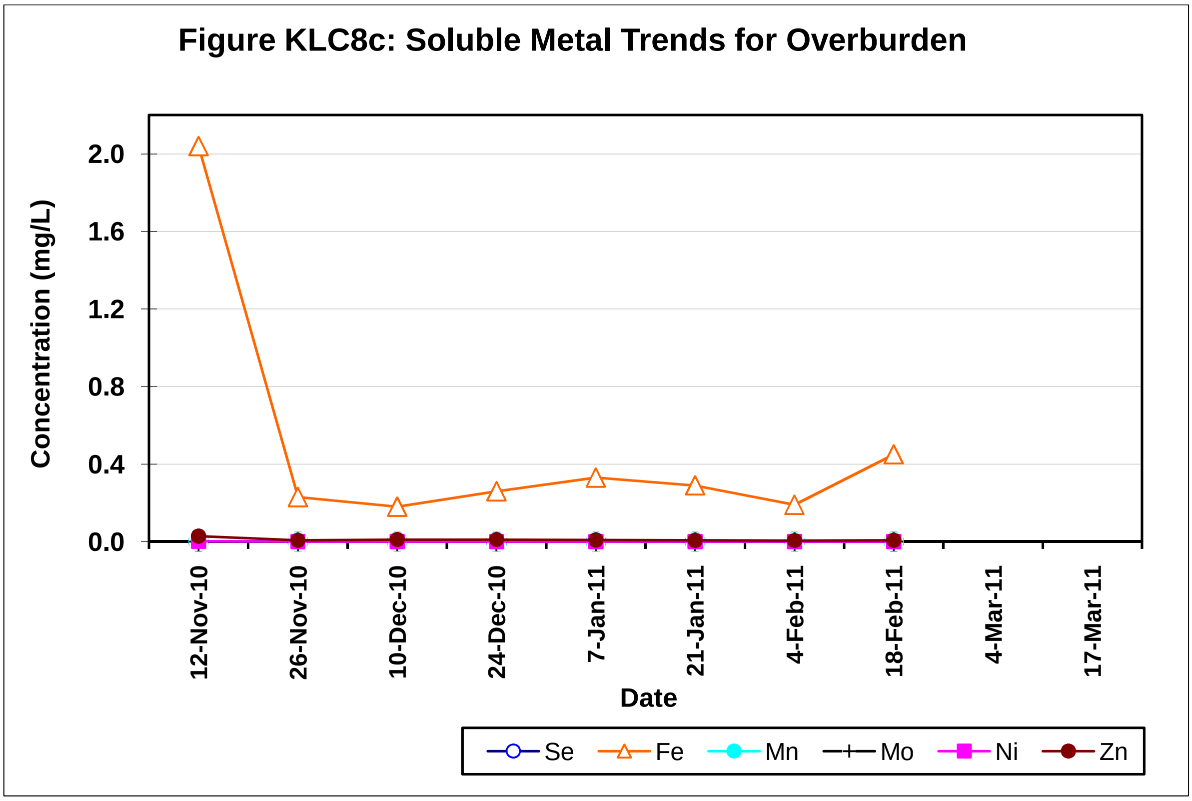


Figure KLC8c: Soluble Metal Trends for Overburden
Concentration (mg/L)
2.0
1.6
1.2
0.8
0.4
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

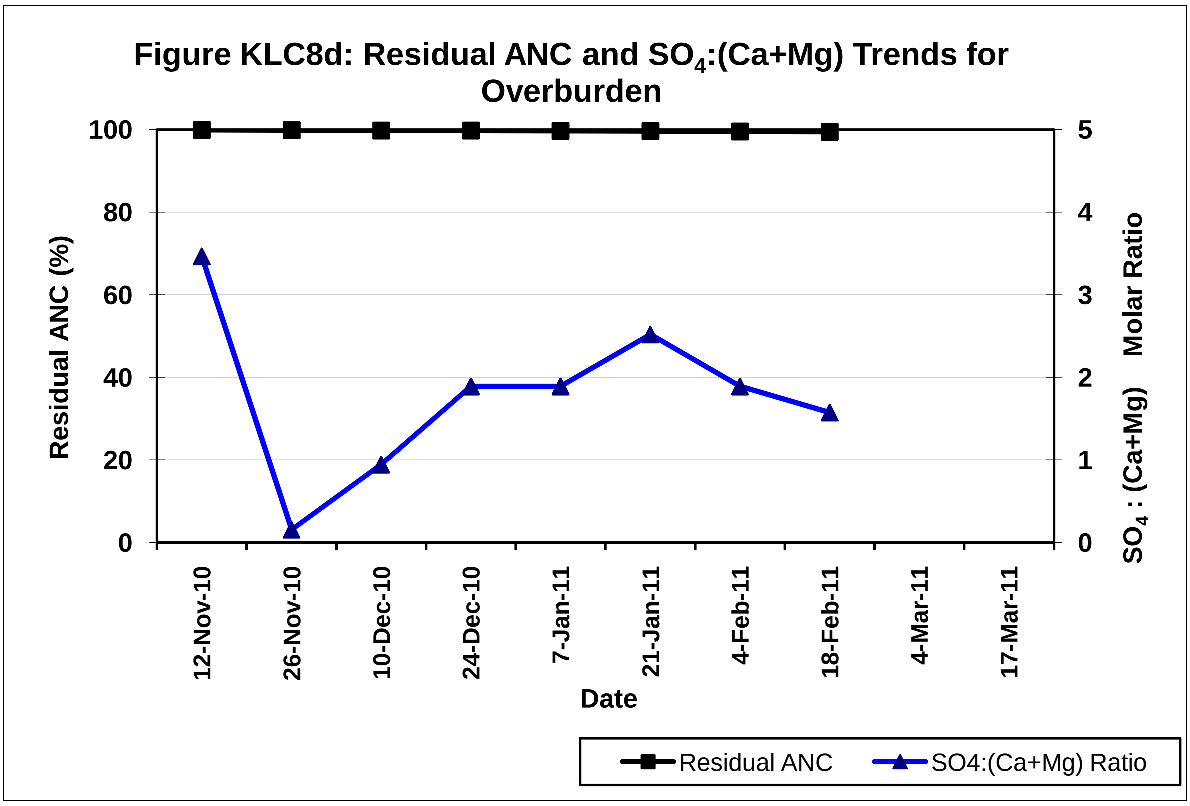


Figure KLC8d: Residual ANC and SO4:(Ca+Mg) Trends for Overburden
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC9

KLC Test Results for Alpha Sample 9 (Medium Sulfur Overburden 1362D ARD02 Claystone)

Sample Weight (kg)	2.0	**MPA (kg H_2SO_4/t)**	1.8
pH(1:5)	7.80	**ANC (kg H_2SO_4/t)**	2.9
EC(1:5) (μS/cm)	403	**NAPP (kg H_2SO_4/t)**	-1.1
Total S (%)	0.06	**ANC:MPA ratio**	1.6

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.780	0.740	0.750	0.730	0.700	0.720	0.700	0.700		
Cum. Volume (L)	0.780	1.520	2.270	3.000	3.700	4.420	5.120	5.820		
Pore Volumes	0.6	1.1	1.7	2.2	2.7	3.3	3.8	4.3		
pH	7.08	7.54	6.9	6.88	7.37	7.23	7.56	7.29		
EC (μS/cm)	180	625	906	702	396	194	165	73		
Acidity (mg/L)*	5	3	<1	<1	<1	3	3	2		
Alkalinity (mg/L)*	3	<1	5	3	14	12	17	58		
Net Alkalinity (mg/L)*	-2	-3	5	3	14	9	14	56		
Dissolved elements (mg/L)										
Al	0.76	0.46	0.04	0.21	2.66	7.1	3.37	6.52		
As	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001		
B	<0.05	0.22	0.2	0.26	0.27	0.19	0.25	0.15		
Ca	1	2	3	2	<1	<1	<1	<1		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	40	177	286	238	103	25	15	6		
Co	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cr	<0.001	<0.001	<0.001	<0.001	0.002	0.006	0.003	0.005		
Cu	0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001		
Fe	0.06	0.06	<0.05	<0.05	0.28	0.69	0.32	0.62		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	<1	2	2	2	1	<1	<1	<1		
Mg	0.5	1	2	1	<1	<1	<1	<1		
Mn	0.002	<0.001	0.002	0.001	<0.001	0.001	<0.001	0.002		
Mo	<0.001	0.001	0.003	0.004	0.007	0.006	0.008	0.004		
Na	31	117	189	158	82	45	34	18		
Ni	<0.001	<0.001	<0.001	0.001	<0.001	0.002	0.001	0.002		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	6	16	24	19	15	12	10	5		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.008	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005		
RESULTS**										
SO_4 Release Rate	2.3	5.9	9.0	6.9	5.3	4.3	3.5	1.8		
Cumulative SO_4 Release	2.3	8.3	17	24	29	34	37	39		
Ca Release Rate	0.4	0.7	1.1	0.7	0.2	0.2	0.2	0.2		
Cumulative Ca Release	0.4	1.1	2.3	3.0	3.2	3.3	3.5	3.7		
Mg Release Rate	0.2	0.4	0.8	0.4	0.2	0.2	0.2	0.2		
Cumulative Mg Release	0.2	0.6	1.3	1.7	1.9	2.0	2.2	2.4		
Residual ANC (%)	100	100	100	100	99	99	99	99		
Residual Sulfur (%)	100	100	99	99	98	98	98	98		
SO_4/(Ca+Mg) molar ratio	1.4	1.8	1.6	2.2	4.7	3.8	3.2	1.6		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

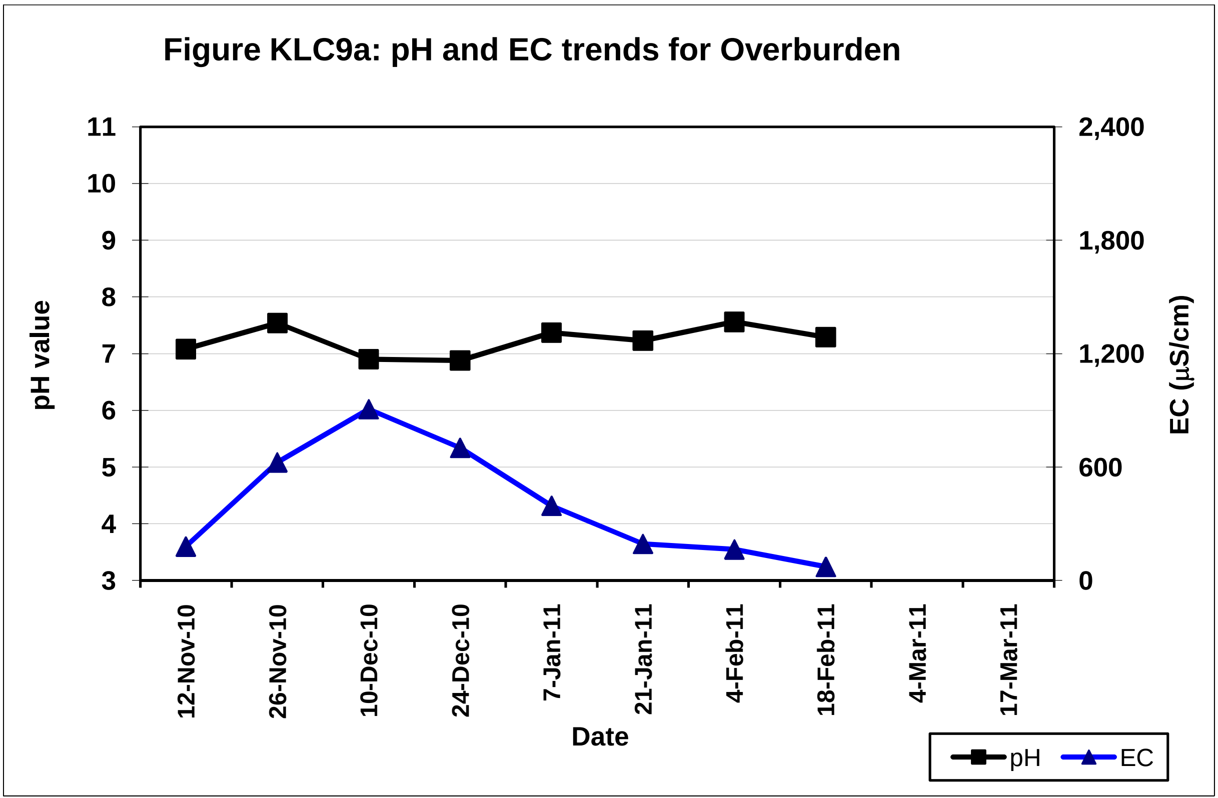


Figure KLC9a: pH and EC trends for Overburden
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

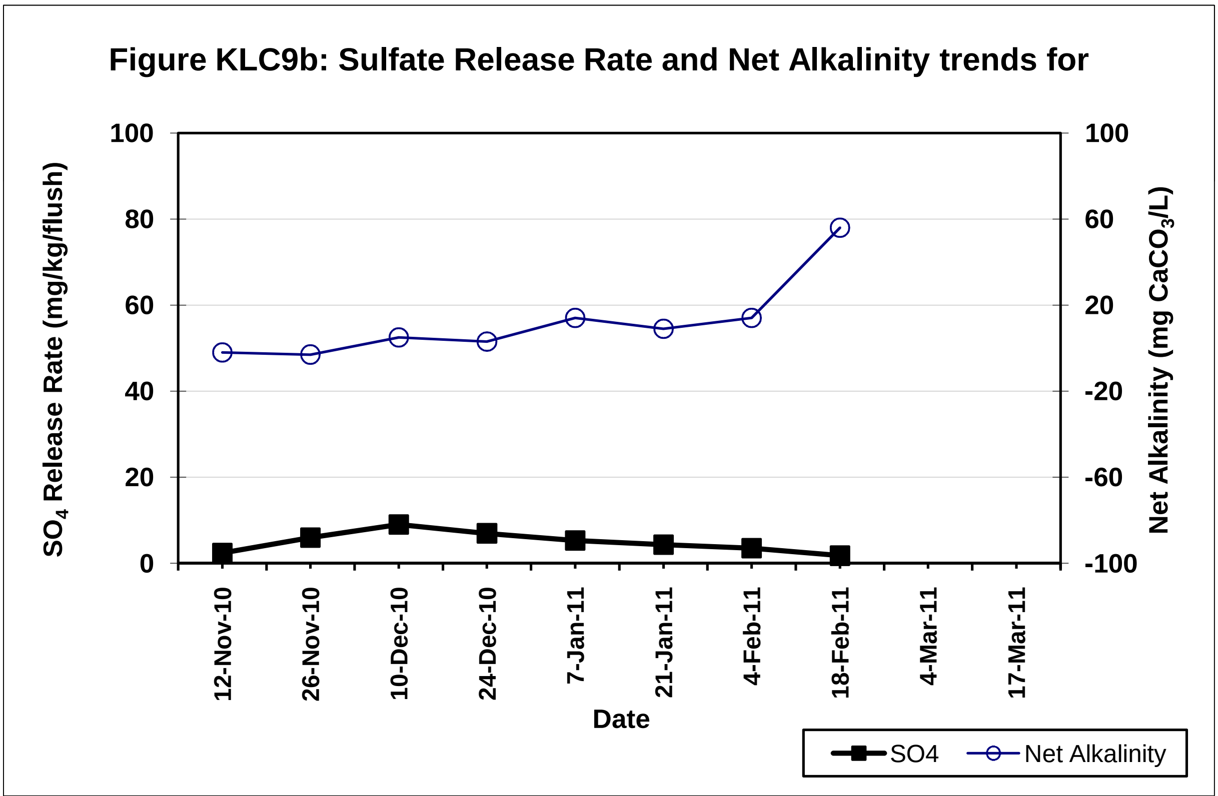


Figure KLC9b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
100
80
60
40
20
0
100
60
20
-20
-60
-100
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

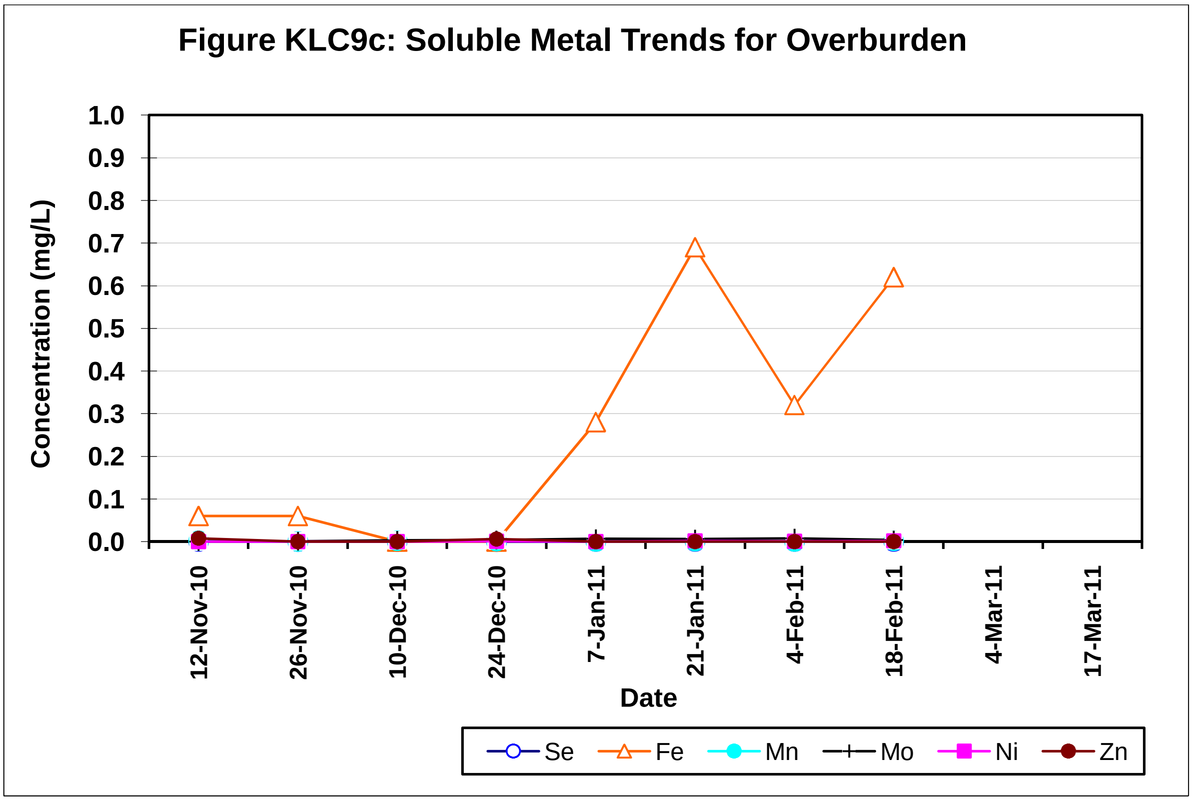


Figure KLC9c: Soluble Metal Trends for Overburden
Concentration (mg/L)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

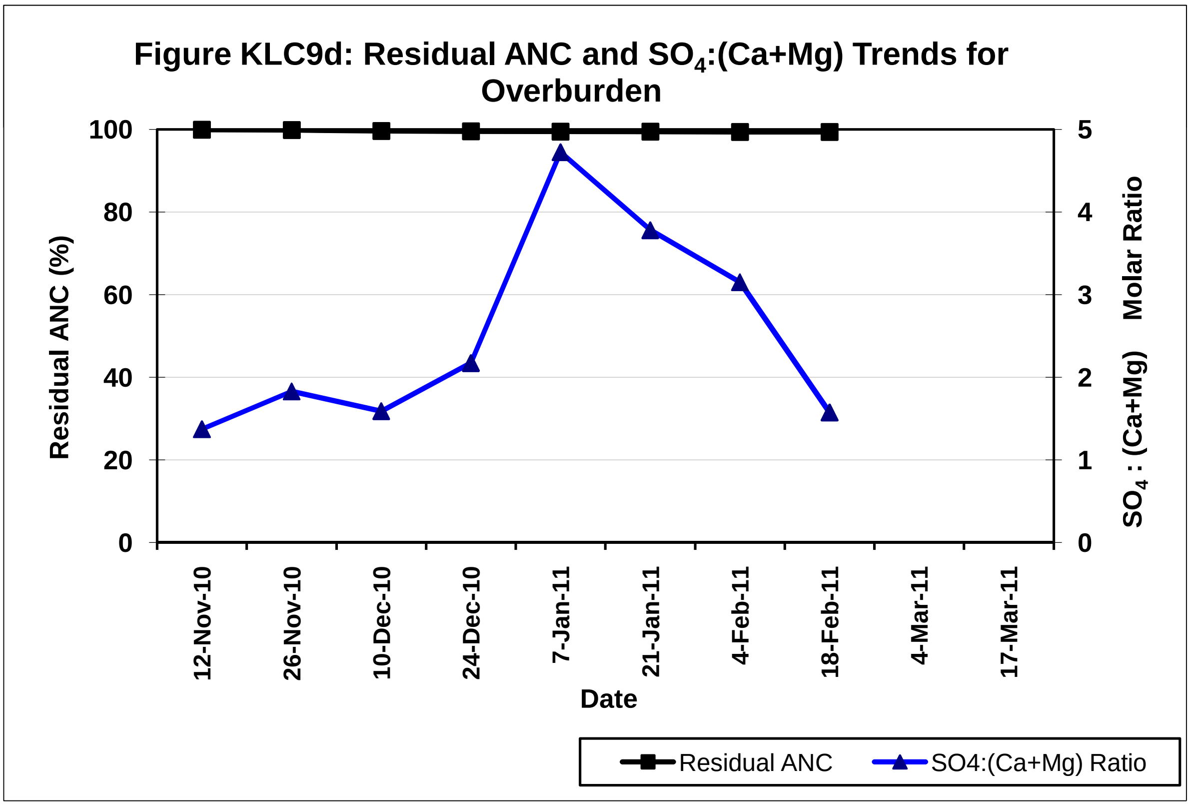


Figure KLC9d: Residual ANC and SO4:(Ca+Mg) Trends for Overburden
Residual ANC (%)
100
80
60
40
20
0
SO4 : (Ca+Mg) Molar Ratio
5
4
3
2
1
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC10

KLC Test Results for Alpha Sample 10 (Low Sulfur Overburden 1362D ARD04 Claystone)

Sample Weight (kg)	2.0	**MPA (kg H_2SO_4/t)**	0.6
pH(1:5)	7.40	**ANC (kg H_2SO_4/t)**	9
EC(1:5) (μS/cm)	494	**NAPP (kg H_2SO_4/t)**	-8.4
Total S (%)	0.02	**ANC:MPA ratio**	15

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.500	0.600	0.700	0.550	0.640	0.840	0.820	0.840		
Cum. Volume (L)	0.500	1.100	1.800	2.350	2.990	3.830	4.650	5.490		
Pore Volumes	0.4	0.8	1.3	1.7	2.2	2.8	3.4	4.1		
pH	6.63	7.79	7.39	7.25	7.18	7.8	7.9	8.22		
EC (μS/cm)	20,500	6,350	912	505	152	145	107	70		
Acidity (mg/L)*	41	4	<1	<1	<1	1	1	1		
Alkalinity (mg/L)*	137	148	16	12	10	7	11	69		
Net Alkalinity (mg/L)*	96	144	16	12	10	6	10	68		
Dissolved elements (mg/L)										
Al	<0.01	<0.01	1.54	1.62	4.13	41.7	86.1	84.7		
As	<0.001	<0.001	<0.001	<0.001	0.001	0.003	0.007	0.007		
B	0.3	0.38	0.1	0.11	<0.05	<0.05	<0.05	<0.05		
Ca	158	17	<1	<1	2	<1	1	1		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	6,820	1,620	283	174	43	32	26	20		
Co	0.075	0.002	0.001	0.006	0.004	0.008	0.015	0.015		
Cr	0.002	0.002	0.001	<0.001	<0.001	0.039	0.068	0.067		
Cu	<0.001	<0.001	0.002	0.005	0.006	0.015	0.028	0.027		
Fe	<0.05	<0.05	0.59	0.16	0.86	26.5	50.4	50.6		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	33	10	2	11	30	13	19	20		
Mg	296	29	2	4	13	6	10	10		
Mn	2.380	0.090	0.031	0.125	0.095	0.183	0.352	0.364		
Mo	0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Na	4,250	1,320	208	118	29	34	22	19		
Ni	0.012	<0.001	0.001	0.002	0.001	0.022	0.04	0.04		
Pb	<0.001	<0.001	0.001	0.004	0.006	0.006	0.014	0.014		
SO_4	1,580	578	56	23	9	12	8	8		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
V	<0.01	<0.01	0.01	0.04	0.03	0.05	0.10	0.10		
Zn	16.8	0.267	1.29	3.78	2.92	1.30	1.93	1.93		
RESULTS**										
SO_4 Release Rate	395	173	20	6.3	2.9	5.0	3.3	3.4		
Cumulative SO_4 Release	395	568	588	594	597	602	606	609		
Ca Release Rate	40	5.1	0.2	0.1	0.6	0.2	0.4	0.4		
Cumulative Ca Release	40	45	45	45	46	46	46	47		
Mg Release Rate	74	8.7	0.7	1.1	4.2	2.5	4.1	4.2		
Cumulative Mg Release	74	83	83	85	89	91	95	99		
Residual ANC (%)	96	95	95	95	95	95	94	94		
Residual Sulfur (%)	34	5.1	1.9	0.8	0.3	0	0	0		
SO_4/(Ca+Mg) molar ratio	1.0	3.7	6.2	1.4	0.2	0.5	0.2	0.2		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

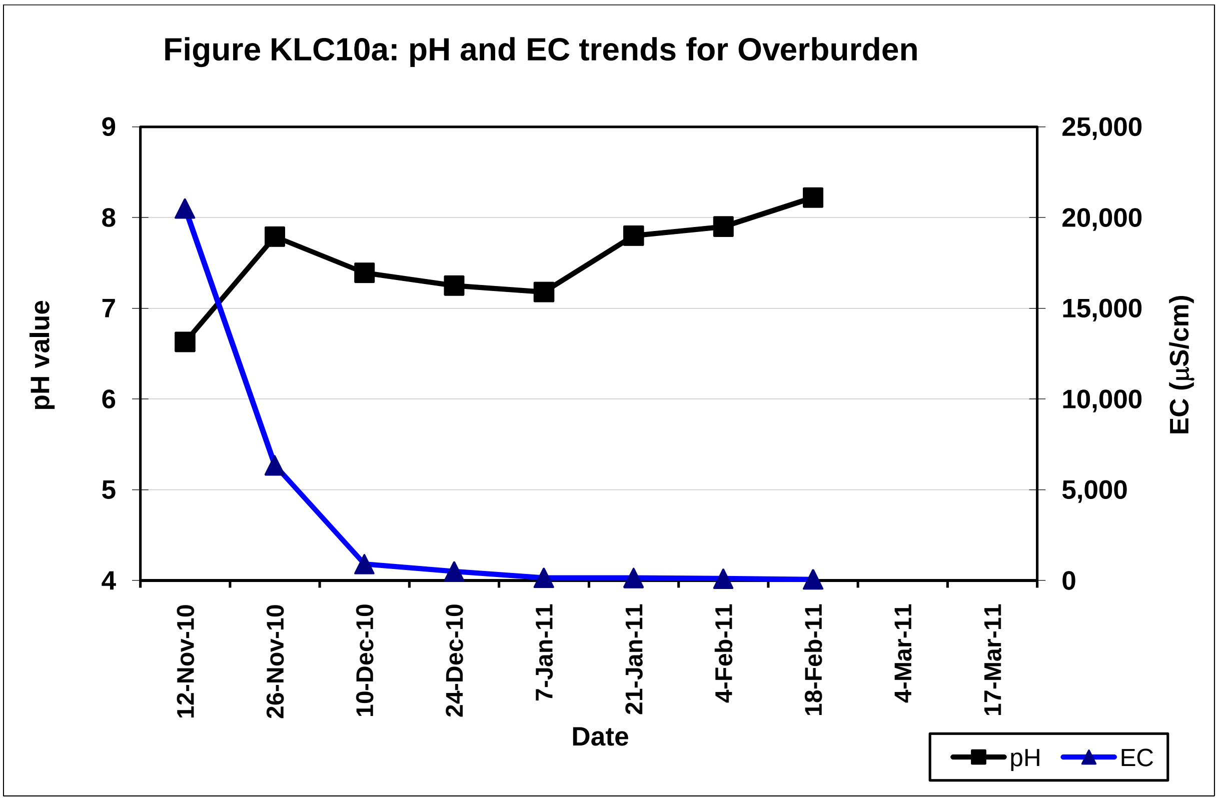


Figure KLC10a: pH and EC trends for Overburden
pH value
EC (µS/cm)
9
8
7
6
5
4
25,000
20,000
15,000
10,000
5,000
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

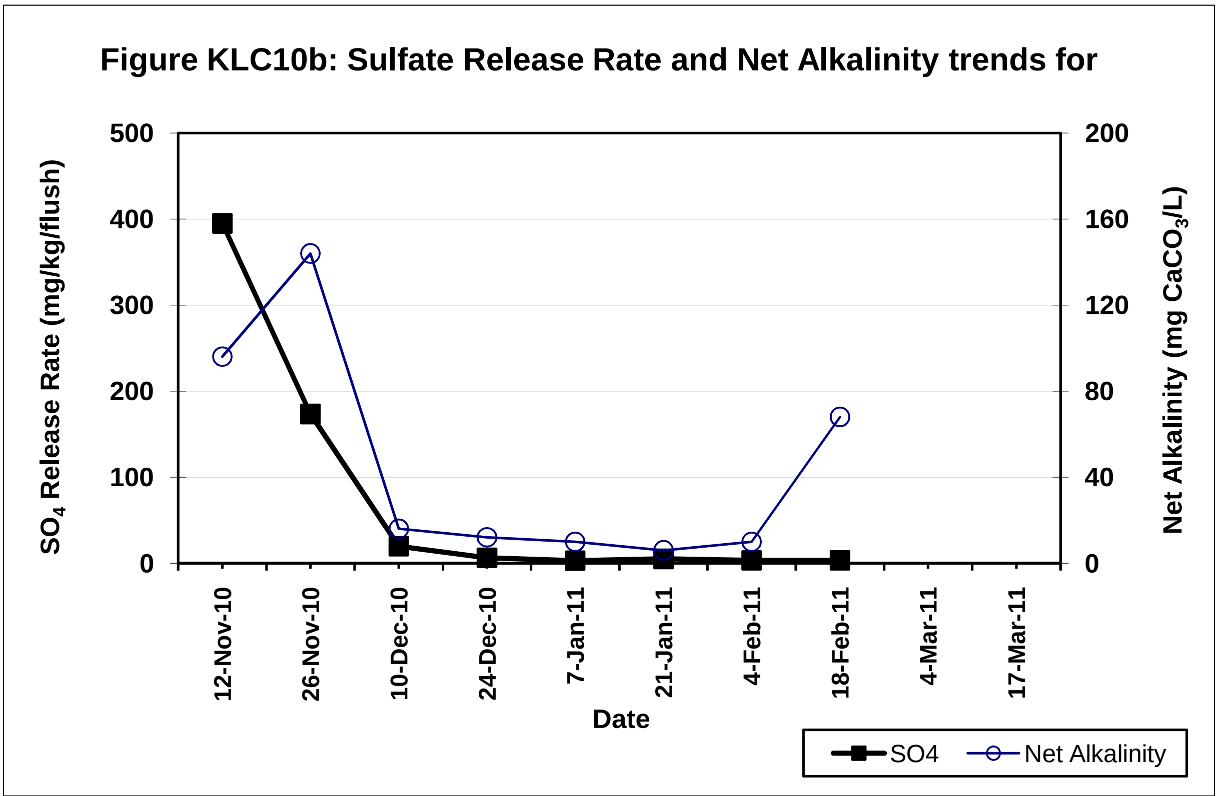


Figure KLC10b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
500
400
300
200
100
0
200
160
120
80
40
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

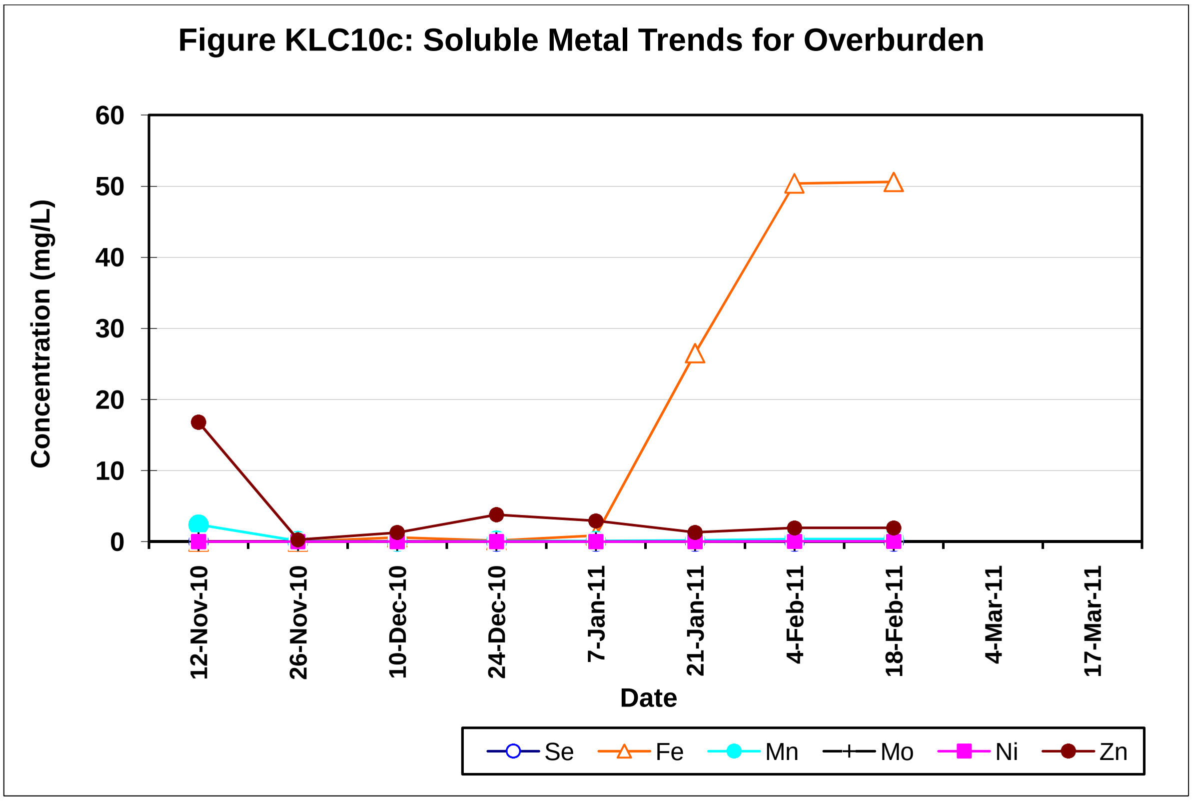


Figure KLC10c: Soluble Metal Trends for Overburden
Concentration (mg/L)
60
50
40
30
20
10
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

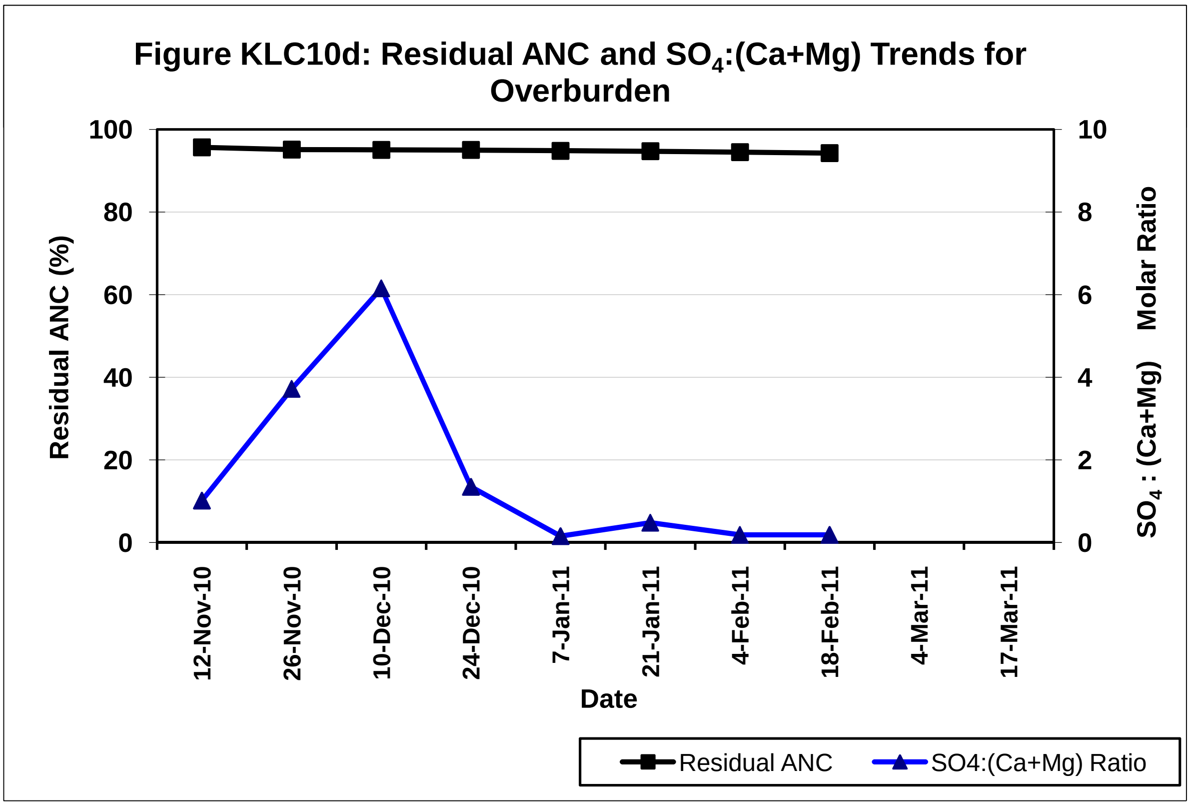


Figure KLC10d: Residual ANC and SO_4:(Ca+Mg) Trends for Overburden
Residual ANC (%)
100
80
60
40
20
0
10
8
6
4
2
0
SO_4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC11

KLC Test Results for Alpha Sample 11 (High Sulfur Overburden 1324D ARD04 Carbonaceous Shale)

Sample Weight (kg)	2.0	**MPA (kg H_2SO_4/t)**	35.5
pH(1:5)	7.40	**ANC (kg H_2SO_4/t)**	46.9
EC(1:5) (μS/cm)	1,330	**NAPP (kg H_2SO_4/t)**	-11.4
Total S (%)	1.16	**ANC:MPA ratio**	1.3

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.720	0.740	0.740	0.720	0.700	0.680	0.700	0.720		
Cum. Volume (L)	0.720	1.460	2.200	2.920	3.620	4.300	5.000	5.720		
Pore Volumes	0.5	1.1	1.6	2.2	2.7	3.2	3.7	4.2		
pH	6.63	7.21	6.82	6.55	7.18	7.16	7.08	7.1		
EC (μS/cm)	534	609	728	697	1700	1,970	1,720	1,790		
Acidity (mg/L)*	7	1	<1	<1	<1	3	3	3		
Alkalinity (mg/L)*	64	26	5	<1	6	10	9	67		
Net Alkalinity (mg/L)*	57	25	5	0	6	7	6	64		
Dissolved elements (mg/L)										
Al	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01		
As	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
B	<0.05	<0.05	0.05	0.06	0.17	0.15	0.14	0.12		
Ca	46	44	60	54	177	219	192	197		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	14	21	30	30	44	31	19	27		
Co	<0.001	<0.001	<0.001	0.004	0.003	0.003	<0.001	0.001		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	0.001	<0.001	0.001	0.001	0.001	<0.001	<0.001	<0.001		
Fe	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	6	7	8	7	19	18	16	11		
Mg	9	11	17	16	56	68	58	58		
Mn	0.023	0.080	0.180	0.306	0.541	0.573	<0.001	0.324		
Mo	0.002	<0.001	<0.001	<0.001	0.002	<0.001	0.001	<0.001		
Na	54	86	72	65	168	156	130	117		
Ni	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	190	248	334	303	916	1070	933	884		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	0.01	<0.01	<0.01	0.02	0.02	0.02	0.02		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	<0.005	0.014	0.013	0.027	0.023	0.033	0.011	0.031		
RESULTS**										
SO_4 Release Rate	68	92	124	109	321	364	327	318		
Cumulative SO_4 Release	68	160	284	393	713	1,077	1,404	1,722		
Ca Release Rate	17	16	22	19	62	74	67	71		
Cumulative Ca Release	17	33	55	74	136	211	278	349		
Mg Release Rate	3.2	4.1	6.3	5.8	20	23	20	21		
Cumulative Mg Release	3.2	7.3	14	19	39	62	82	103		
Residual ANC (%)	100	100	100	99	99	98	98	97		
Residual Sulfur (%)	100	100	99	99	98	97	96	95		
SO_4/(Ca+Mg) molar ratio	1.3	1.7	1.6	1.6	1.4	1.3	1.4	1.3		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

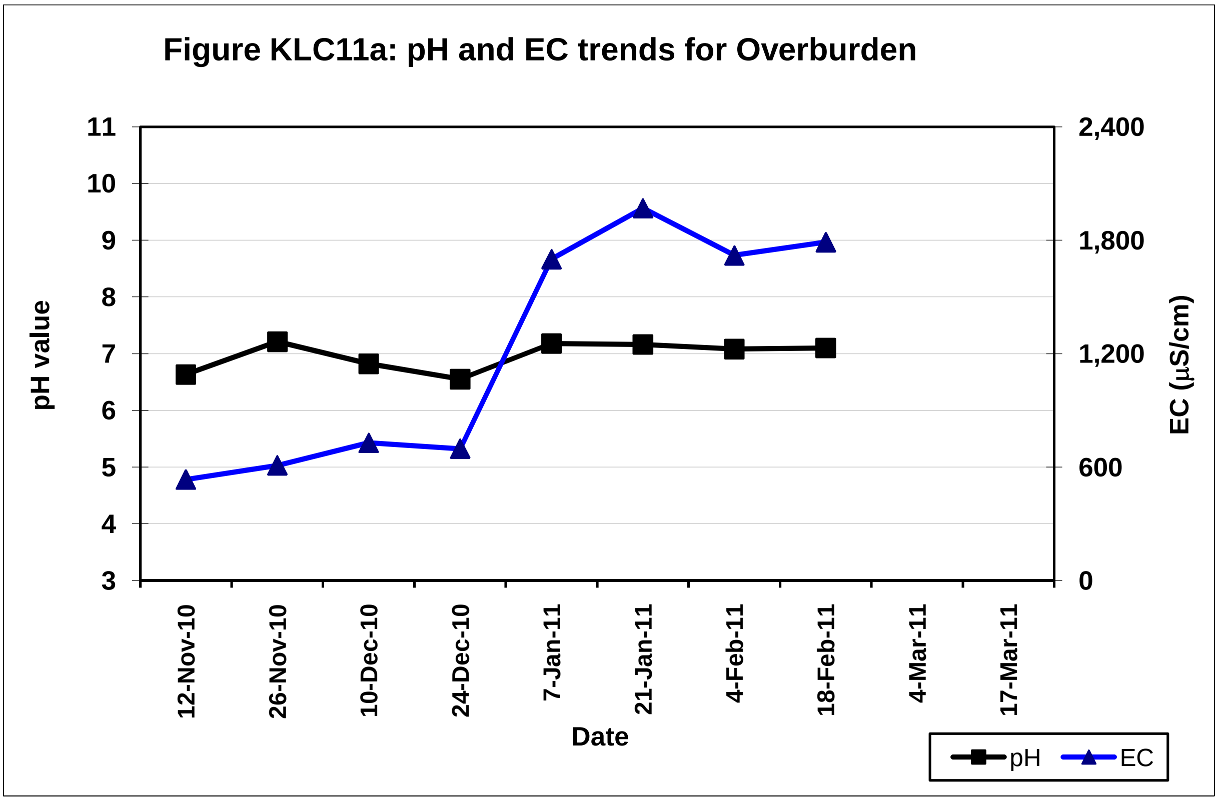


Figure KLC11a: pH and EC trends for Overburden
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

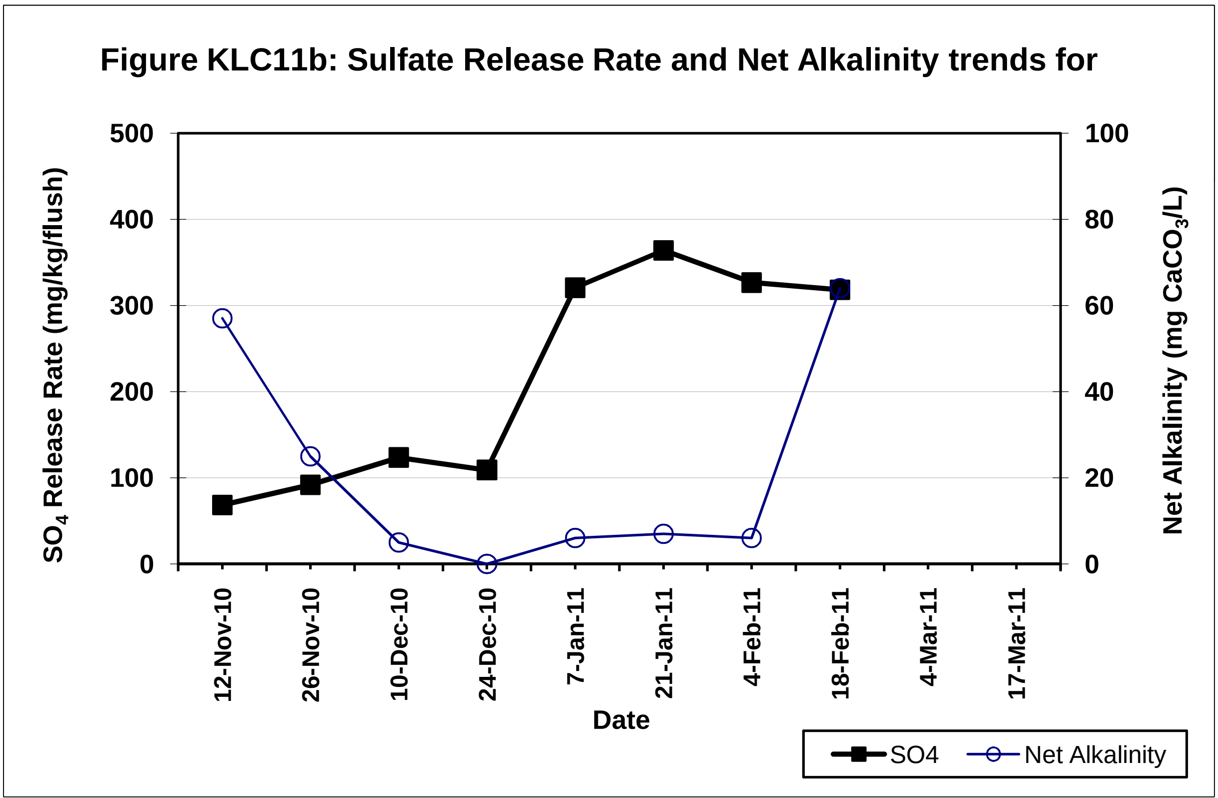


Figure KLC11b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
500
400
300
200
100
0
100
80
60
40
20
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

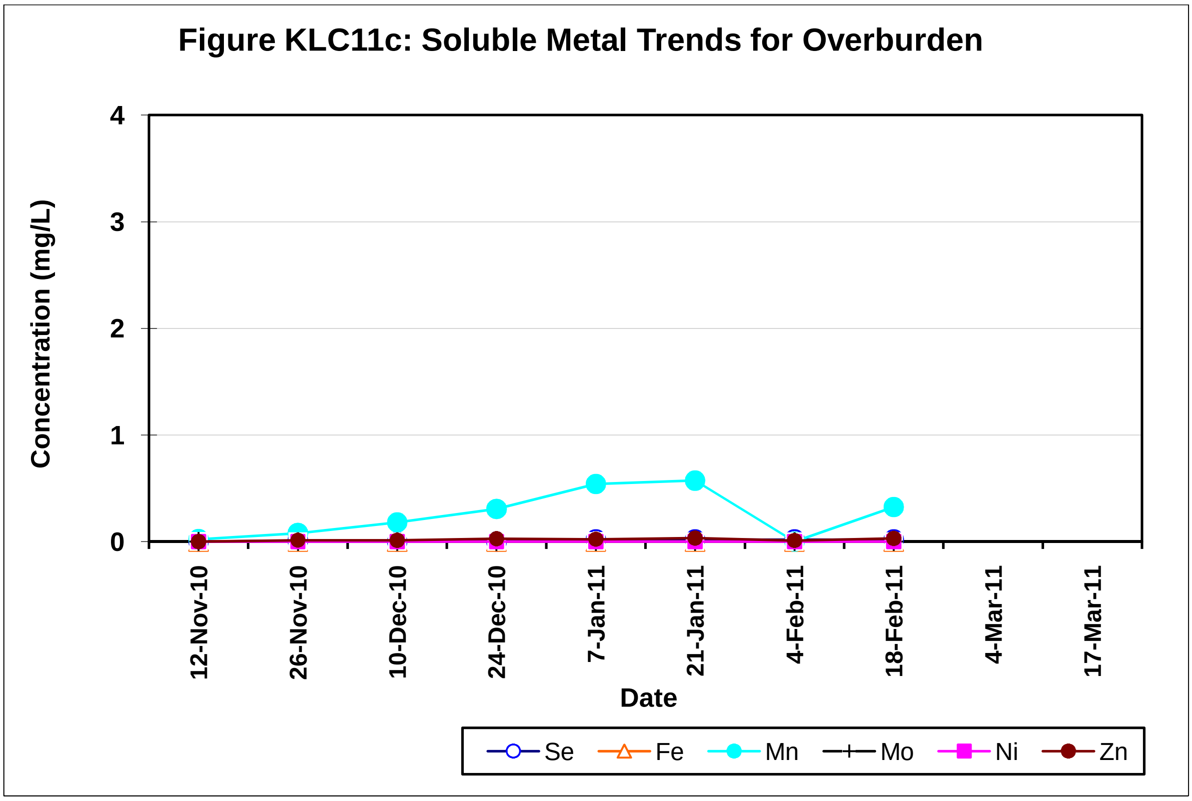


Figure KLC11c: Soluble Metal Trends for Overburden
Concentration (mg/L)
4
3
2
1
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

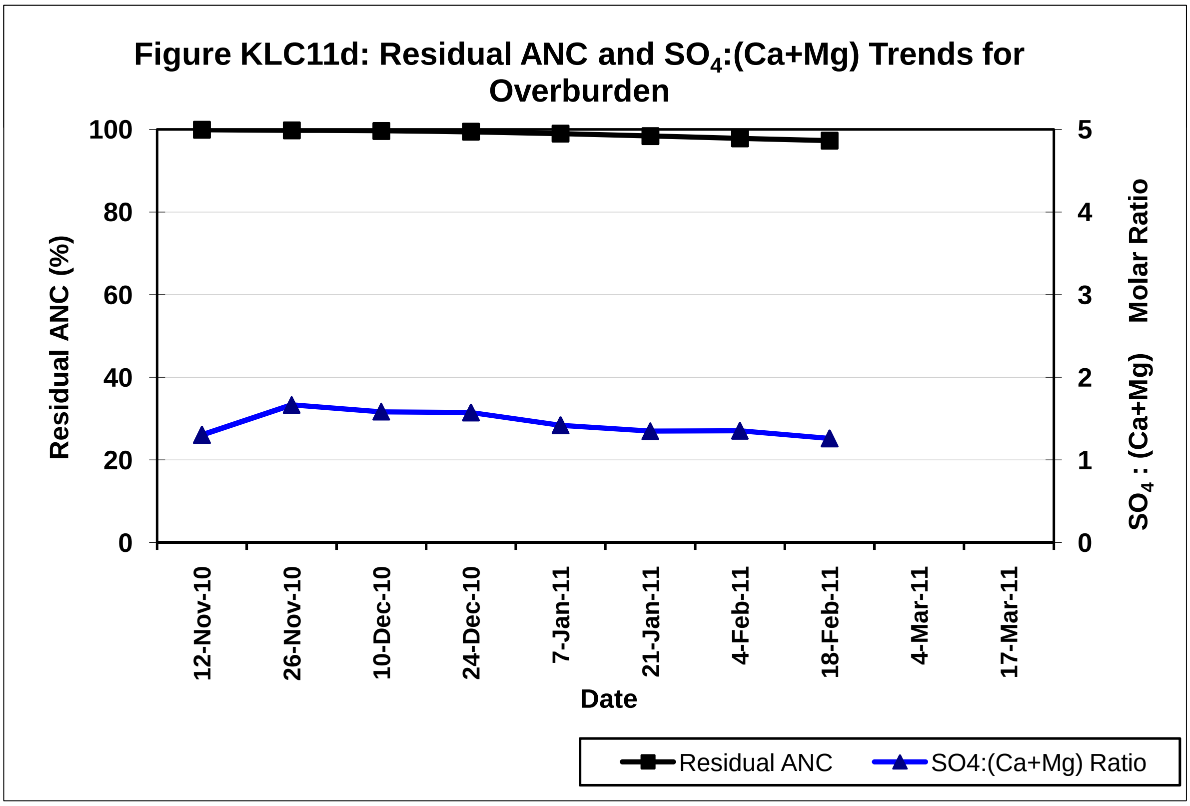


Figure KLC11d: Residual ANC and SO4:(Ca+Mg) Trends for Overburden
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC12

KLC Test Results for Alpha Sample 12 (Raw Coal 1290L 201064 C Seam)

Sample Weight (kg)	1.7	**MPA (kg H_2SO_4/t)**	9.8
pH(1:5)	7.50	**ANC (kg H_2SO_4/t)**	5.2
EC(1:5) (μS/cm)	146	**NAPP (kg H_2SO_4/t)**	3.6
Total S (%)	0.32	**ANC:MPA ratio**	0.5

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.700	0.720	0.700	0.680	0.620	0.680	0.700	0.680		
Cum. Volume (L)	0.700	1.420	2.120	2.800	3.420	4.100	4.800	5.480		
Pore Volumes	0.5	1.1	1.6	2.1	2.5	3.0	3.6	4.1		
pH	7.95	6.25	4.98	5.35	4.49	4.58	4.43	4.58		
EC (μS/cm)	167	342	440	561	468	585	589	479		
Acidity (mg/L)*	5	1	<1	<1	<1	8	19	7		
Alkalinity (mg/L)*	<1	<1	<1	<1	<1	<1	<1	1		
Net Alkalinity (mg/L)*	-5	-1	0	0	0	-8	-19	-6		
Dissolved elements (mg/L)										
Al	0.04	<0.01	0.02	<0.01	0.02	0.03	0.05	0.04		
As	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
B	0.07	0.18	0.17	0.35	0.27	0.29	0.32	0.28		
Ca	4	8	<1	13	13	23	26	20		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0002	0.0004	0.0003		
Cl	9	8	<1	11	7	6	6	3		
Co	0.013	0.009	0.013	0.017	0.018	0.030	0.036	0.032		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	<0.001	<0.001	0.004	0.001	0.002	0.002	0.008	0.009		
Fe	<0.05	<0.05	<0.05	<0.05	1.09	0.46	0.76	0.44		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	2	2	<1	4	3	4	4	2		
Mg	2	3	<1	7	6	10	10	9		
Mn	0.04	0.08	0.15	0.26	0.3	0.633	0.909	0.941		
Mo	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Na	25	54	<1	88	67	78	67	50		
Ni	0.005	0.003	0.004	0.006	0.006	0.011	0.015	0.012		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001		
SO_4	57	136	<1	227	190	252	247	190		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	0.02	0.02	0.03	0.02	0.02	0.02	0.02		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.073	0.030	0.054	0.064	0.067	0.125	0.162	0.138		
RESULTS**										
SO_4 Release Rate	23	58	0	91	69	101	102	76		
Cumulative SO_4 Release	23	81	81	172	241	342	444	520		
Ca Release Rate	1.6	3.4	0.2	5.2	4.7	9.2	10.7	8.0		
Cumulative Ca Release	1.6	5.0	5.2	10	15	24	35	43		
Mg Release Rate	0.8	1.3	0.2	2.8	2.2	4.0	4.1	3.6		
Cumulative Mg Release	0.8	2.1	2.3	5.1	7.3	11	15	19		
Residual ANC (%)	100	100	100	99	99	98	97	97		
Residual Sulfur (%)	100	99	99	98	97	96	95	95		
SO_4/(Ca+Mg) molar ratio	3.3	4.4	0.2	3.9	3.5	2.7	2.4	2.3		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

Figure KLC12a: pH and EC trends for Raw Coal

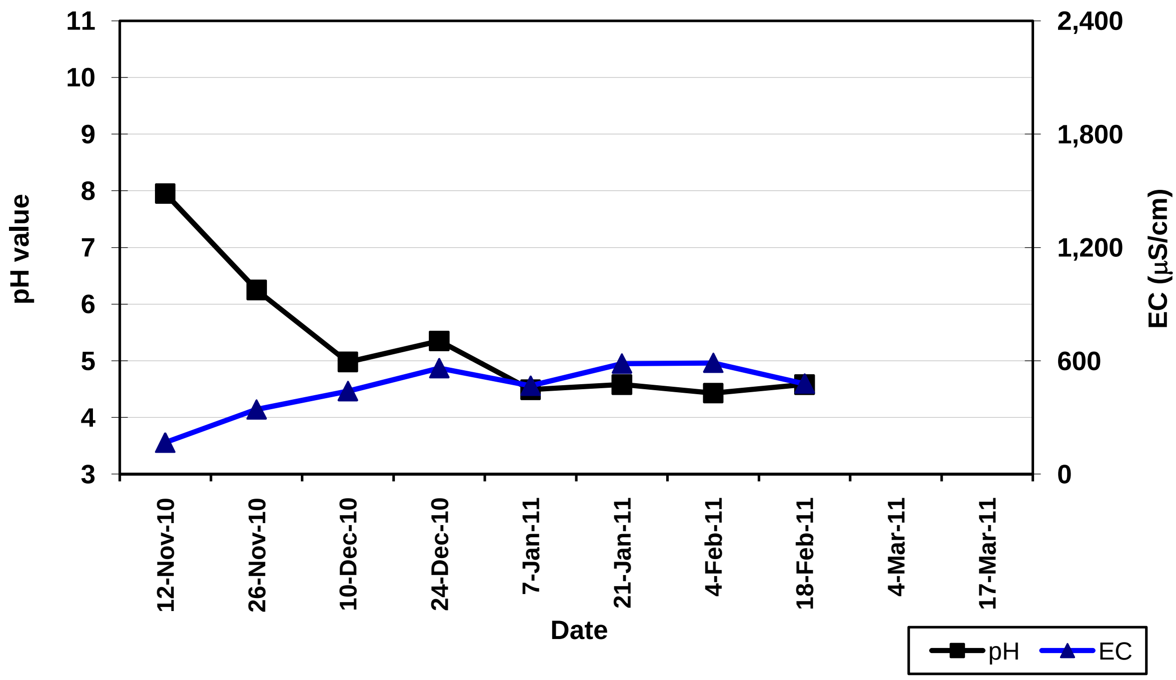
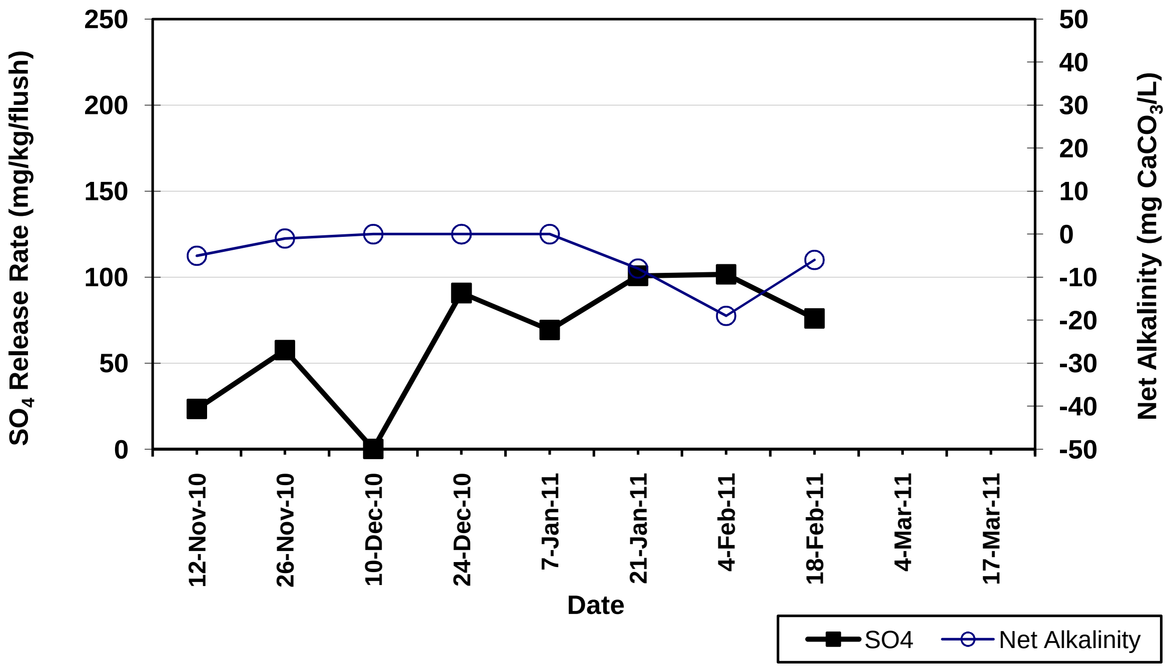


Figure KLC12b: Sulfate Release Rate and Net Alkalinity trends for Raw



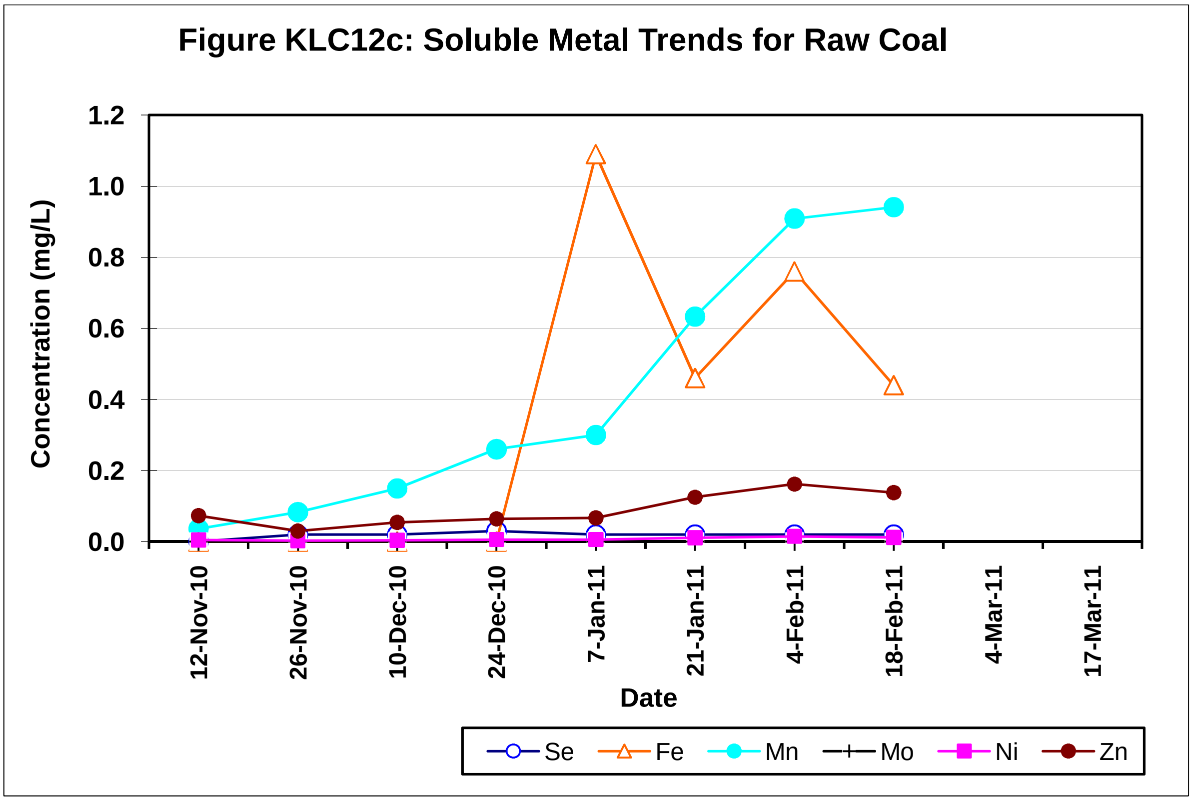


Figure KLC12c: Soluble Metal Trends for Raw Coal
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Concentration (mg/L)
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

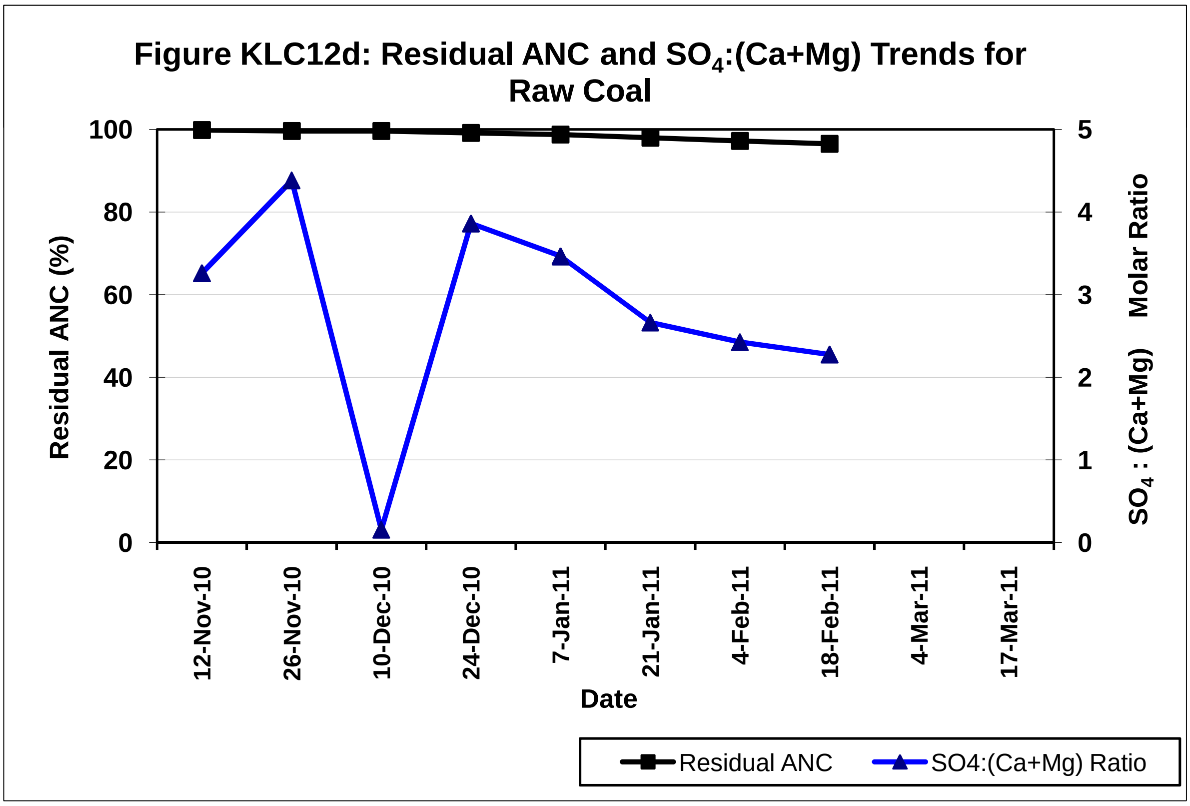


Figure KLC12d: Residual ANC and SO4:(Ca+Mg) Trends for Raw Coal
100
80
60
40
20
0
Residual ANC (%)
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC13

KLC Test Results for Alpha Sample 13 (Washed Coal 1290L 201076 C Seam)

Sample Weight (kg)	1.5	**MPA (kg H_2SO_4/t)**	10.4
pH(1:5)	3.80	**ANC (kg H_2SO_4/t)**	1.9
EC(1:5) (µS/cm)	496	**NAPP (kg H_2SO_4/t)**	8.5
Total S (%)	0.34	**ANC:MPA ratio**	0.2

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.780	0.800	0.780	0.760	0.720	0.740	0.750	0.760		
Cum. Volume (L)	0.780	1.580	2.360	3.120	3.840	4.580	5.330	6.090		
Pore Volumes	0.6	1.2	1.7	2.3	2.8	3.4	3.9	4.5		
pH	4.35	3.86	3.74	3.61	3.59	3.52	3.51	3.54		
EC (µS/cm)	130	443	539	1,150	583	455	455	562		
Acidity (mg/L)*	11	13	10	19	14	17	18	23		
Alkalinity (mg/L)*	<1	<1	<1	<1	<1	<1	<1	<1		
Net Alkalinity (mg/L)*	-11	-1	-10	-19	-14	-17	-18	-23		
Dissolved elements (mg/L)										
Al	0.01	0.04	0.05	0.11	0.04	0.05	0.04	0.05		
As	<0.001	0.009	<0.020	<0.020	<0.020	0.01	0.006	0.021		
B	<0.05	0.14	0.13	0.39	0.19	0.14	0.15	0.21		
Ca	5	19	25	45	24	17	15	20		
Cd	<0.0001	0.0001	<0.0001	0.0002	0.0001	<0.0001	<0.0001	0.0001		
Cl	31	109	140	366	144	109	95	138		
Co	0.017	0.036	0.032	0.084	0.033	0.025	0.022	0.033		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	0.003	0.003	0.004	0.005	0.002	0.002	0.004	0.003		
Fe	1.94	1.5	0.55	0.66	0.38	0.23	0.33	0.18		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	<1	2	3	4	2	2	2	2		
Mg	2	7	10	22	11	7	7	9		
Mn	0.04	0.62	0.923	2.83	1.56	1.37	1.32	2.08		
Mo	<0.001	<0.001	0.001	0.003	0.001	<0.001	<0.001	<0.001		
Na	11	41	49	105	51	33	30	39		
Ni	0.009	0.018	0.014	0.038	0.014	0.011	0.011	0.015		
Pb	<0.001	0.001	0.002	0.003	0.002	<0.001	0.001	0.001		
SO_4	15	16	24	43	22	26	27	33		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	0.04	<0.20	<0.20	<0.20	0.03	0.03	0.08		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.024	0.089	0.062	0.138	0.052	0.045	0.043	0.059		
RESULTS**										
SO_4 Release Rate	7.8	8.5	12	22	11	13	13.5	16.7		
Cumulative SO_4 Release	7.8	16	29	51	61	74	87	104		
Ca Release Rate	2.6	10	13	23	12	8.4	8	10		
Cumulative Ca Release	2.6	13	26	49	60	68	76	86		
Mg Release Rate	1.0	3.7	5.2	11.1	5.3	3.5	3.5	4.6		
Cumulative Mg Release	1.0	4.8	10	21	26	30	33	38		
Residual ANC (%)	99	97	95	89	87	85	83	81		
Residual Sulfur (%)	100	100	100	100	99	99	99	99		
SO_4/(Ca+Mg) molar ratio	0.8	0.2	0.2	0.2	0.2	0.4	0.4	0.4		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

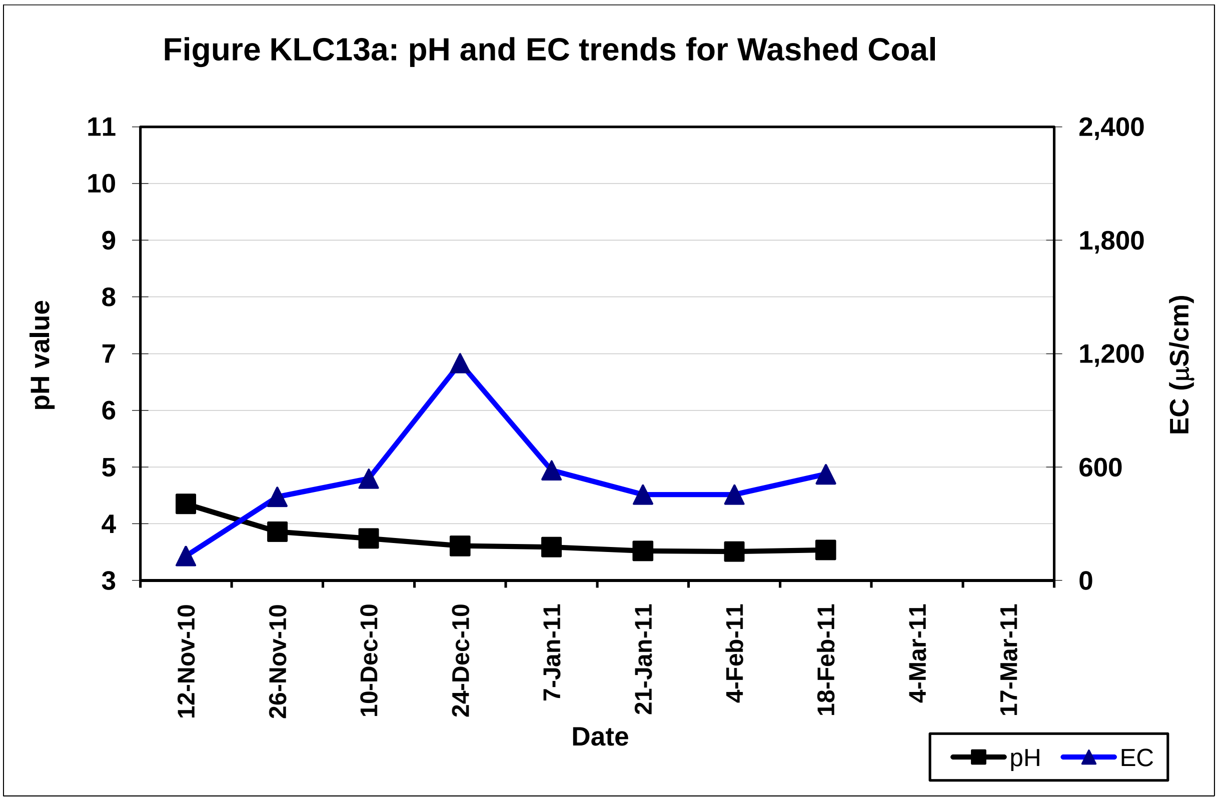


Figure KLC13a: pH and EC trends for Washed Coal
pH value
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
EC (µS/cm)
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

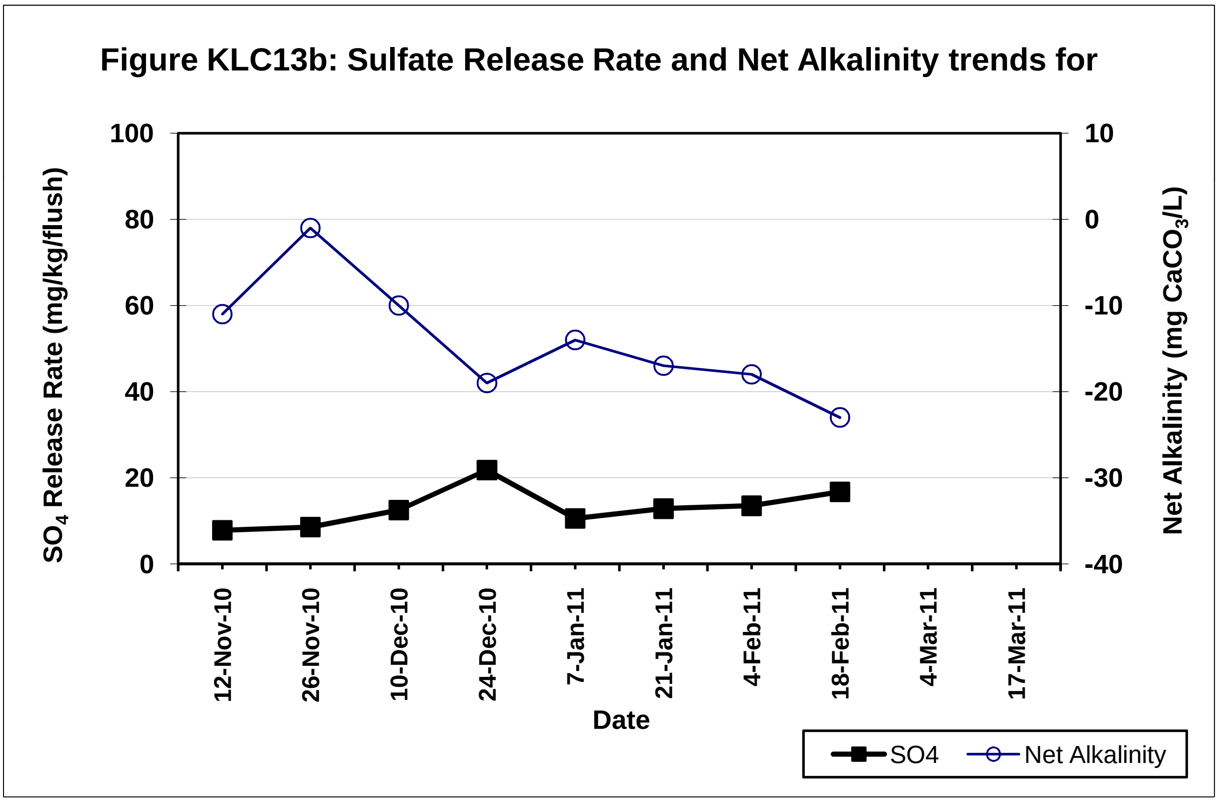


Figure KLC13b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
100
80
60
40
20
0
10
0
-10
-20
-30
-40
Net Alkalinity (mg CaCO3/L)
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

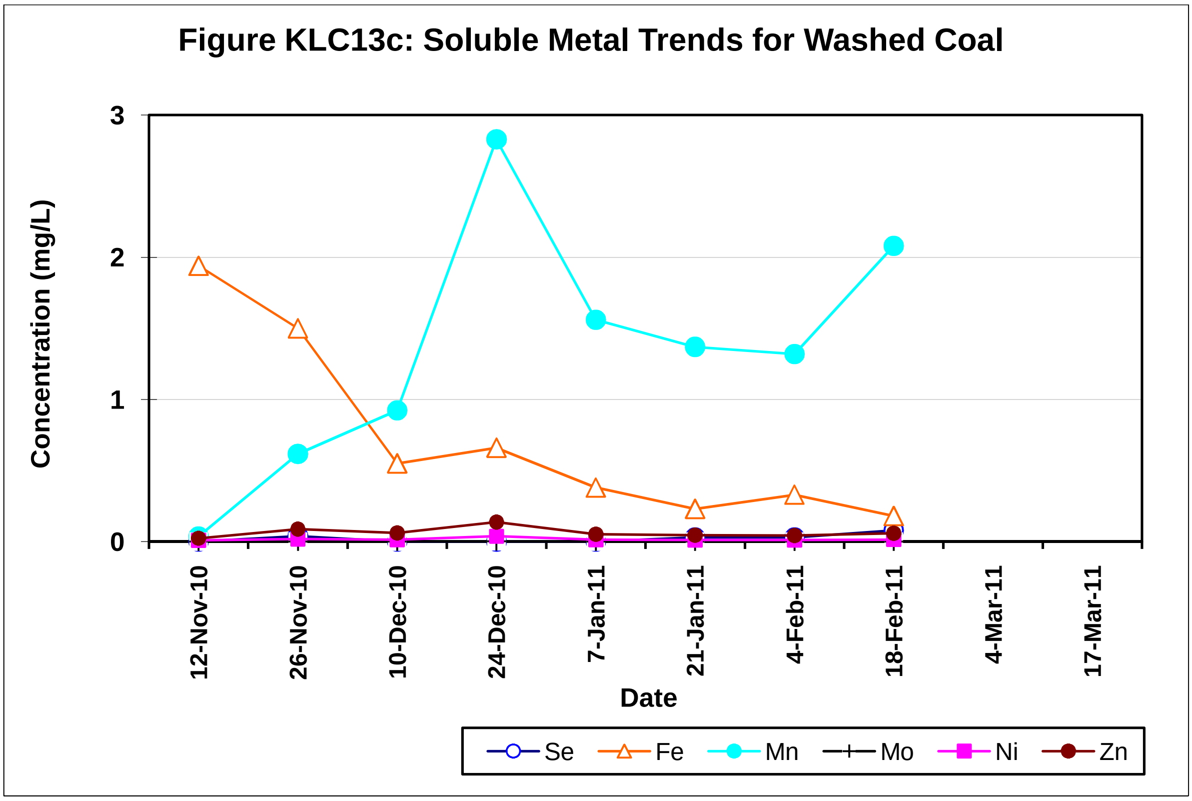


Figure KLC13c: Soluble Metal Trends for Washed Coal
Concentration (mg/L)
3
2
1
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

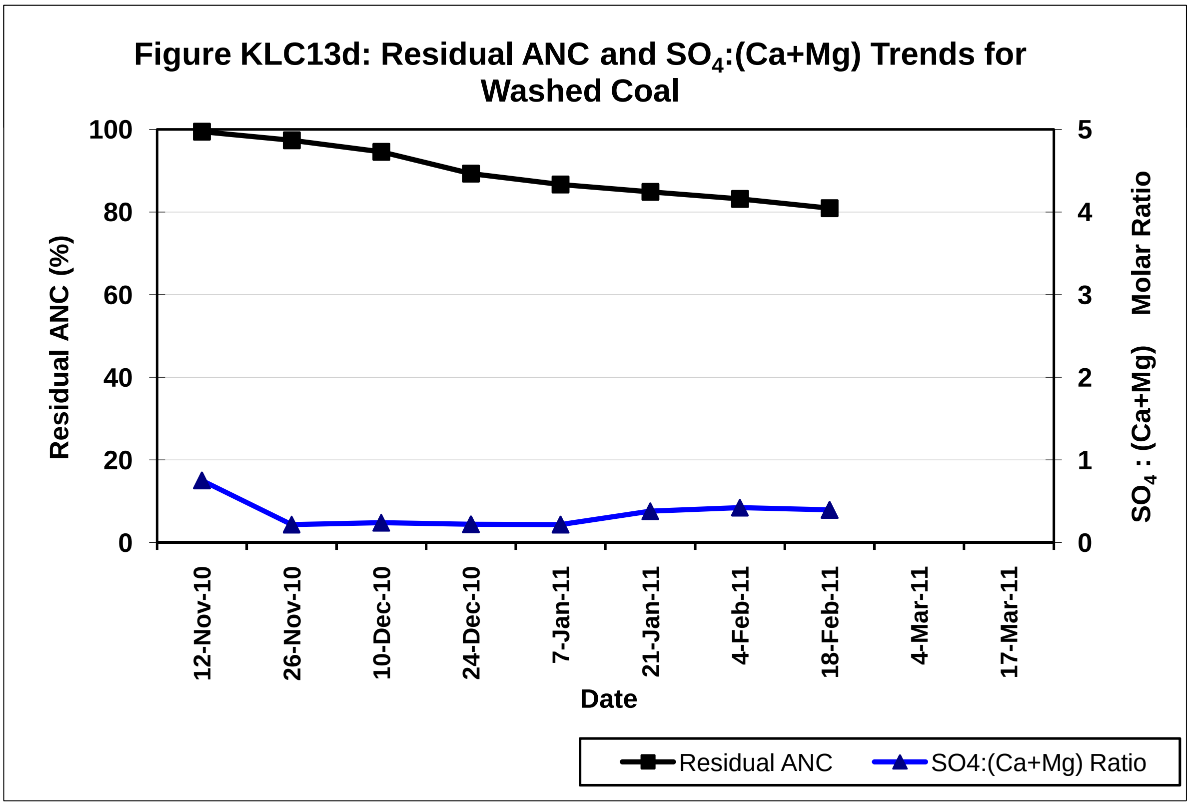


Figure KLC13d: Residual ANC and SO_4:(Ca+Mg) Trends for Washed Coal
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO_4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC14

KLC Test Results for Alpha Sample 14 (Raw Coal 1290L 201085 DU Seam)

Sample Weight (kg)	1.5	**MPA (kg H_2SO_4/t)**	9.8
pH(1:5)	7.10	**ANC (kg H_2SO_4/t)**	4.7
EC(1:5) (μS/cm)	218	**NAPP (kg H_2SO_4/t)**	5.1
Total S (%)	0.32	**ANC:MPA ratio**	0.5

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.740	0.760	0.750	0.740	0.750	0.720	0.720	0.750		
Cum. Volume (L)	0.740	1.500	2.250	2.990	3.740	4.460	5.180	5.930		
Pore Volumes	0.5	1.1	1.7	2.2	2.8	3.3	3.8	4.4		
pH	7.90	6.16	5.97	5.88	5.85	5.59	5.66	5.45		
EC (μS/cm)	74	175	170	262	216	174	127	154		
Acidity (mg/L)*	3	2	<1	<1	<1	2	2	2		
Alkalinity (mg/L)*	7	6	<1	<1	<1	1	1	1		
Net Alkalinity (mg/L)*	4	4	0	0	0	-1	-1	-1		
Dissolved elements (mg/L)										
Al	0.52	0.10	0.05	<0.01	0.10	0.02	0.09	0.05		
As	<0.001	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
B	<0.05	0.1	0.09	0.16	0.12	0.08	0.09	0.08		
Ca	3	2	2	3	3	3	2	3		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	5	8	6	10	6	3	2	3		
Co	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Fe	1.94	1.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	<1	1	1	2	2	1	1	1		
Mg	0.5	0.5	<1	<1	<1	<1	<1	<1		
Mn	0.022	0.020	0.019	0.046	0.045	0.044	0.036	0.067		
Mo	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Na	11	32	27	45	36	30	22	25		
Ni	0.009	0.018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Pb	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	23	64	58	97	77	68	50	62		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	0.06	0.04	0.07	0.05	0.03	0.02	0.03		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
RESULTS**										
SO_4 Release Rate	11	32	29	48	39	33	24	31		
Cumulative SO_4 Release	11	44	73	121	159	192	216	247		
Ca Release Rate	1.5	1.0	1.0	1.5	1.5	1.4	1.0	1.5		
Cumulative Ca Release	1.5	2.5	3.5	5.0	6.5	7.9	8.9	10.4		
Mg Release Rate	0.2	0.3	0.3	0.2	0.3	0.2	0.2	0.3		
Cumulative Mg Release	0.2	0.5	0.8	1.0	1.2	1.5	1.7	2.0		
Residual ANC (%)	100	100	100	100	100	99	99	99		
Residual Sulfur (%)	100	100	99	99	98	98	98	97		
SO_4/(Ca+Mg) molar ratio	2.5	9.5	8.6	10.6	8.4	7.4	7.4	6.8		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

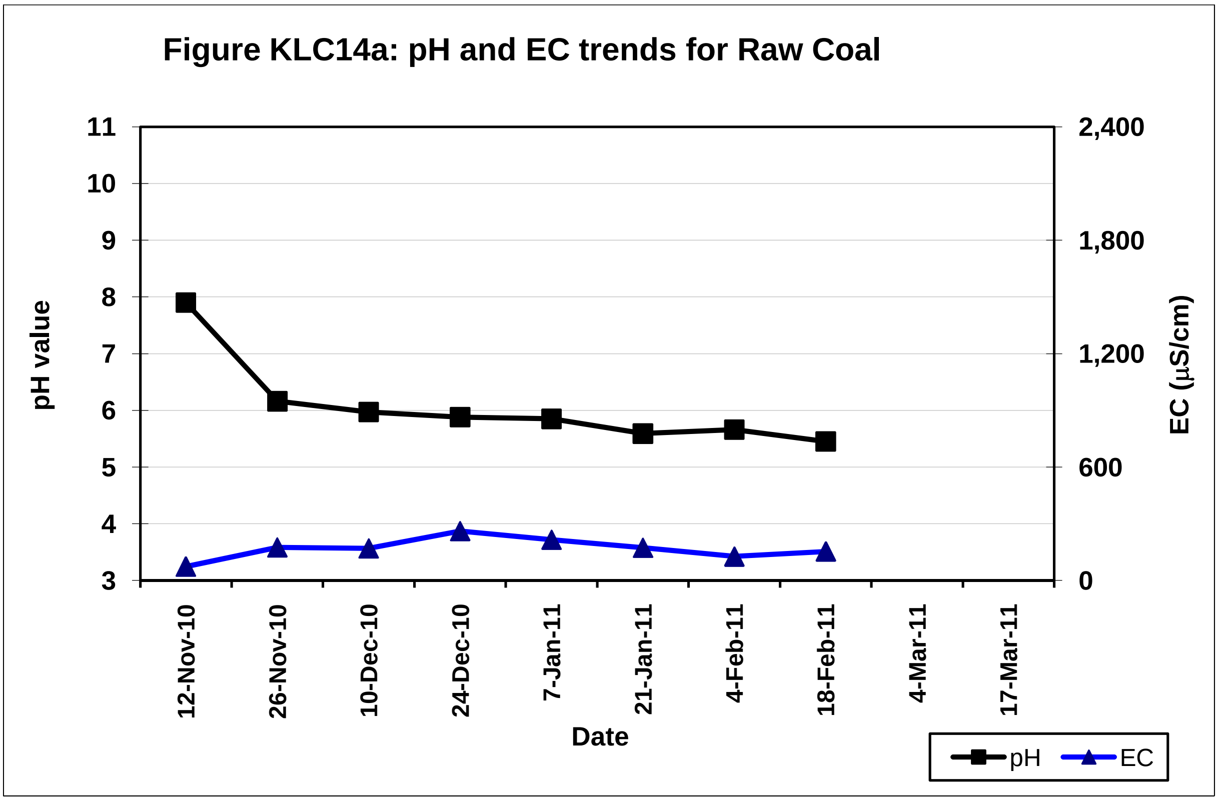


Figure KLC14a: pH and EC trends for Raw Coal
pH value
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
EC (µS/cm)
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

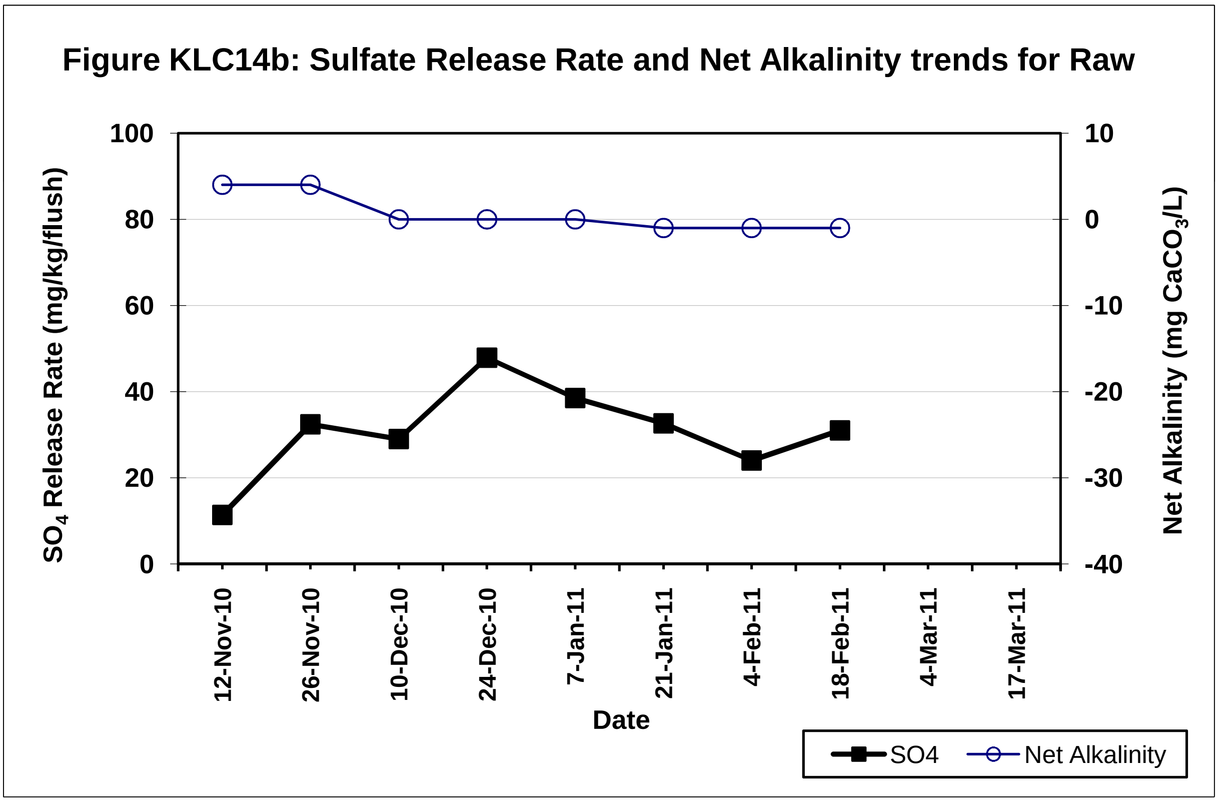


Figure KLC14b: Sulfate Release Rate and Net Alkalinity trends for Raw
SO4 Release Rate (mg/kg/flush)
100
80
60
40
20
0
10
0
-10
-20
-30
-40
Net Alkalinity (mg CaCO3/L)
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

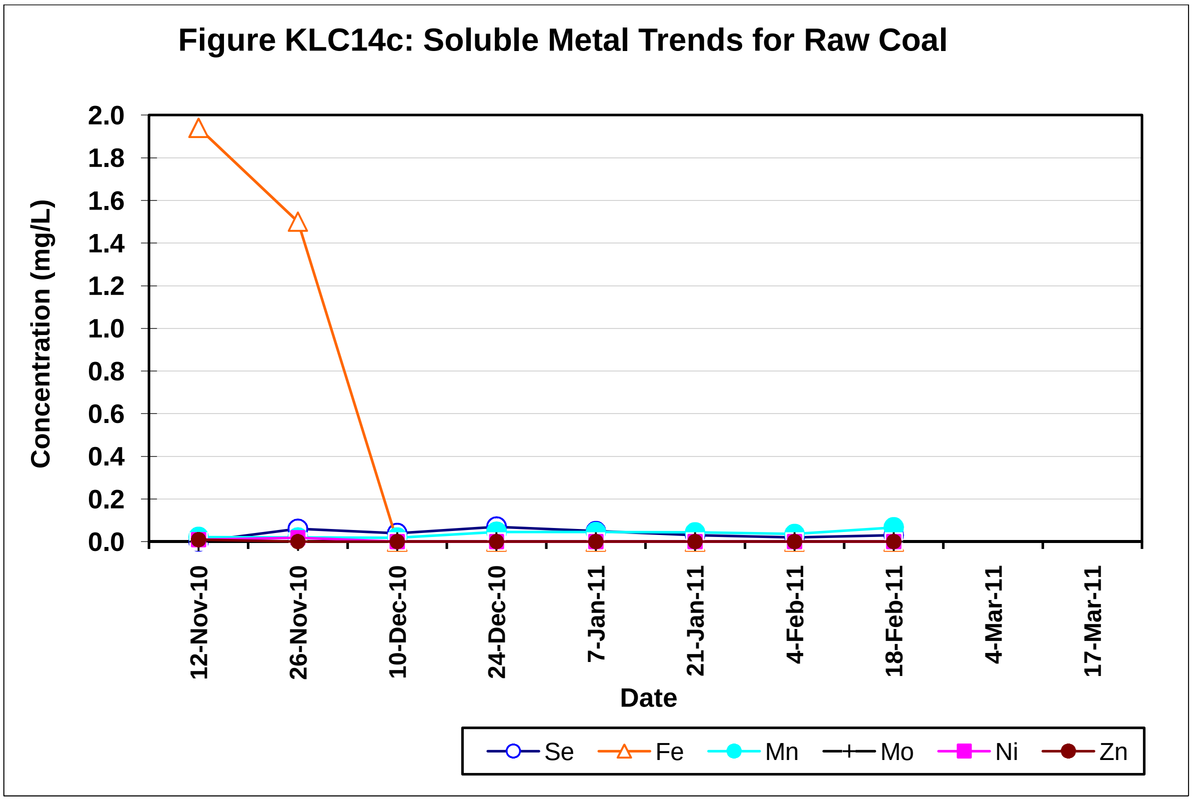


Figure KLC14c: Soluble Metal Trends for Raw Coal
Concentration (mg/L)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

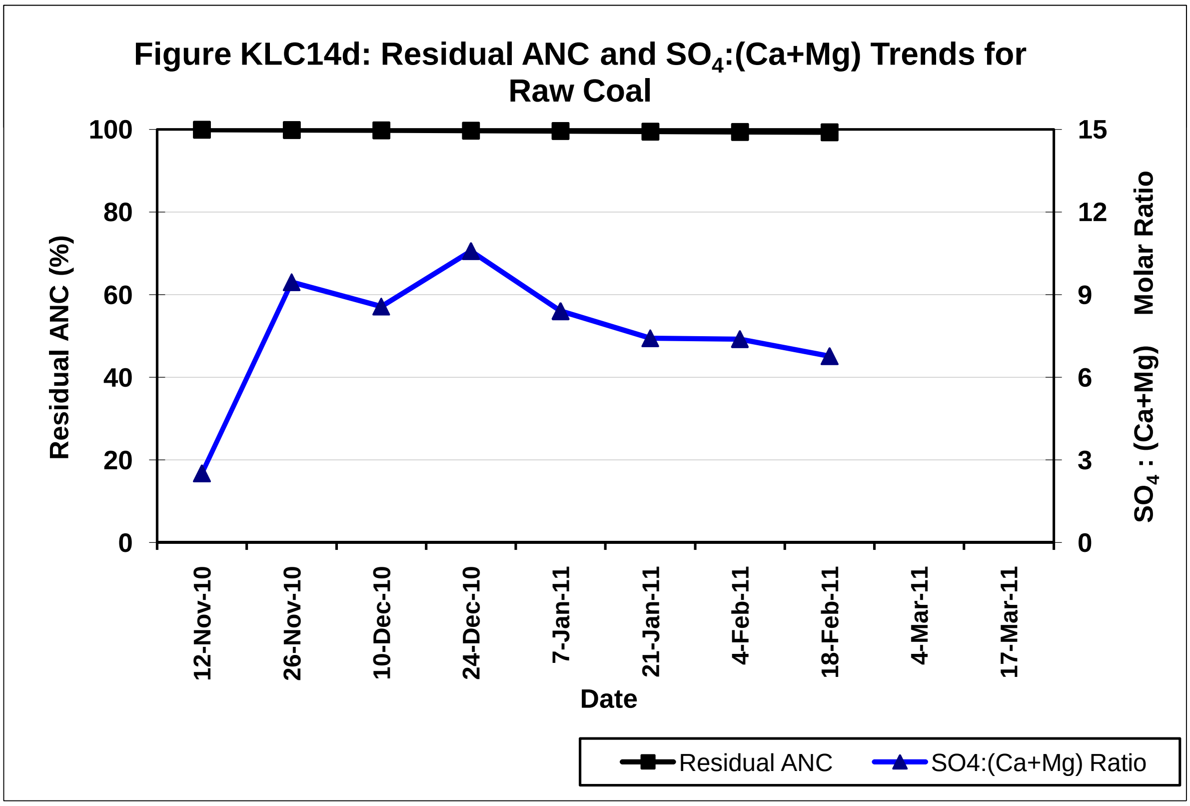


Figure KLC14d: Residual ANC and SO_4:(Ca+Mg) Trends for Raw Coal
Residual ANC (%)
100
80
60
40
20
0
15
12
9
6
3
0
SO_4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC15

KLC Test Results for Alpha Sample 15 (Washed Coal 1290L 201098 DU Seam)

Sample Weight (kg)	1.5	**MPA (kg H_2SO_4/t)**	9.2
pH(1:5)	4.80	**ANC (kg H_2SO_4/t)**	3.4
EC(1:5) (μS/cm)	417	**NAPP (kg H_2SO_4/t)**	5.8
Total S (%)	0.30	**ANC:MPA ratio**	0.4

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.860	0.850	0.860	0.820	0.760	0.750	0.780	0.760		
Cum. Volume (L)	0.860	1.710	2.570	3.390	4.150	4.900	5.680	6.440		
Pore Volumes	0.6	1.3	1.9	2.5	3.1	3.6	4.2	4.8		
pH	7.13	8.02	4.69	4.59	4.61	4.56	4.62	4.6		
EC (μS/cm)	402	335	324	491	316	277	212	245		
Acidity (mg/L)*	5	4	<1	<1	<1	6	4	4		
Alkalinity (mg/L)*	2	1	<1	<1	<1	<1	1	1		
Net Alkalinity (mg/L)*	-3	4	0	0	0	-6	-3	-3		
Dissolved elements (mg/L)										
Al	<0.01	0.02	0.01	0.02	0.01	0.01	<0.01	0.01		
As	<0.001	0.006	<0.020	<0.020	<0.020	<0.005	<0.001	0.008		
B	0.07	0.09	0.11	0.18	0.12	0.09	0.1	0.09		
Ca	25	17	18	29	17	16	12	14		
Cd	<0.0001	<0.0001	<0.0001	0.0002	0.0001	0.0001	<0.0001	0.0001		
Cl	116	89	89	141	81	65	42	56		
Co	0.009	0.009	0.008	0.013	0.008	0.008	0.006	0.008		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001		
Fe	0.06	0.1	<0.05	<0.05	0.07	0.05	0.07	<0.05		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	2	2	2	4	2	2	1	1		
Mg	5	3	4	6	4	3	2	3		
Mn	0.26	0.28	0.334	0.552	0.417	0.449	0.392	0.576		
Mo	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001		
Na	46	38	34	55	32	28	19	23		
Ni	0.004	0.003	0.003	0.005	0.004	0.004	0.003	0.004		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	22	18	18	30	21	24	19	23		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	0.01	0.04	0.02	<0.20	<0.20	0.01	<0.01	0.04		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.026	0.019	0.021	0.036	0.024	0.027	0.023	0.030		
RESULTS**										
SO_4 Release Rate	13	10	10	16	11	12	10	12		
Cumulative SO_4 Release	13	23	33	50	60	72	82	94		
Ca Release Rate	14	9.6	10	16	8.6	8.0	6.2	7.1		
Cumulative Ca Release	14	24	34	50	59	67	73	80		
Mg Release Rate	2.9	1.7	2.3	3.3	2.0	1.5	1.0	1.5		
Cumulative Mg Release	2.9	4.6	6.9	10	12	14	15	16		
Residual ANC (%)	99	98	97	95	94	94	93	92		
Residual Sulfur (%)	100	100	100	99	99	99	99	99		
SO_4/(Ca+Mg) molar ratio	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

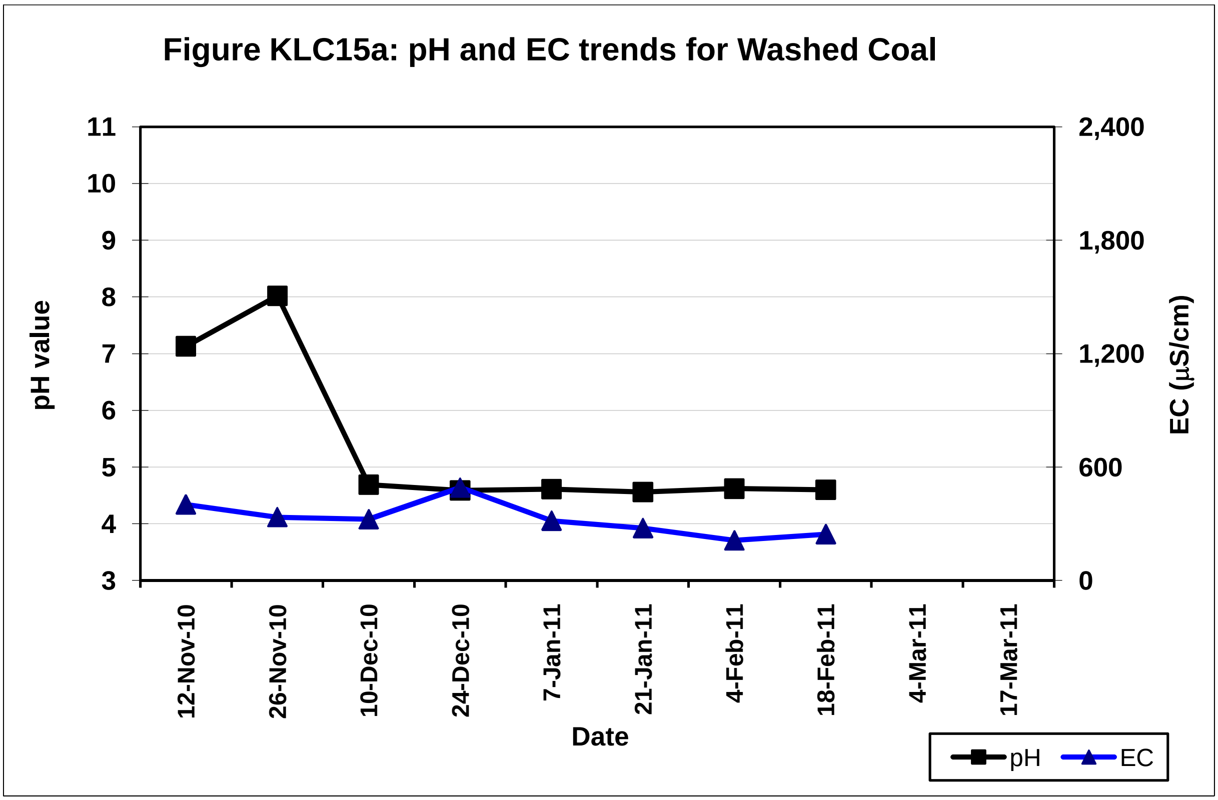


Figure KLC15a: pH and EC trends for Washed Coal
pH value
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
EC (µS/cm)
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

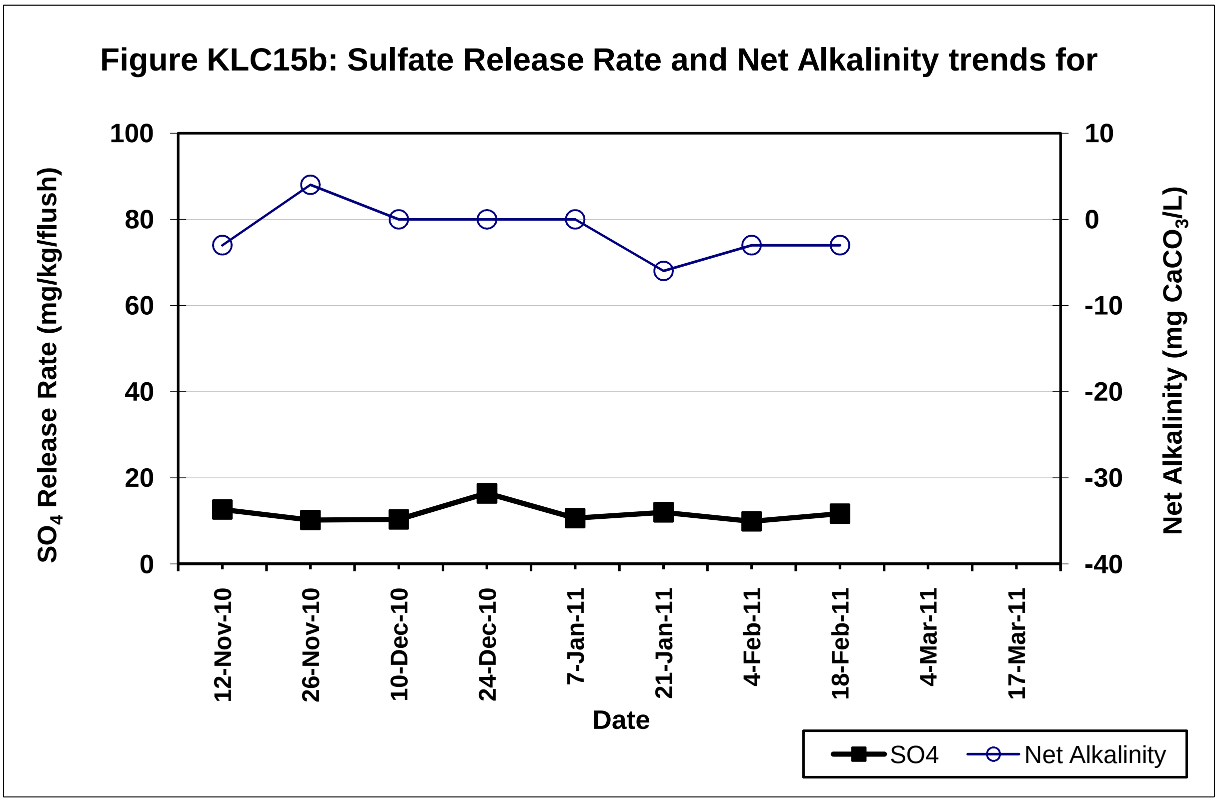


Figure KLC15b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
100
80
60
40
20
0
10
0
-10
-20
-30
-40
Net Alkalinity (mg CaCO3/L)
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

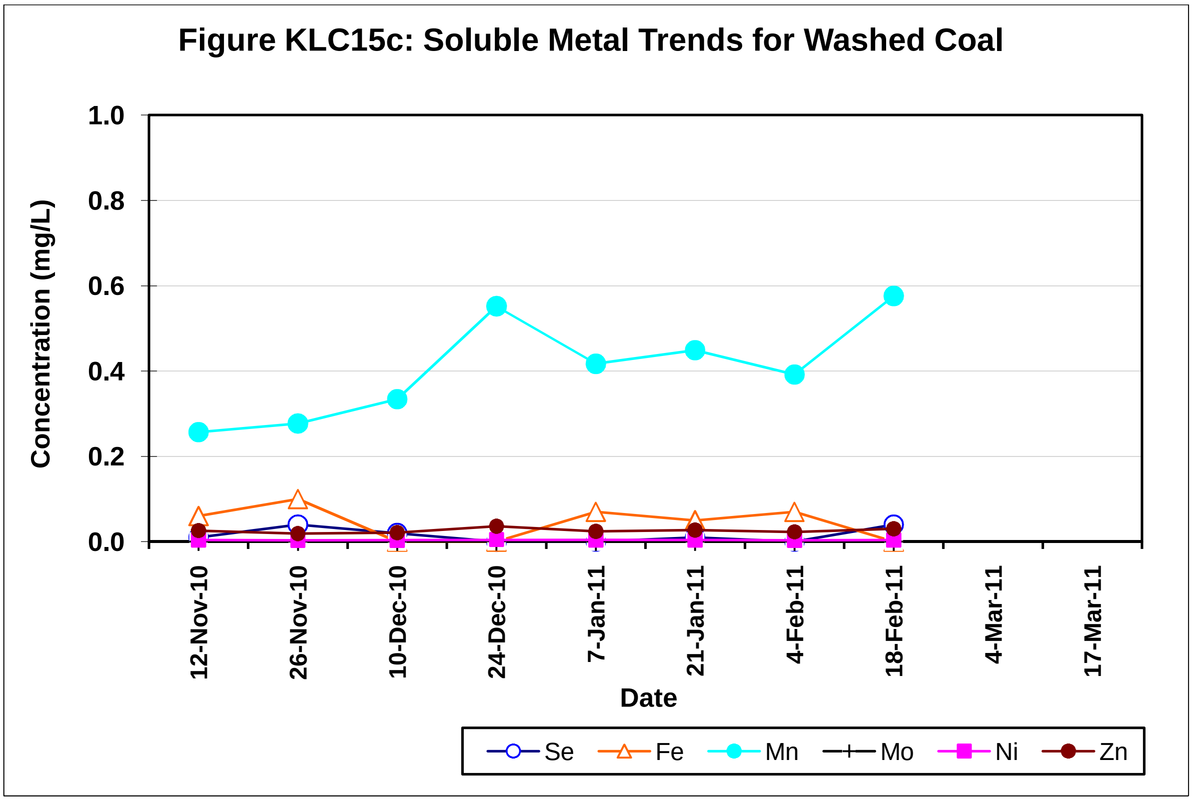


Figure KLC15c: Soluble Metal Trends for Washed Coal
Concentration (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

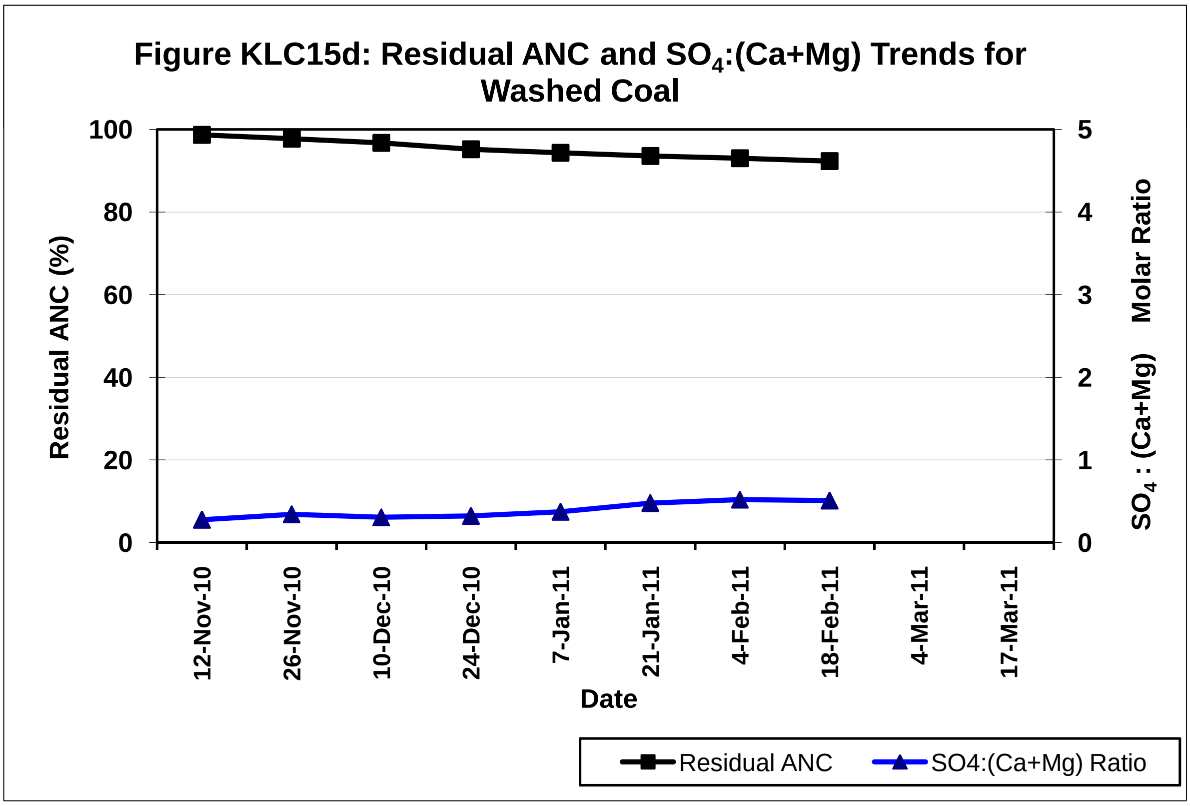


Figure KLC15d: Residual ANC and SO4:(Ca+Mg) Trends for Washed Coal
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC16

KLC Test Results for Alpha Sample 16 (Tailings 1290L 201096 DU Seam)

Sample Weight (kg)	1.2	**MPA (kg H_2SO_4/t)**	13.8
pH(1:5)	6.70	**ANC (kg H_2SO_4/t)**	6.3
EC(1:5) (μS/cm)	341	**NAPP (kg H_2SO_4/t)**	7.5
Total S (%)	0.45	**ANC:MPA ratio**	0.5

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.780	0.800	0.780	0.780	0.740	0.720	0.750	0.580		
Cum. Volume (L)	0.780	1.580	2.360	3.140	3.880	4.600	5.350	5.930		
Pore Volumes	0.7	1.4	2.1	2.7	3.4	4.0	4.7	5.2		
pH	7.95	7.08	5.99	6.24	5.72	5.35	5.33	5.15		
EC (μS/cm)	1,790	1,070	751	577	629	638	608	659		
Acidity (mg/L)*	4	3	<1	<1	<1	5	4	5		
Alkalinity (mg/L)*	60	23	<1	<1	1	1	1	1		
Net Alkalinity (mg/L)*	56	20	0	0	0	-4	-3	-4		
Dissolved elements (mg/L)										
Al	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
As	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
B	0.98	1.3	0.75	0.67	0.61	0.55	0.63	0.51		
Ca	82	44	44	38	60	68	69	74		
Cd	0.0001	<0.0001	0.0001	0.0002	0.0002	0.0004	0.0006	0.0011		
Cl	88	33	10	6	4	3	2	2		
Co	0.022	0.018	0.026	0.027	0.051	0.074	0.096	0.136		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Fe	<0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	10	8	6	6	6	5	5	4		
Mg	22	11	10	9	14	15	14	16		
Mn	0.87	0.63	0.863	0.854	1.69	2.52	3.31	5.87		
Mo	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Na	299	170	92	55	43	33	24	22		
Ni	0.011	0.006	0.008	0.01	0.018	0.029	0.041	0.064		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	732	442	327	245	291	293	279	310		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	0.27	0.11	0.04	0.02	0.03	0.03	0.04	0.03		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.101	0.140	0.230	0.243	0.474	0.734	0.974	1.650		
RESULTS**										
SO_4 Release Rate	476	295	213	159	179	176	174	150		
Cumulative SO_4 Release	476	770	983	1,142	1,322	1,498	1,672	1,822		
Ca Release Rate	53	29	29	25	37	41	43	36		
Cumulative Ca Release	53	83	111	136	173	214	257	293		
Mg Release Rate	14	7.3	6.5	5.9	8.6	9.0	8.8	7.7		
Cumulative Mg Release	14	22	28	34	43	52	60	68		
Residual ANC (%)	97	95	94	93	91	88	86	84		
Residual Sulfur (%)	96	94	93	92	90	89	88	86		
SO_4/(Ca+Mg) molar ratio	2.6	3.0	2.3	1.9	1.5	1.3	1.3	1.3		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

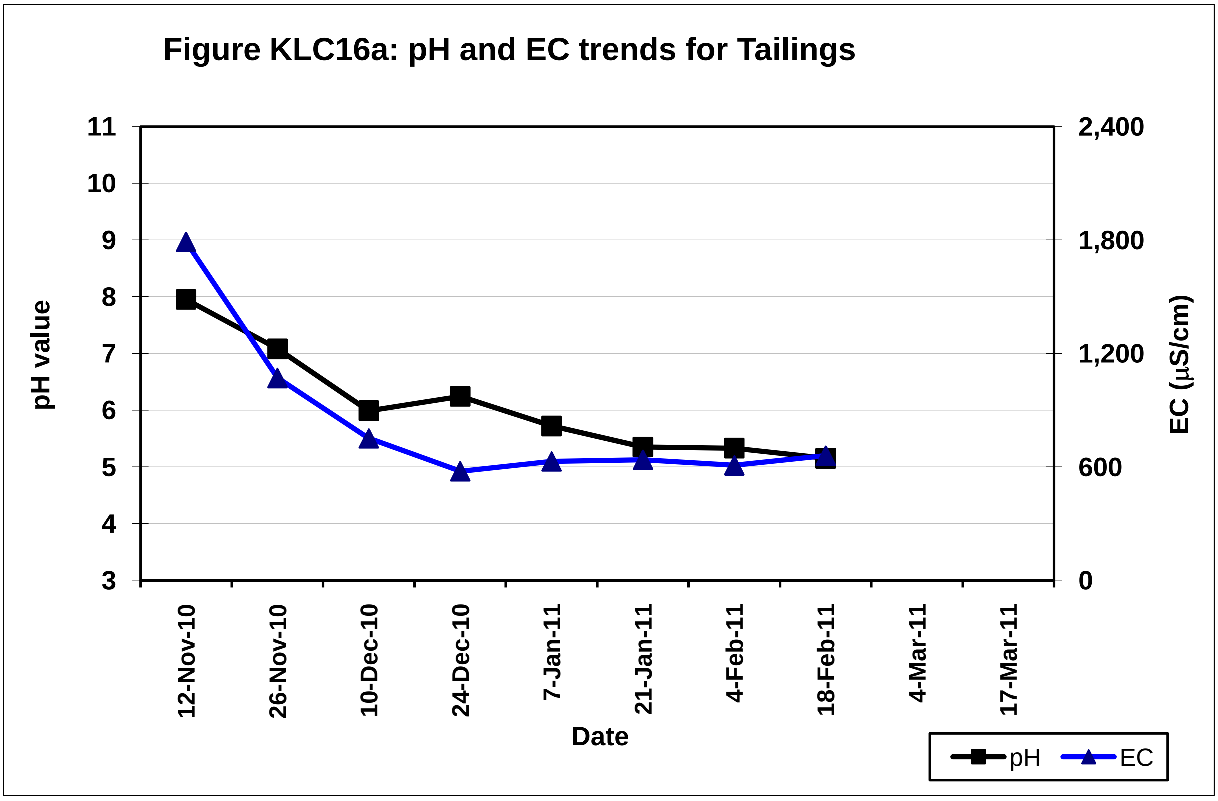


Figure KLC16a: pH and EC trends for Tailings
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

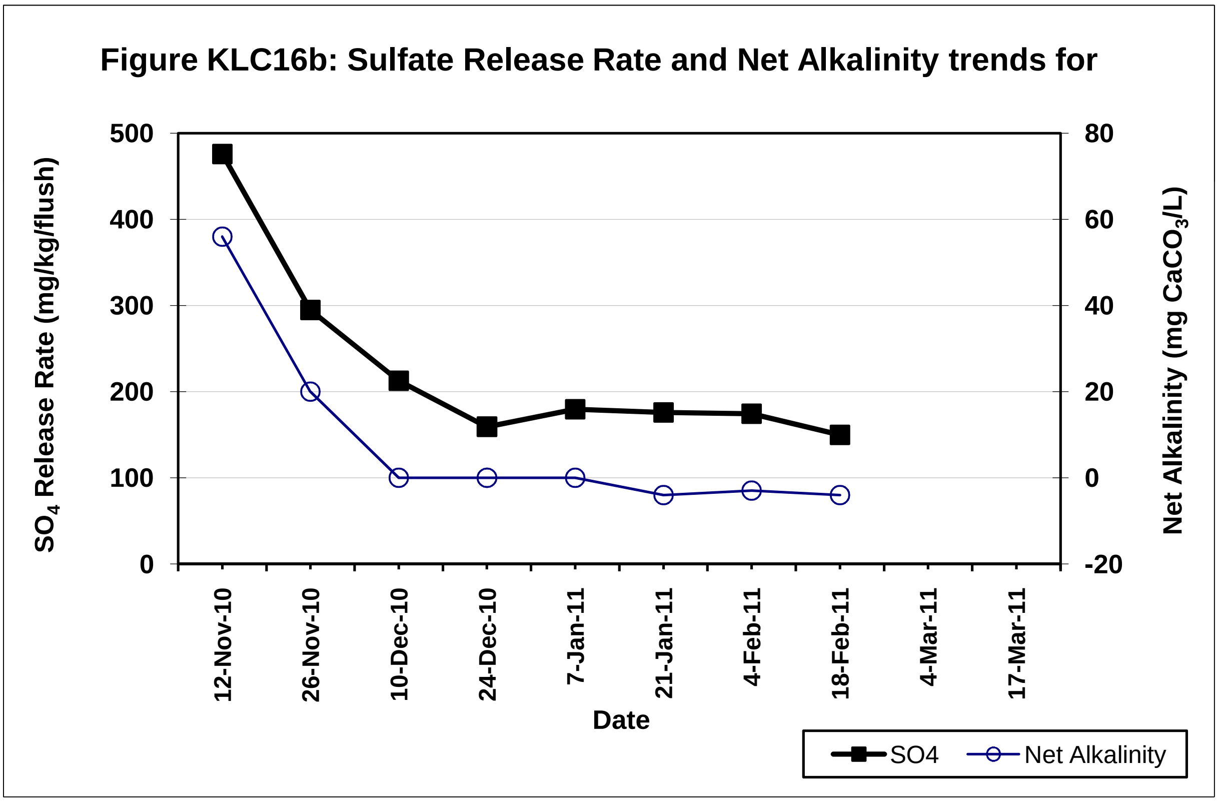


Figure KLC16b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
500
400
300
200
100
0
80
60
40
20
0
-20
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

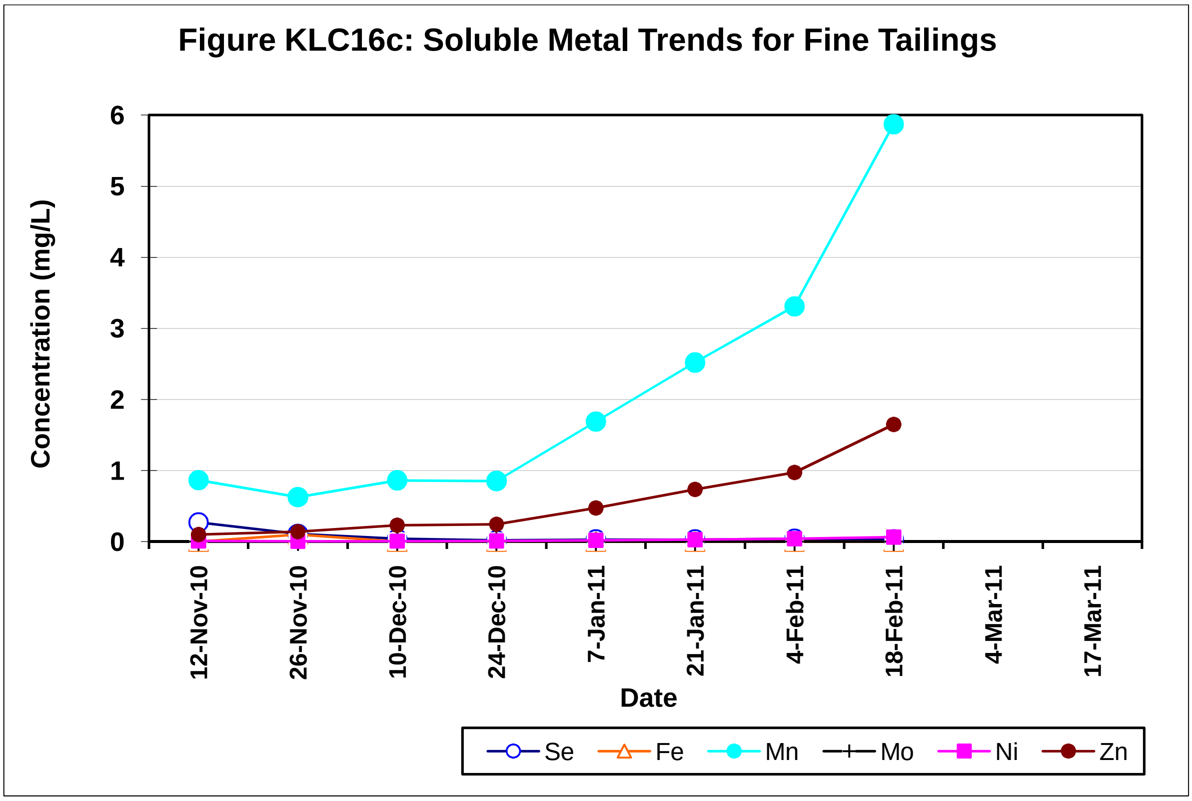


Figure KLC16c: Soluble Metal Trends for Fine Tailings
Concentration (mg/L)
0
1
2
3
4
5
6
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

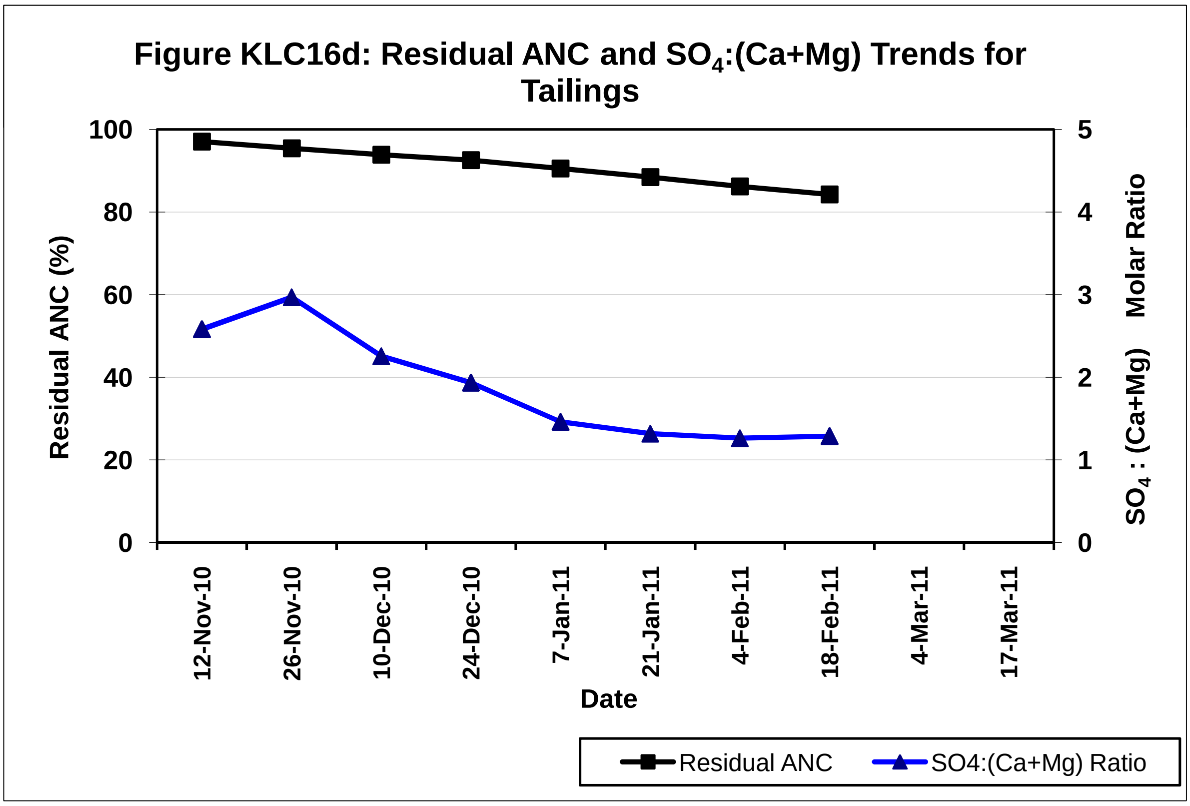


Figure KLC16d: Residual ANC and SO_4:(Ca+Mg) Trends for Tailings
Residual ANC (%)
0
20
40
60
80
100
SO_4 : (Ca+Mg) Molar Ratio
0
1
2
3
4
5
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC17

KLC Test Results for Alpha Sample 17 (Raw Coal 1290L 201105 DL Seam)

Sample Weight (kg)	1.5	**MPA (kg H_2SO_4/t)**	5.8
pH(1:5)	7.30	**ANC (kg H_2SO_4/t)**	6.8
EC(1:5) (μS/cm)	144	**NAPP (kg H_2SO_4/t)**	-1
Total S (%)	0.19	**ANC:MPA ratio**	1.2

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.800	0.840	0.820	0.800	0.750	0.760	0.780	0.800		
Cum. Volume (L)	0.800	1.640	2.460	3.260	4.010	4.770	5.550	6.350		
Pore Volumes	0.6	1.2	1.8	2.4	3.0	3.5	4.1	4.7		
pH	5.65	7.51	6.59	6.6	6.62	6.46	6.57	6.44		
EC (μS/cm)	50	96	110	126	127	112	106	93		
Acidity (mg/L)*	5	2	<1	<1	<1	2	2	2		
Alkalinity (mg/L)*	8	6	2	2	3	2	2	29		
Net Alkalinity (mg/L)*	3	4	2	2	3	0	0	27		
Dissolved elements (mg/L)										
Al	0.4	0.28	0.13	0.07	0.36	0.04	0.14	0.15		
As	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
B	<0.05	0.16	0.13	0.2	0.15	0.13	0.17	0.14		
Ca	2	1	<1	<1	<1	<1	<1	<1		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	4	7	6	8	7	5	4	4		
Co	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Fe	0.08	<0.05	<0.05	<0.05	0.09	<0.05	<0.05	<0.05		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	<1	<1	<1	<1	<1	<1	<1	<1		
Mg	0.5	0.5	<1	<1	<1	<1	<1	<1		
Mn	0.01	0.01	0.007	0.008	0.009	0.011	0.011	0.012		
Mo	0.002	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001		
Na	8	19	18	20	21	21	19	18		
Ni	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	13	29	32	37	37	38	37	35		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	0.02	<0.01	0.02	0.02	0.02	0.02	0.01		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
RESULTS**										
SO_4 Release Rate	6.9	16	17	20	19	19	19	19		
Cumulative SO_4 Release	6.9	23	41	60	79	98	117	136		
Ca Release Rate	1.1	0.6	0.3	0.3	0.3	0.3	0.3	0.3		
Cumulative Ca Release	1.1	1.6	1.9	2.2	2.4	2.7	2.9	3.2		
Mg Release Rate	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3		
Cumulative Mg Release	0.3	0.5	0.8	1.1	1.3	1.6	1.9	2.1		
Residual ANC (%)	100	100	100	100	100	100	100	100		
Residual Sulfur (%)	100	100	99	99	99	98	98	98		
SO_4/(Ca+Mg) molar ratio	1.9	6.6	10.1	11.7	11.7	12.0	11.7	11.0		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

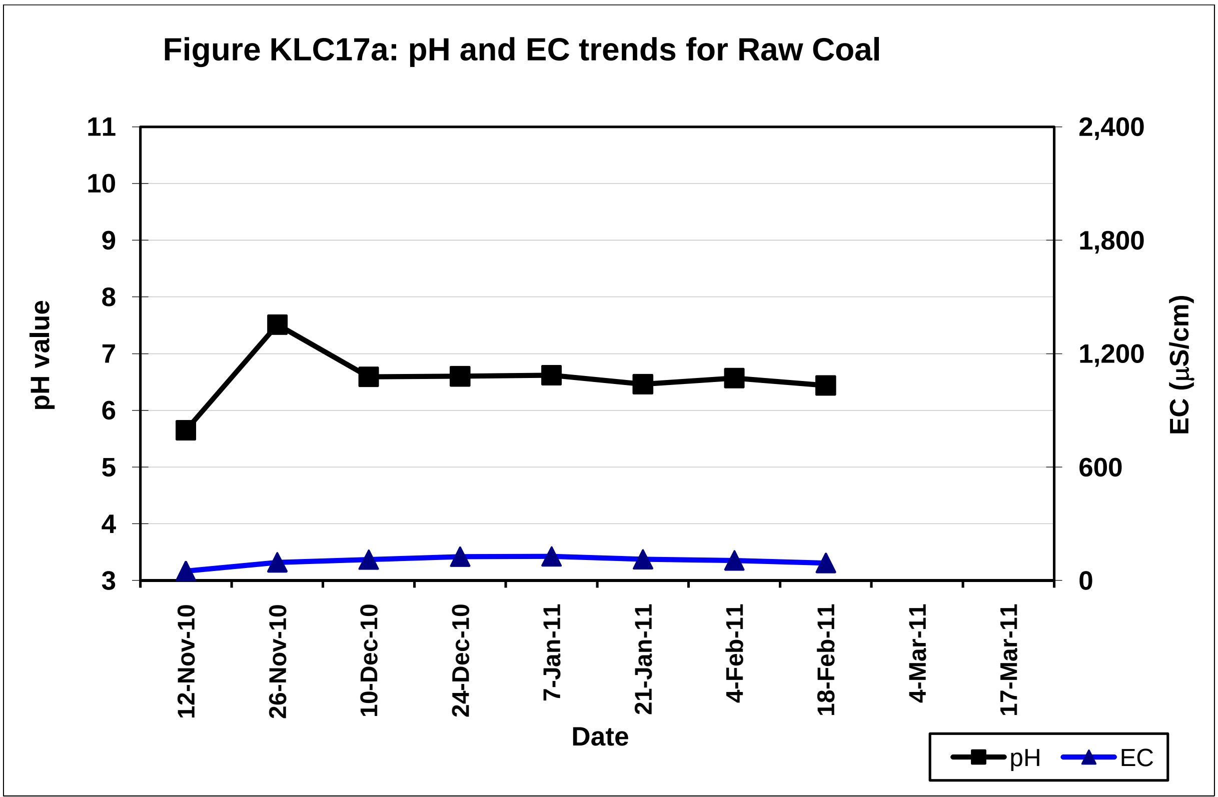


Figure KLC17a: pH and EC trends for Raw Coal
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

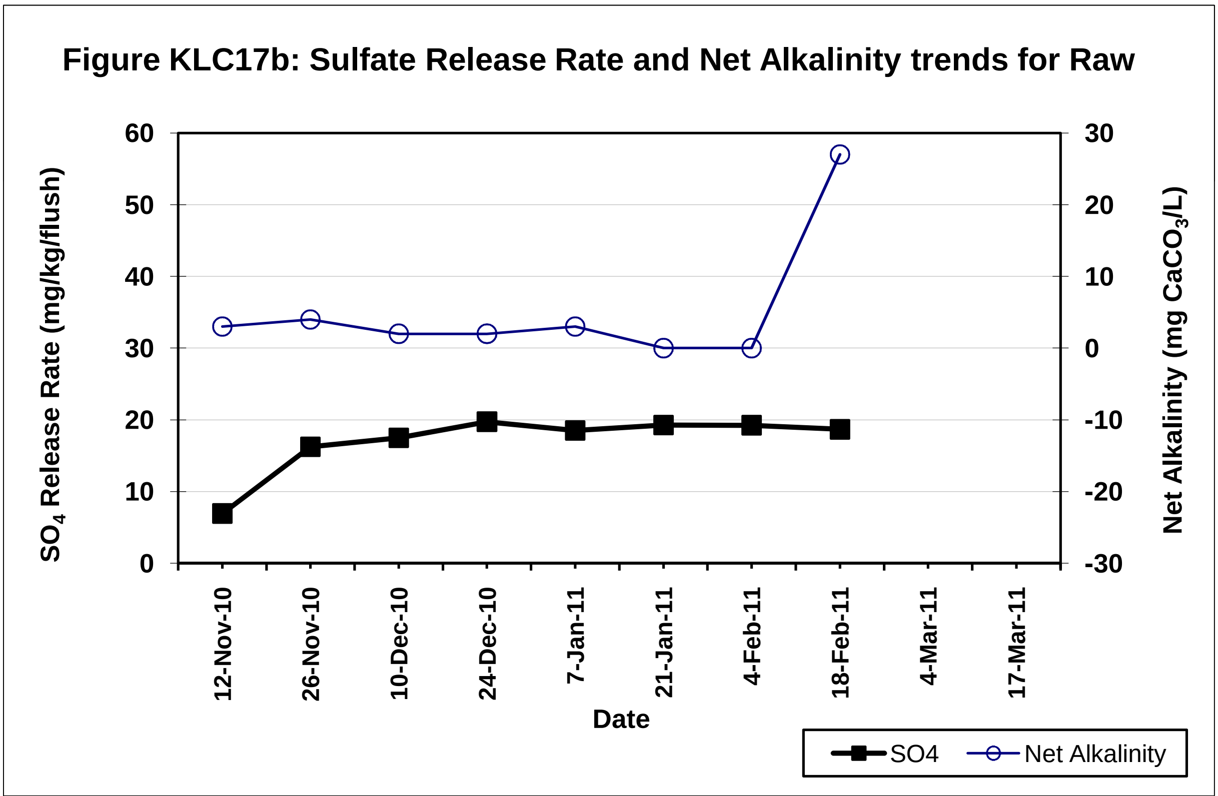


Figure KLC17b: Sulfate Release Rate and Net Alkalinity trends for Raw
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
60
50
40
30
20
10
0
30
20
10
0
-10
-20
-30
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

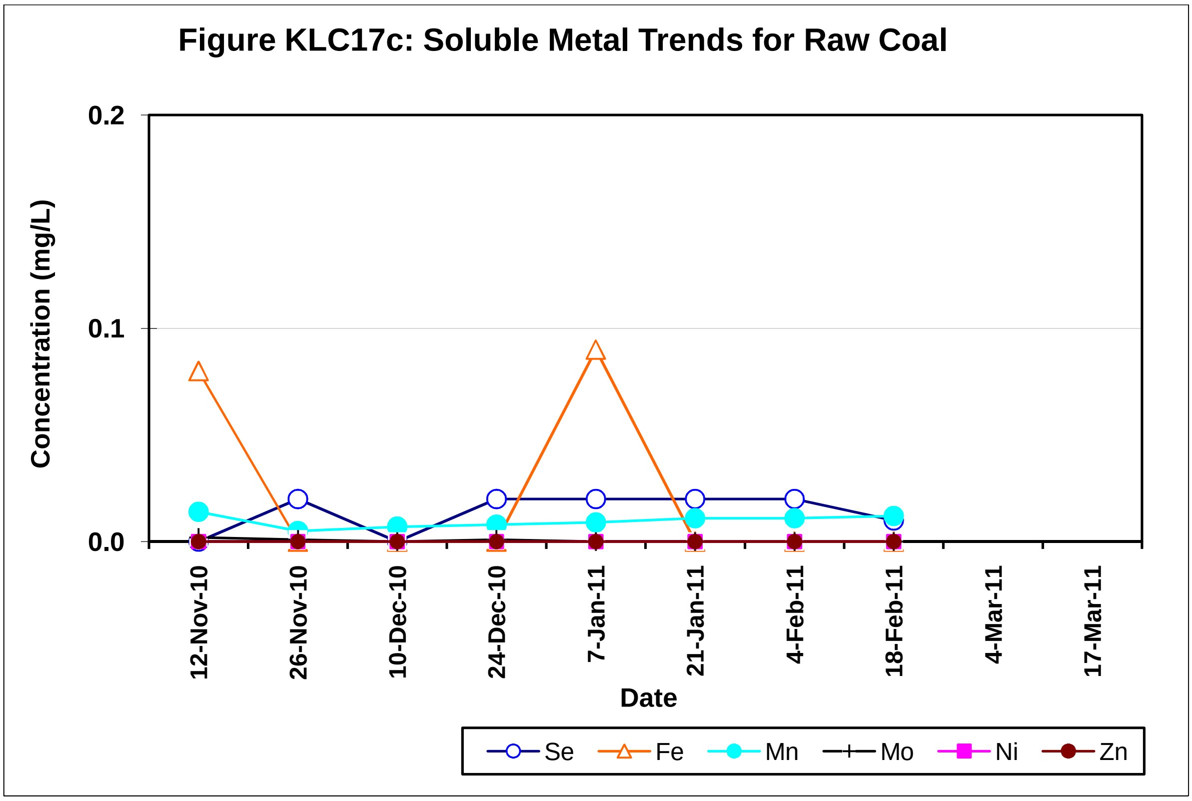


Figure KLC17c: Soluble Metal Trends for Raw Coal
Concentration (mg/L)
0.2
0.1
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

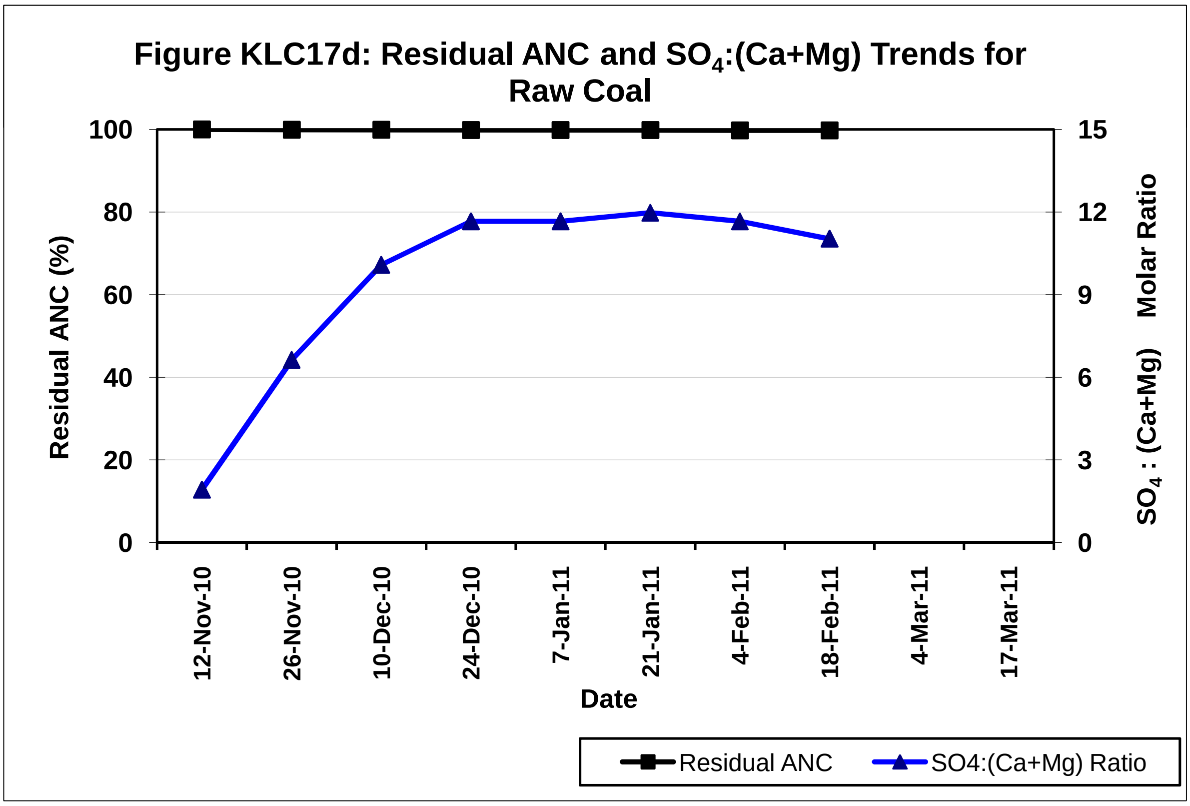


Figure KLC17d: Residual ANC and SO_4:(Ca+Mg) Trends for Raw Coal
Residual ANC (%)
100
80
60
40
20
0
15
12
9
6
3
0
SO_4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC18

KLC Test Results for Alpha Sample 18 (Washed Coal 1290L 201118 DL Seam)

Sample Weight (kg)	1.5	**MPA (kg H_2SO_4/t)**	4.6
pH(1:5)	4.20	**ANC (kg H_2SO_4/t)**	2.8
EC(1:5) (µS/cm)	480	**NAPP (kg H_2SO_4/t)**	1.8
Total S (%)	0.15	**ANC:MPA ratio**	0.6

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.600	0.620	0.600	0.700	0.600	0.520	0.600	0.780		
Cum. Volume (L)	0.600	1.220	1.820	2.520	3.120	3.640	4.240	5.020		
Pore Volumes	0.4	0.9	1.3	1.9	2.3	2.7	3.1	3.7		
pH	6.04	4.46	4.23	4.06	4.1	4.02	4.03	4.1		
EC (µS/cm)	251	226	263	687	365	303	286	388		
Acidity (mg/L)*	4	3	<1	<1	<1	9	7	9		
Alkalinity (mg/L)*	3	<1	<1	<1	<1	<1	<1	<1		
Net Alkalinity (mg/L)*	-1	-3	0	0	0	-9	-7	-9		
Dissolved elements (mg/L)										
Al	<0.01	0.02	0.03	0.07	0.04	0.02	0.02	0.04		
As	0.002	0.002	0.002	<0.020	<0.020	<0.005	<0.001	0.019		
B	<0.05	0.06	0.06	0.19	0.08	0.06	0.08	0.1		
Ca	16	13	19	44	22	18	16	23		
Cd	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	73	61	81	216	100	83	72	117		
Co	0.002	0.002	0.002	0.004	0.002	0.002	0.002	0.002		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	<0.001	<0.001	0.001	0.002	<0.001	<0.001	<0.001	0.001		
Fe	0.14	0.11	0.11	0.22	0.1	0.07	0.09	0.07		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	1	<1	1	2	1	1	<1	1		
Mg	3	2	3	7	4	3	2	4		
Mn	0.21	0.20	0.239	0.699	0.352	0.341	0.352	0.572		
Mo	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	<0.001		
Na	23	21	23	59	31	25	21	31		
Ni	<0.001	0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001		
Pb	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001		
SO_4	4	3	4	8	4	5	5	7		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	<0.01	0.01	0.01	0.04	<0.20	<0.01	<0.01	0.07		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	0.017	0.011	0.01	0.021	0.008	0.011	0.013	0.012		
RESULTS**										
SO_4 Release Rate	1.6	1.2	1.6	3.7	1.6	1.7	2.0	3.6		
Cumulative SO_4 Release	1.6	2.8	4.4	8.2	9.8	12	13.5	17.1		
Ca Release Rate	6.4	5.4	7.6	21	8.8	6.2	6.4	12.0		
Cumulative Ca Release	6.4	12	19	40	49	55	61	73		
Mg Release Rate	1.2	0.8	1.2	3.3	1.6	1.0	0.8	2.1		
Cumulative Mg Release	1.2	2.0	3.2	6.5	8.1	9.1	9.9	12.0		
Residual ANC (%)	99	99	98	96	95	94	93	92		
Residual Sulfur (%)	100	100	100	100	100	100	100	100		
SO_4/(Ca+Mg) molar ratio	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

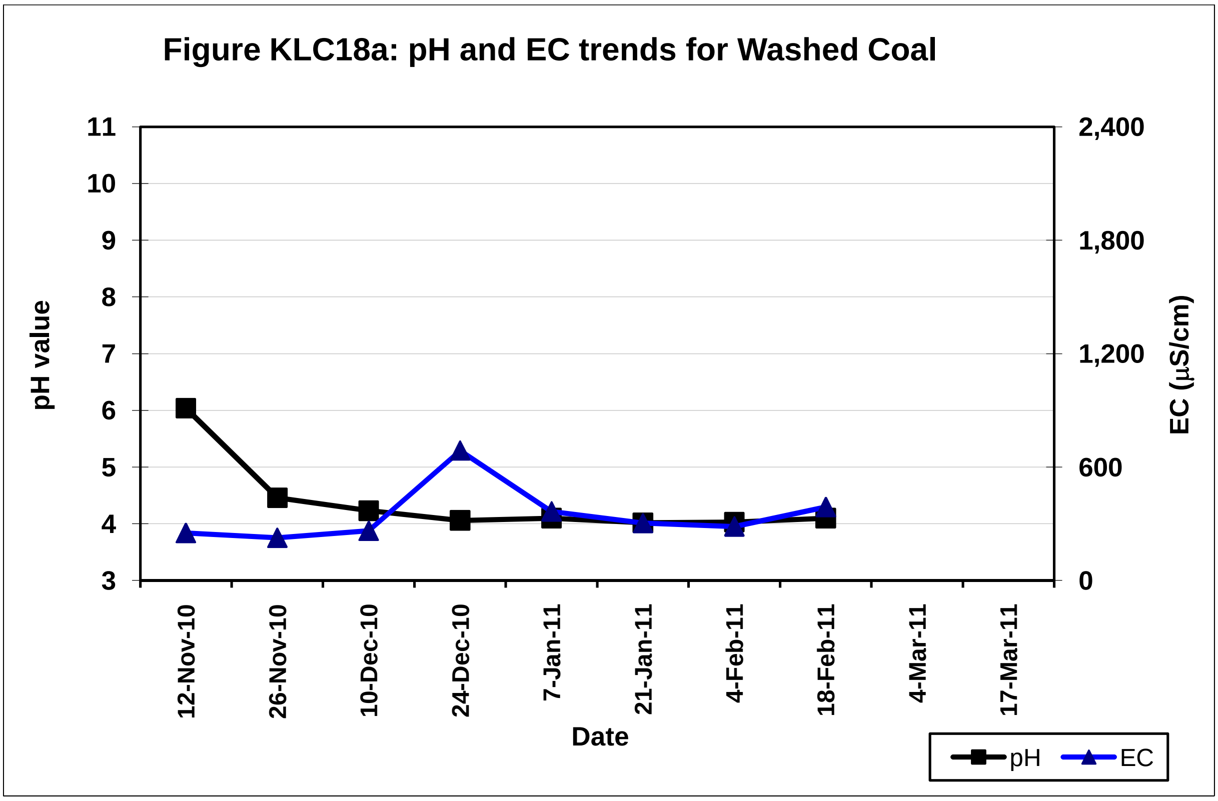


Figure KLC18a: pH and EC trends for Washed Coal
pH value
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
EC (µS/cm)
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

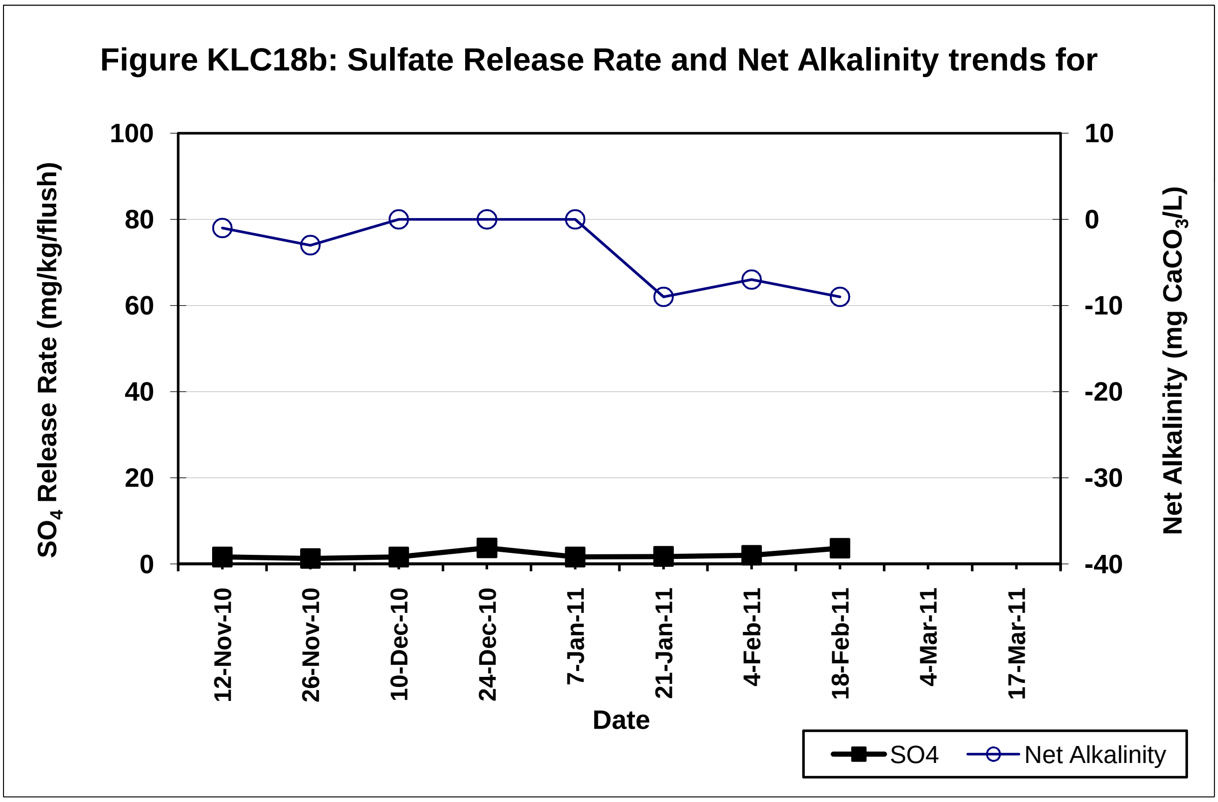


Figure KLC18b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
100
80
60
40
20
0
10
0
-10
-20
-30
-40
Net Alkalinity (mg CaCO3/L)
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

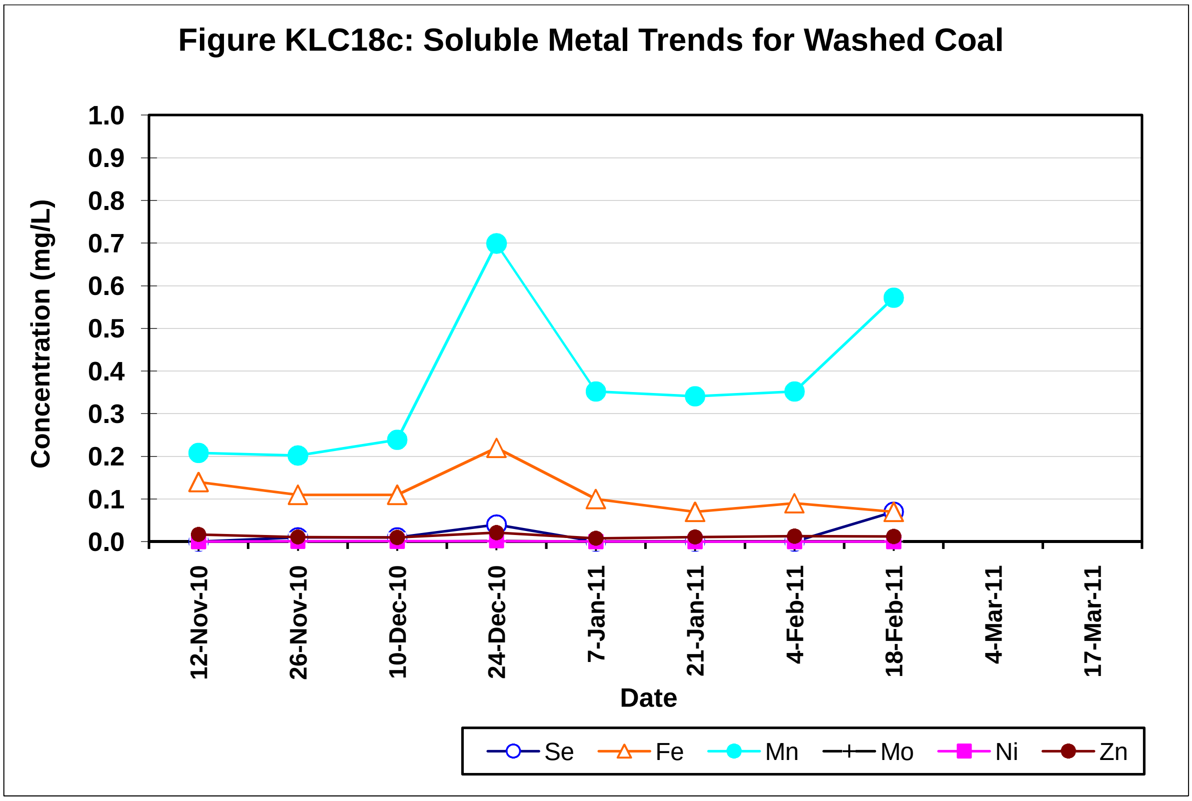


Figure KLC18c: Soluble Metal Trends for Washed Coal
Concentration (mg/L)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

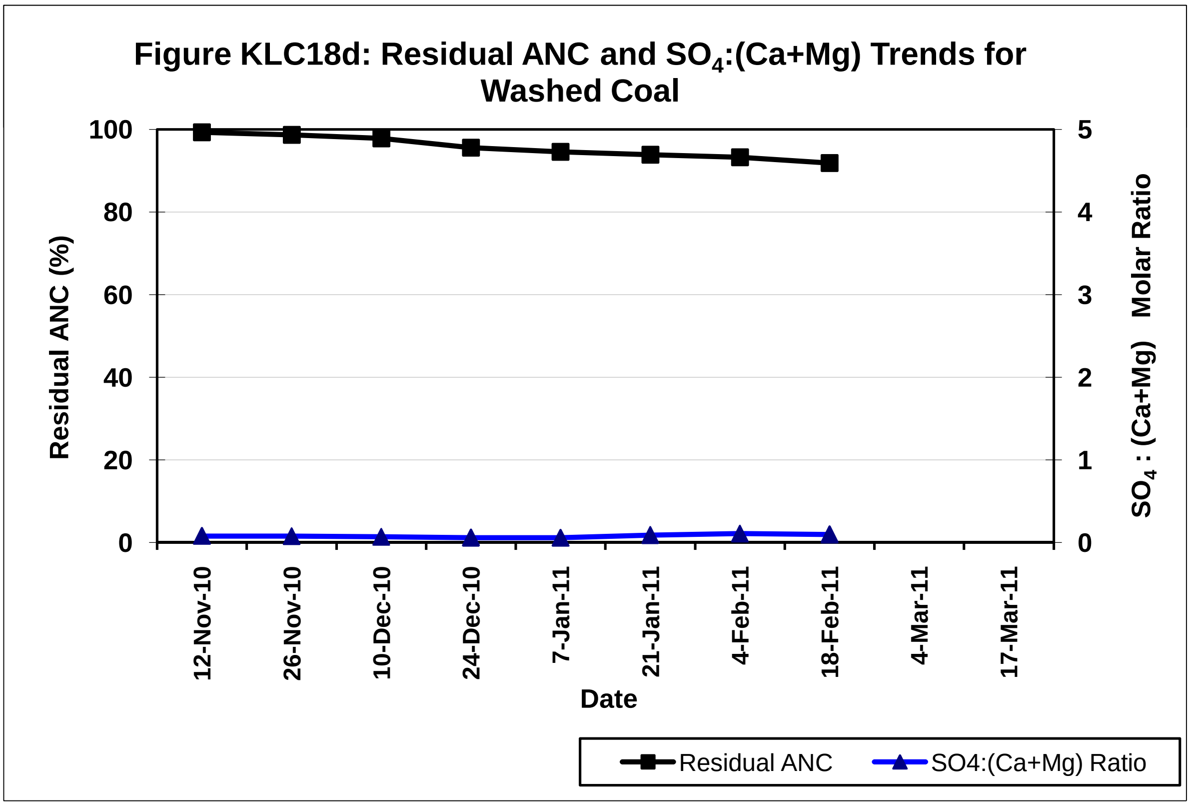


Figure KLC18d: Residual ANC and SO_4:(Ca+Mg) Trends for Washed Coal
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO_4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC19

KLC Test Results for Alpha Sample 19 (Coarse Reject 1290L 201119 DL Seam and Crushed Limestone)

Sample Weight (kg)	1.8	**MPA (kg H_2SO_4/t)**	4.3
pH(1:5)	4.00	**ANC (kg H_2SO_4/t)**	2.4
EC(1:5) (µS/cm)	875	**NAPP (kg H_2SO_4/t)**	1.9
Total S (%)	0.34	**ANC:MPA ratio**	0.6

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.820	0.800	0.820	0.800	0.780	0.740	0.780	0.760		
Cum. Volume (L)	0.820	1.620	2.440	3.240	4.020	4.760	5.540	6.300		
Pore Volumes	0.6	1.2	1.8	2.4	3.0	3.5	4.1	4.7		
pH	7.97	7.71	7.51	7.55	7.52	7.31	7.25	7.52		
EC (µS/cm)	612	1,930	1,410	1,750	1,230	1,130	1,030	1,010		
Acidity (mg/L)*	5	1	<1	<1	<1	3	2	2		
Alkalinity (mg/L)*	97	47	18	22	18	13	12	42		
Net Alkalinity (mg/L)*	92	46	18	22	18	10	10	40		
Dissolved elements (mg/L)										
Al	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
As	0.004	0.06	<0.020	0.027	<0.020	0.025	<0.001	0.041		
B	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	0.05	<0.05		
Ca	69	243	185	218	170	146	135	124		
Cd	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	117	855	532	623	396	396	310	313		
Co	0.001	0.002	0.001	0.001	0.001	0.001	<0.001	<0.001		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Fe	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	4	7	5	5	4	3	3	2		
Mg	5	19	14	15	12	10	9	8		
Mn	0.48	1.15	0.811	1.04	0.893	0.918	0.74	0.855		
Mo	<0.001	<0.001	0.006	0.008	0.004	<0.001	0.004	<0.001		
Na	46	87	55	61	48	37	33	30		
Ni	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	40	68	66	63	63	81	90	88		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	0.02	0.01	<0.20	<0.20	<0.20	0.1	<0.01	0.16		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
RESULTS**										
SO_4 Release Rate	18	30	30	28	27	33	39	37		
Cumulative SO_4 Release	18	48	79	107	134	167	206	243		
Ca Release Rate	31	108	84	97	74	60	59	52		
Cumulative Ca Release	31	139	224	321	394	454	513	565		
Mg Release Rate	2.3	8.4	6.4	6.7	5.2	4.1	3.9	3.4		
Cumulative Mg Release	2.3	11	17	24	29	33	37	40		
Residual ANC (%)	96	84	74	63	55	48	42	36		
Residual Sulfur (%)	100	100	99	99	99	98	98	98		
SO_4/(Ca+Mg) molar ratio	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.3		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

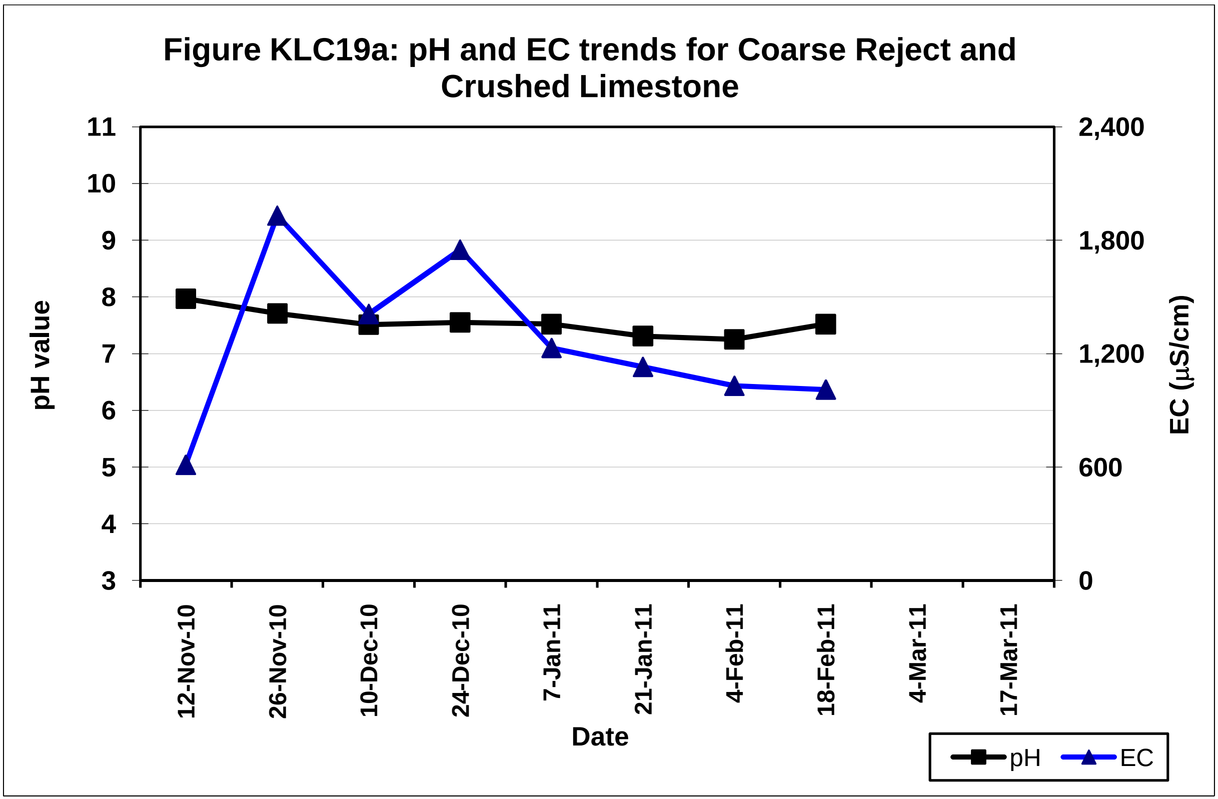


Figure KLC19a: pH and EC trends for Coarse Reject and Crushed Limestone
pH value
EC (µS/cm)
11
10
9
8
7
6
5
4
3
2,400
1,800
1,200
600
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

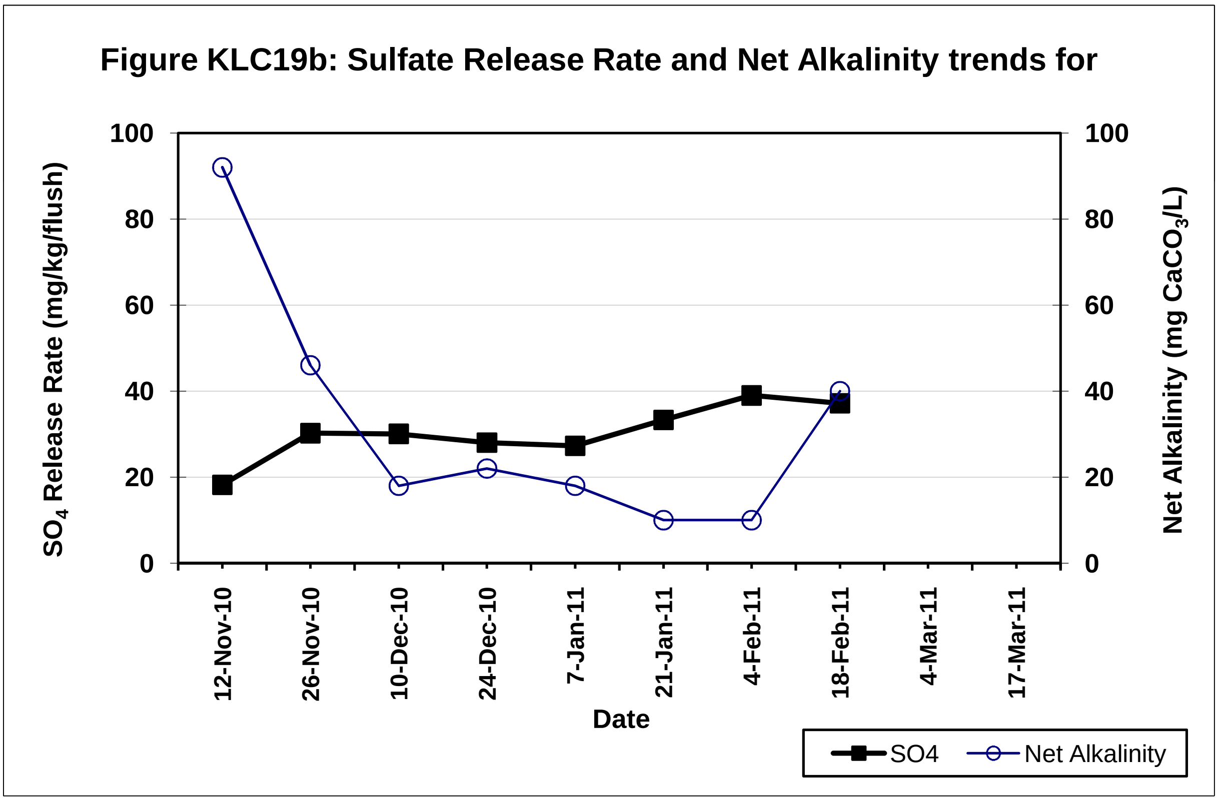


Figure KLC19b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
100
80
60
40
20
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

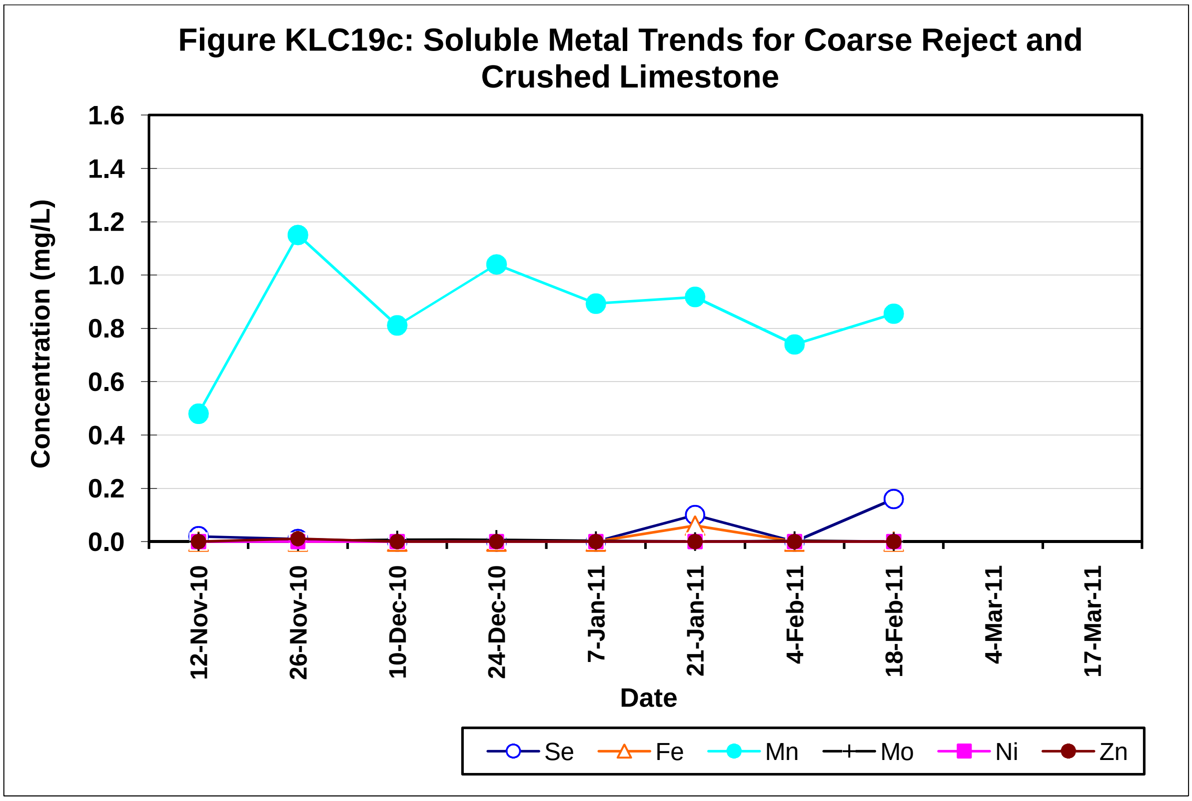


Figure KLC19c: Soluble Metal Trends for Coarse Reject and Crushed Limestone
Concentration (mg/L)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

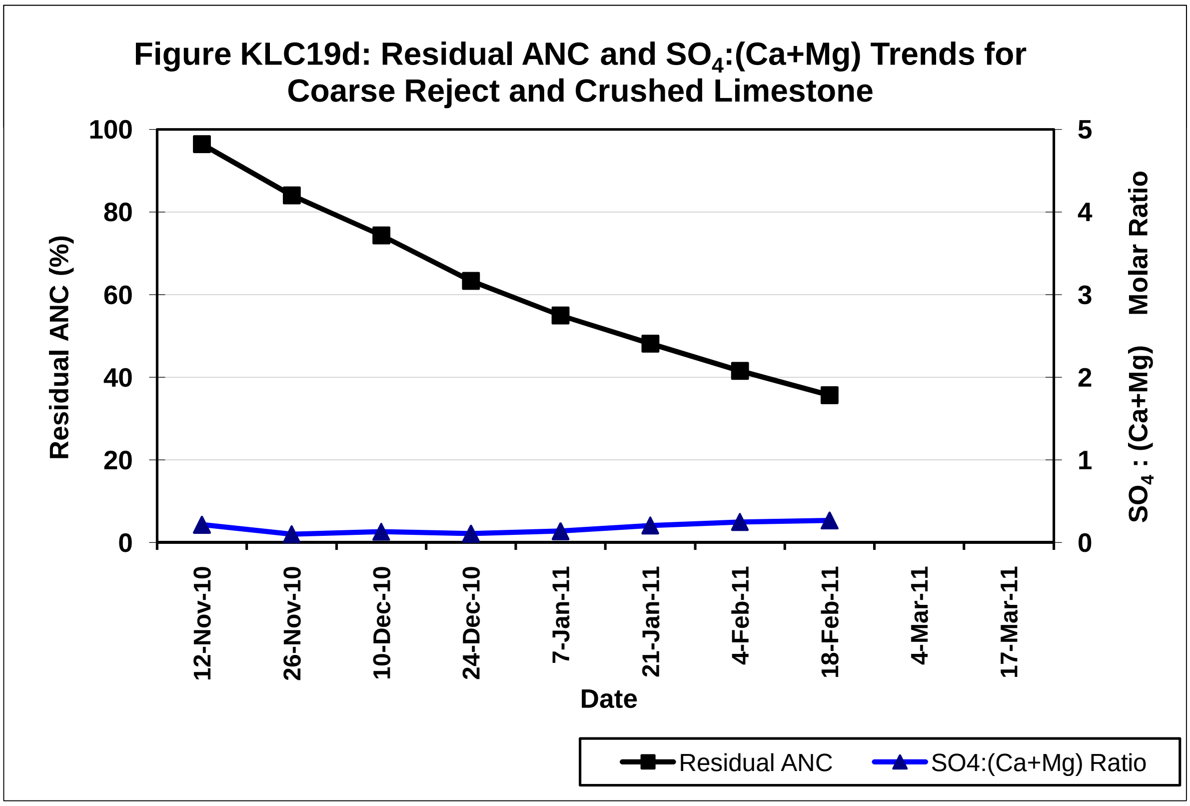


Figure KLC19d: Residual ANC and SO4:(Ca+Mg) Trends for Coarse Reject and Crushed Limestone
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC20

KLC Test Results for Alpha Sample 20 (Coarse Reject 1290L 201099 DU Seam and Crushed Limestone)

Sample Weight (kg)	1.8	**MPA (kg H_2SO_4/t)**	9.8
pH(1:5)	4.30	**ANC (kg H_2SO_4/t)**	1.8
EC(1:5) (µS/cm)	652	**NAPP (kg H_2SO_4/t)**	8
Total S (%)	0.32	**ANC:MPA ratio**	0.2

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.750	0.760	0.760	0.780	0.800	0.780	0.800	0.780		
Cum. Volume (L)	0.750	1.510	2.270	3.050	3.850	4.630	5.430	6.210		
Pore Volumes	0.6	1.1	1.7	2.3	2.9	3.4	4.0	4.6		
pH	8.02	7.77	7.53	7.58	7.57	7.47	7.53	7.34		
EC (µS/cm)	838	1,940	1,890	1,670	940	762	667	861		
Acidity (mg/L)*	4	3	<1	<1	<1	2	2	2		
Alkalinity (mg/L)*	114	141	22	26	15	13	13	53		
Net Alkalinity (mg/L)*	110	138	22	26	15	11	11	51		
Dissolved elements (mg/L)										
Al	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
As	0.004	0.047	<0.020	<0.020	<0.020	0.008	<0.001	0.028		
B	<0.05	<0.05	0.09	0.1	0.06	<0.05	0.06	0.05		
Ca	96	224	231	211	120	96	86	104		
Cd	<0.0001	<0.0001	0.0002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001		
Cl	172	791	699	557	241	177	128	138		
Co	0.005	0.012	0.01	0.009	0.005	0.004	0.003	0.004		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Fe	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	6	6	6	6	3	2	2	2		
Mg	10	26	24	22	12	8	7	9		
Mn	0.28	0.77	0.582	0.668	0.404	0.404	0.335	0.612		
Mo	<0.001	<0.001	0.007	0.005	0.002	<0.001	0.002	<0.001		
Na	68	117	94	89	43	30	26	30		
Ni	0.005	<0.001	0.007	0.005	0.003	0.003	0.002	0.003		
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
SO_4	85	141	149	133	103	123	116	156		
Sb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Se	0.04	0.28	<0.20	<0.20	<0.20	0.05	0.01	0.13		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005		
RESULTS**										
SO_4 Release Rate	35	60	63	58	46	53	52	68		
Cumulative SO_4 Release	35	95	158	215	261	315	366	434		
Ca Release Rate	40	95	98	91	53	42	38	45		
Cumulative Ca Release	40	135	232	324	377	418	457	502		
Mg Release Rate	4.2	11	10	10	5.3	3.5	3.1	3.9		
Cumulative Mg Release	4.2	15	25	35	40	44	47	51		
Residual ANC (%)	94	78	63	48	40	33	27	21		
Residual Sulfur (%)	100	99	98	98	97	97	96	95		
SO_4/(Ca+Mg) molar ratio	0.3	0.2	0.2	0.2	0.3	0.5	0.5	0.5		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

Figure KLC20a: pH and EC trends for Coarse Reject and Crushed Limestone

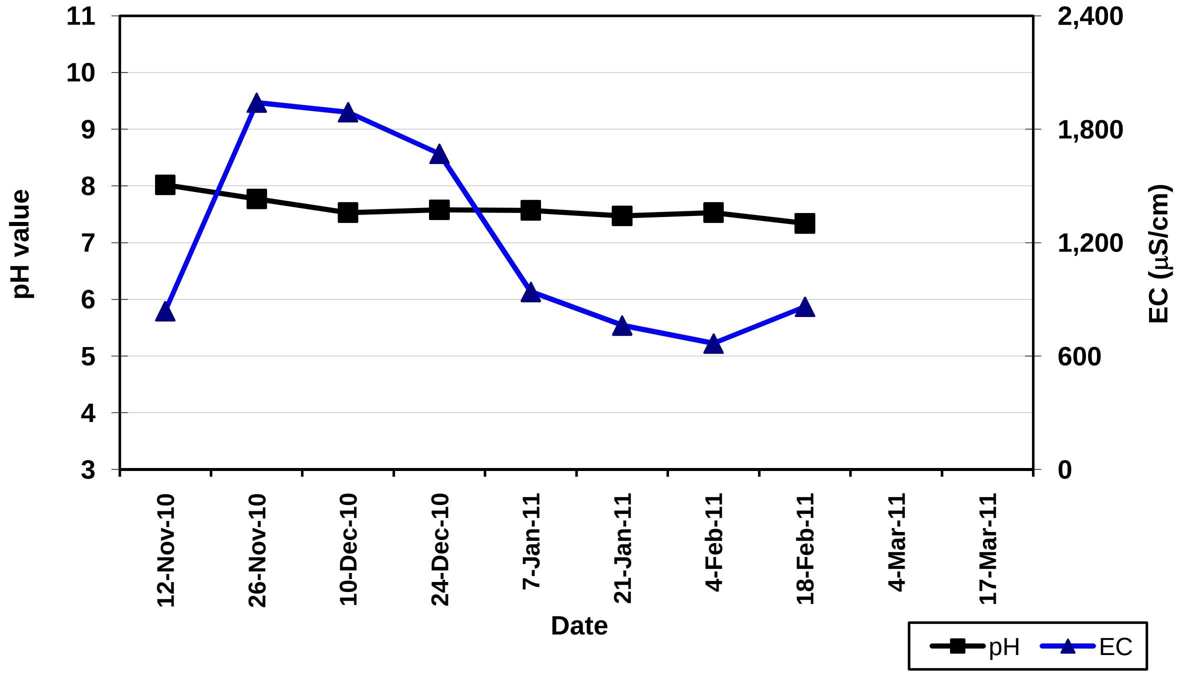
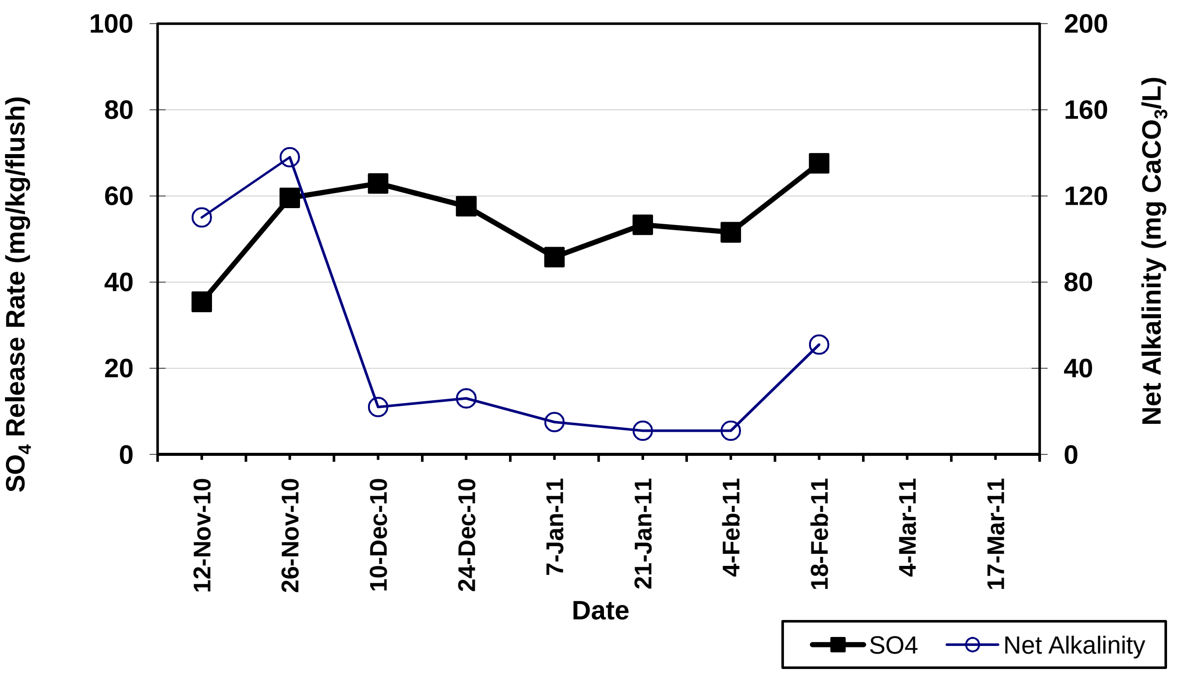


Figure KLC20b: Sulfate Release Rate and Net Alkalinity trends for



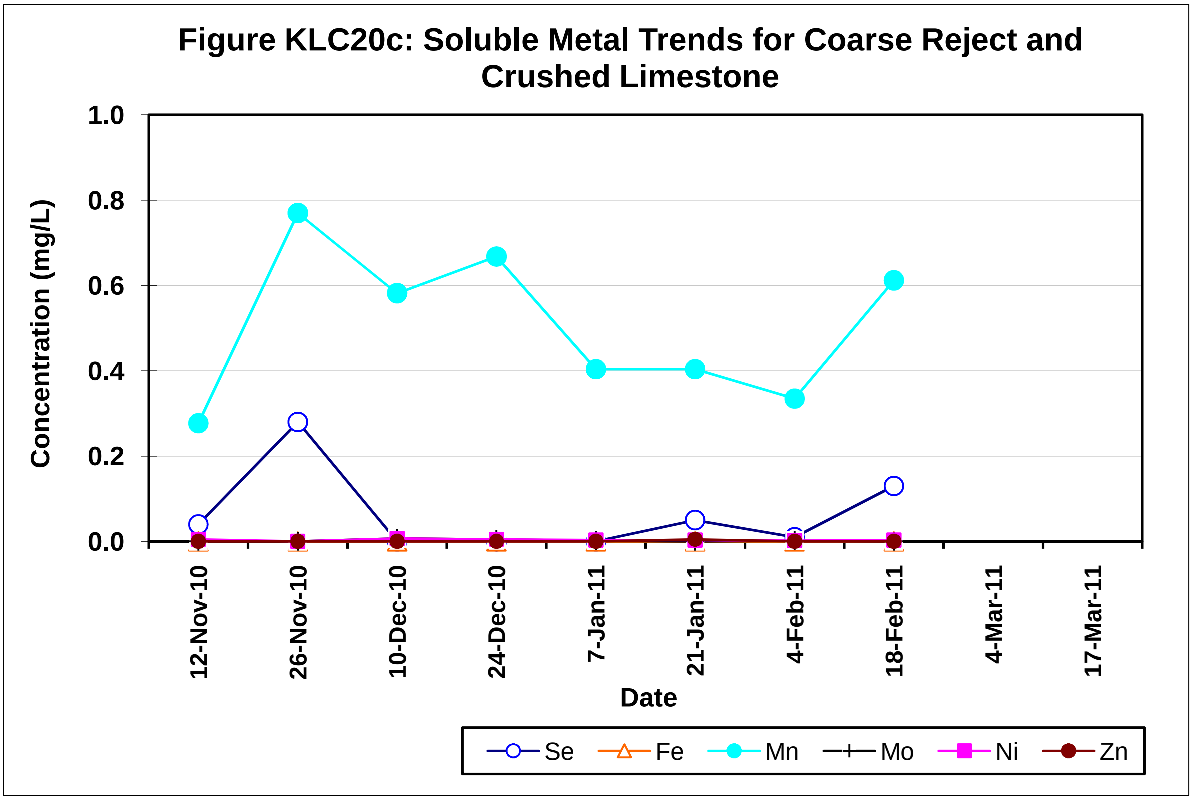


Figure KLC20c: Soluble Metal Trends for Coarse Reject and Crushed Limestone
Concentration (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

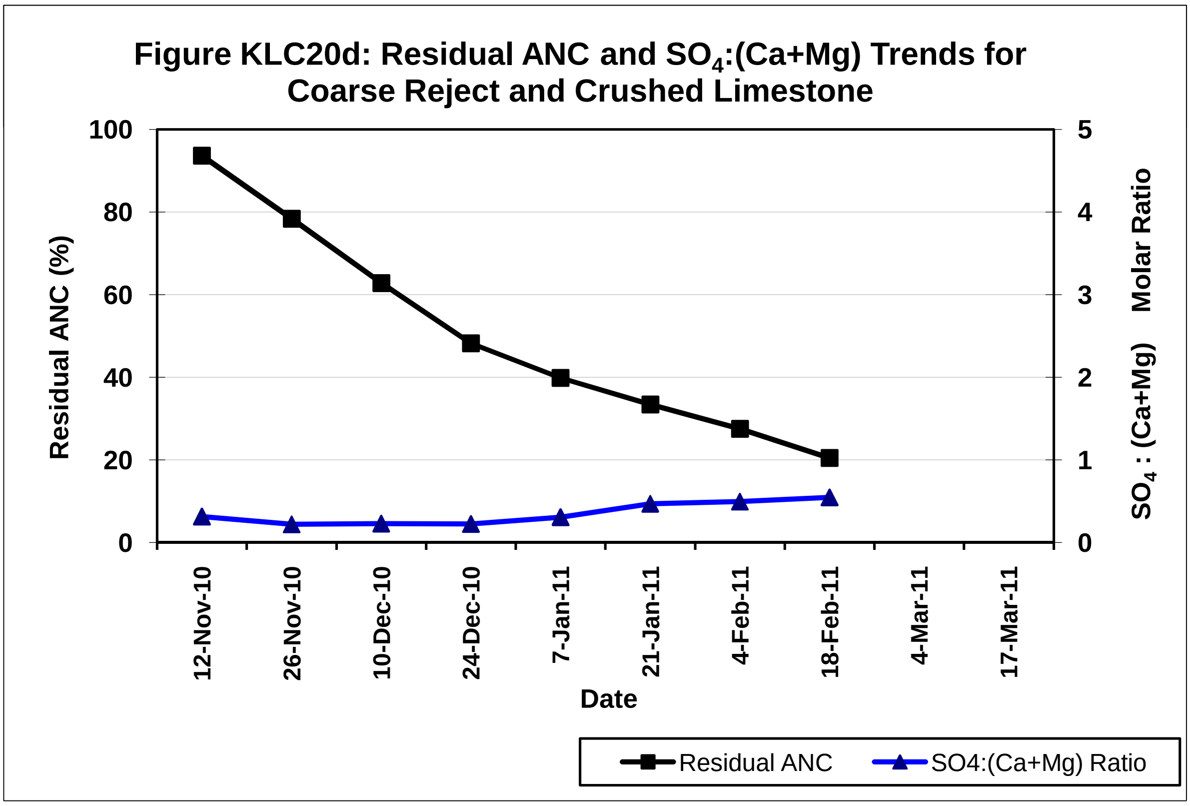


Figure KLC20d: Residual ANC and SO_4:(Ca+Mg) Trends for Coarse Reject and Crushed Limestone
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO_4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Table KLC21

KLC Test Results for Alpha Sample 21 (Coarse Reject 1290L 201077 C Seam and Crushed Limestone)

Sample Weight (kg)	1.8	**MPA (kg H_2SO_4/t)**	21.1
pH(1:5)	3.30	**ANC (kg H_2SO_4/t)**	0.3
EC(1:5) (μS/cm)	1,430	**NAPP (kg H_2SO_4/t)**	20.8
Total S (%)	0.69	**ANC:MPA ratio**	0.01

Date	**12-Nov-10**	**26-Nov-10**	**10-Dec-10**	**24-Dec-10**	**7-Jan-11**	**21-Jan-11**	**4-Feb-11**	**18-Feb-11**	**4-Mar-11**	**17-Mar-11**
Leach Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Volume Collected (L)	0.840	0.820	0.800	0.780	0.720	0.710	0.720	0.740		
Cum. Volume (L)	0.840	1.660	2.460	3.240	3.960	4.670	5.390	6.130		
Pore Volumes	0.6	1.2	1.8	2.4	2.9	3.5	4.0	4.5		
pH	3.64	3.80	3.96	3.9	4.15	3.43	2.95	2.69		
EC (μS/cm)	3,140	6,930	5,160	4,970	2,510	2,070	2,270	2,980		
Acidity (mg/L)*	193	131	77	106	29	50	160	310		
Alkalinity (mg/L)*	<1	<1	<1	<1	<1	<1	<1	<1		
Net Alkalinity (mg/L)*	-193	-131	-77	-106	-29	-50	-160	-310		
Dissolved elements (mg/L)										
Al	0.50	1.16	0.92	0.94	0.60	0.96	3.23	7.32		
As	0.012	0.162	<0.020	<0.020	<0.020	0.02	<0.001	0.07		
B	0.13	0.23	0.15	0.21	0.12	0.08	0.08	0.06		
Ca	258	881	689	708	393	300	276	323		
Cd	0.0064	0.0069	0.0039	0.0067	0.003	0.0034	0.0061	0.0122		
Cl	983	2,470	1,790	1,620	863	603	397	496		
Co	1.100	0.700	0.314	0.288	0.133	0.138	0.245	0.390		
Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003		
Cu	0.068	0.105	0.068	0.065	0.048	0.080	0.207	0.415		
Fe	77.1	53.0	26.2	32.8	7.3	3.45	19.0	54.2		
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
K	27	25	14	14	7	5	4	3		
Mg	75	158	102	102	54	36	33	42		
Mn	3.24	10.80	10.3	13.3	7.81	9.16	8.9	18.3		
Mo	<0.001	<0.001	0.019	0.016	0.007	<0.001	0.004	<0.001		
Na	260	306	163	158	62	36	25	28		
Ni	0.441	0.272	0.125	0.113	0.058	0.075	0.142	0.257		
Pb	0.003	<0.001	0.007	0.007	0.008	0.012	0.044	0.056		
SO_4	768	441	299	398	310	410	587	974		
Sb	<0.001	<0.02	0.002	0.002	<0.001	<0.001	<0.001	<0.001		
Se	0.07	0.7	<0.20	<0.20	<0.20	0.08	<0.01	0.26		
V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zn	1.060	2.910	1.400	1.190	0.442	0.479	0.906	1.670		
RESULTS**										
SO_4 Release Rate	358	201	133	172	124	162	235	400		
Cumulative SO_4 Release	358	559	692	865	989	1,150	1,385	1,786		
Ca Release Rate	120	401	306	307	157	118	110	133		
Cumulative Ca Release	120	522	828	1,135	1,292	1,410	1,521	1,653		
Mg Release Rate	35	72	45	44	22	14	13	17		
Cumulative Mg Release	35	107	152	197	218	232	246	263		
Residual ANC (%)	0	0	0	0	0	0	0	0		
Residual Sulfur (%)	98	97	97	96	95	94	93	91		
SO_4/(Ca+Mg) molar ratio	0.8	0.2	0.1	0.2	0.3	0.5	0.7	1.0		

< indicates less than the analytical detection limit.

* Acidity and Alkalinity data calculated in mg $CaCO_3$/L

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

Total S = Total Sulfur, MPA = Maximum Potential Acidity, ANC = Acid Neutralising Capacity, and NAPP = Net Acid Producing Potential

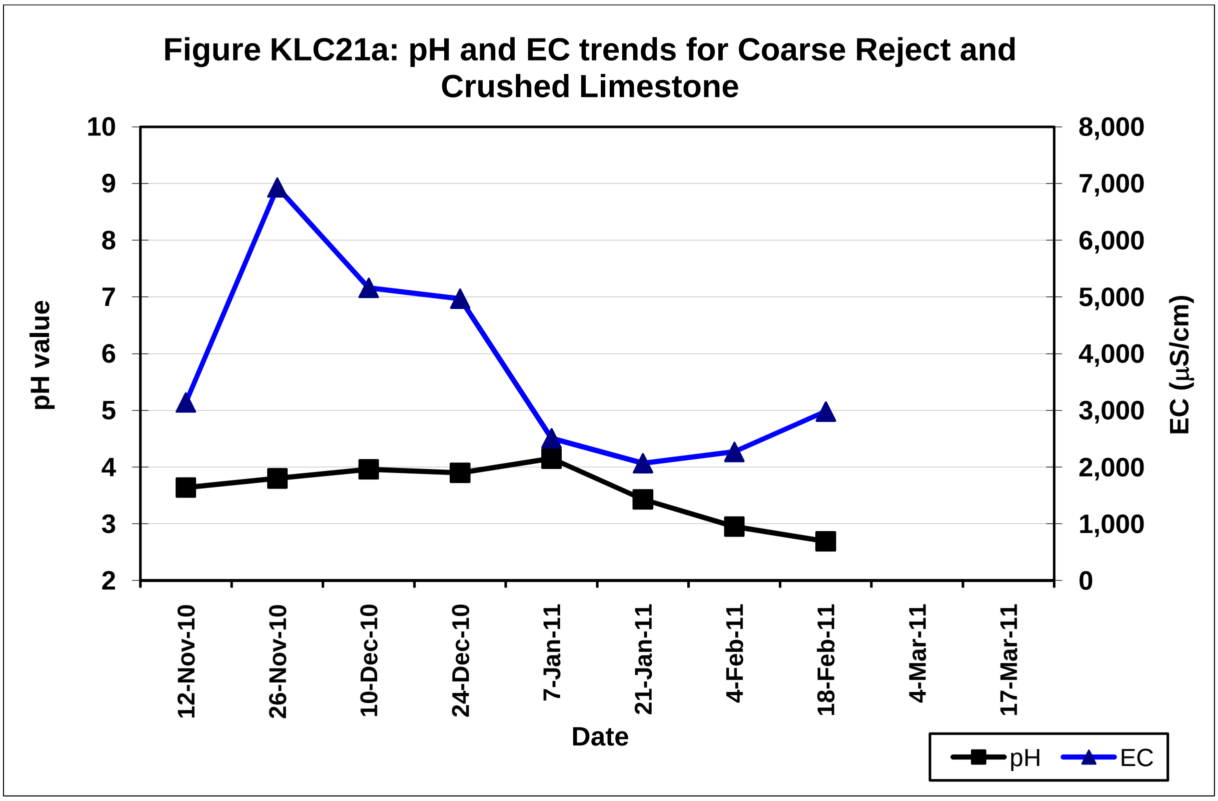


Figure KLC21a: pH and EC trends for Coarse Reject and Crushed Limestone
pH value
EC (µS/cm)
10
9
8
7
6
5
4
3
2
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
pH
EC

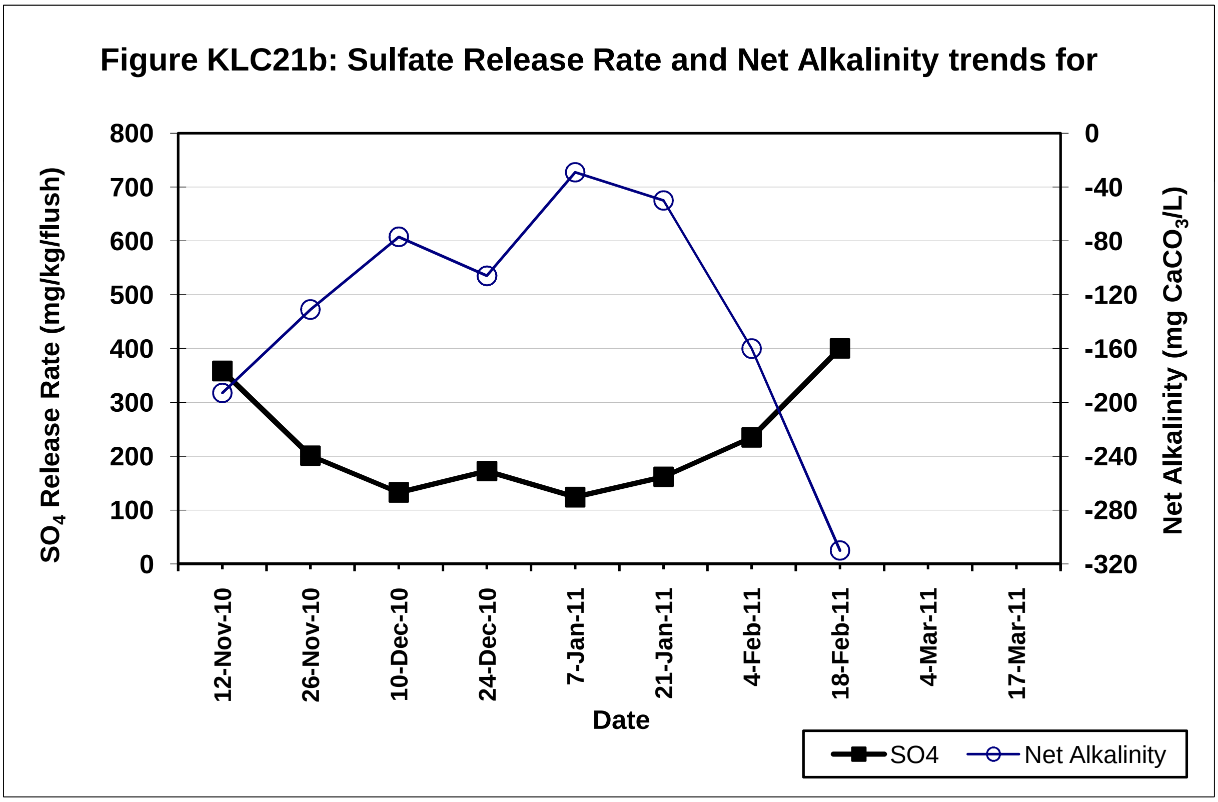


Figure KLC21b: Sulfate Release Rate and Net Alkalinity trends for
SO4 Release Rate (mg/kg/flush)
Net Alkalinity (mg CaCO3/L)
800
700
600
500
400
300
200
100
0
0
-40
-80
-120
-160
-200
-240
-280
-320
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
SO4
Net Alkalinity

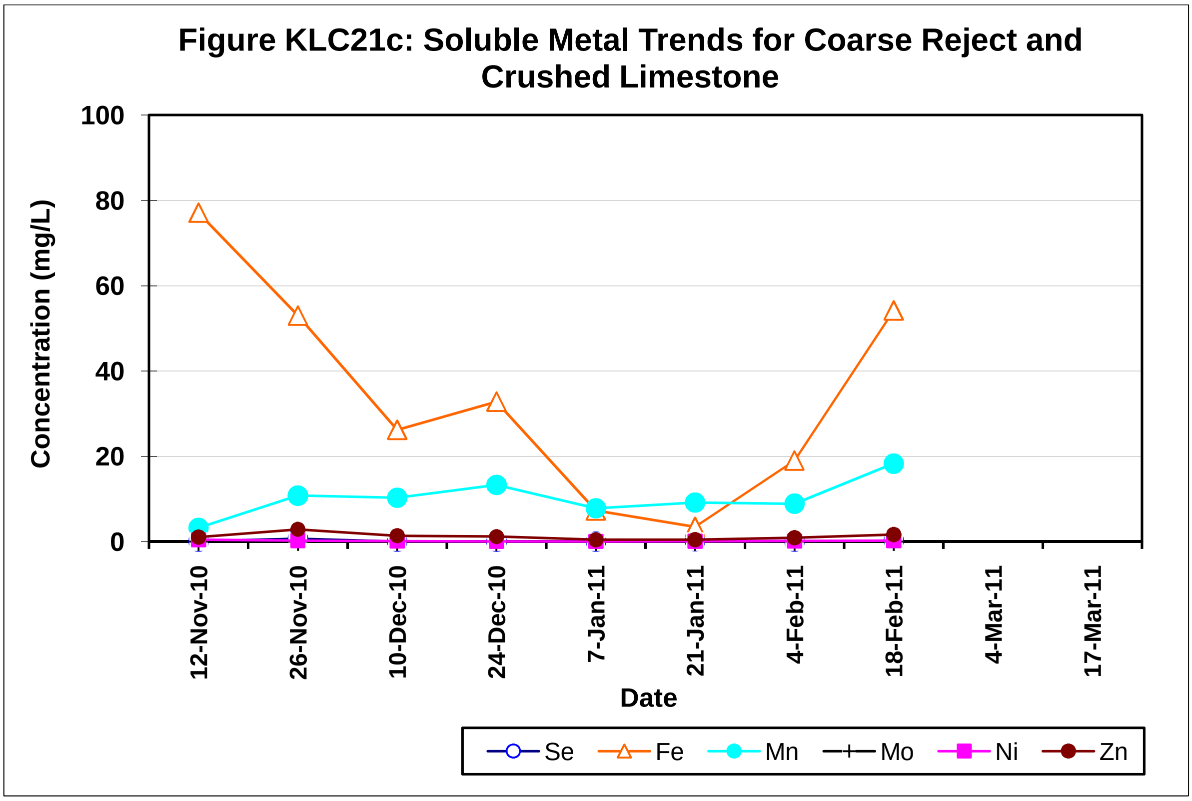


Figure KLC21c: Soluble Metal Trends for Coarse Reject and Crushed Limestone
Concentration (mg/L)
100
80
60
40
20
0
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Se
Fe
Mn
Mo
Ni
Zn

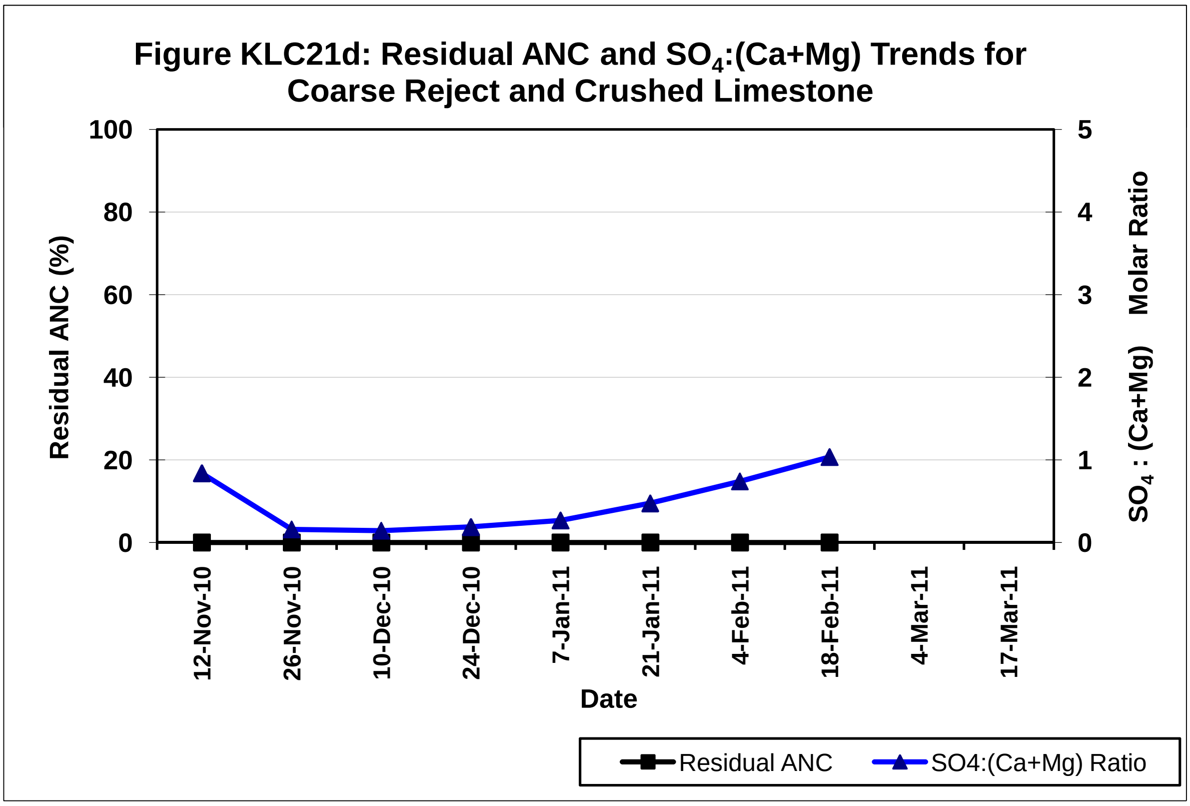


Figure KLC21d: Residual ANC and SO_4:(Ca+Mg) Trends for Coarse Reject and Crushed Limestone
Residual ANC (%)
100
80
60
40
20
0
5
4
3
2
1
0
SO_4 : (Ca+Mg) Molar Ratio
12-Nov-10
26-Nov-10
10-Dec-10
24-Dec-10
7-Jan-11
21-Jan-11
4-Feb-11
18-Feb-11
4-Mar-11
17-Mar-11
Date
Residual ANC
SO4:(Ca+Mg) Ratio

Attachment B

Copies of HCPL Letter to SRK and SRK Response

HANCOCK COAL PTY LTD

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F: +617 3229 4788

4 March 2011

Mr Andrew Garvie
SRK Consulting (Australasia) Pty Ltd
Level 2, 44 Market Street
Sydney NSW 2000

Dear Andrew,

RE: Alpha Coal Project EIS – Geochemistry Report

We are preparing, with the support of URS and other consultants including yourselves, a response to a variety of stakeholder submissions arising from public advertising of our Alpha Coal Project EIS, of which your SRK geochemical report was incorporated as an appendix.

We received some submissions about the geochemistry of the mine waste materials, including overburden. During preparation of our responses, which includes developing cross section diagrams through the Alpha pit area, it was noted that the SRK geochemical report has used two methods to classify the acid forming nature of mine waste materials (NPR - Price 2009 and AMIRA, 2002).

The net potential ratio (NPR) is a Canadian classification method, defined as the ratio of acid neutralising capacity (ANC) to Maximum Potential Acidity (MPA) of a mine waste material. Whilst the NPR provides a useful screening tool for the geochemical assessment of mine waste materials, it can incorrectly classify samples with a very low concentration of oxidisable sulphur as potentially acid forming (PAF), when there is negligible oxidisable sulphur present and there is negligible risk of acid generation. We note in Section 4.2.1.1 of the SRK geochemical report the following statement:

"This suggests that the majority of overburden and interburden samples contain a very low concentration of oxidisable sulphur"

It is understood that on other coal mining projects, SRK has utilised a low sulphur cut-off threshold method to eliminate this potential drawback of the NPR classification method. This issue has been highlighted in Figure 4-13 of the SRK geochemical report, a plot of ANC versus total sulphur for Alpha overburden and interburden samples. The plot shows that samples with total sulfur content less than 0.03% and 0.1% carry a negligible and very low risk of acid generation, respectively, even though the NPR screening method has been used to classify them as PAF in Appendix 5 of the SRK report.

Whilst preparing the above-mentioned cross sections for our responses, the NPR material classification drawback was noted as at number of overburden samples located well away from the main coal seams and in the weathered rock types, (eg. sand), were classified as PAF by the NPR method, many with total and/or oxidisable sulfur contents less than 0.03 % and all with less than 0.1 %. The attached Table 1 provides a list of samples from drill holes where this is the case, taken from three east-west cross sections at the proposed Alpha pit area.

As a result of this finding, we are taking the approach, in line with the approach used by SRK on other coal mining projects, to apply a low sulphur cut-off threshold method to the NPR classification method.

When this is applied, the cross sections become much better aligned with the expected geochemistry of the deposit based on the geological model, sedimentary rock types and genesis of the coal deposit. Essentially the non-carbonaceous overburden away from the coal seams is likely to be non-acid forming (NAF) or have a negligible to very low risk of acid generation. This will have the added benefit of allowing us to focus on the management of other mine waste materials (coal seam roof and floor, coarse reject and fine reject materials) some of which pose a tangible risk of acid generation in the field.

We are validating this low sulphur cut off threshold approach by undertaking laboratory scale kinetic leach column tests on representative overburden materials with varying sulfur content. Should the Alpha Project proceed to the operational phase, HCPL will also conduct larger scale field trials to provide further validation.

We intend to include the content of this letter as part of our response to the EIS Stakeholder submissions, which are due to be completed by 11 March 2011.

I therefore request SRK provide a brief written response to this letter as soon as possible and by close of business on 9 March 2011, to also allow inclusion in the EIS submissions response. If you have any specific questions, please direct them to Alan Roberson on telephone 0431 620 623

Yours sincerely,

Paul Taylor
Manager Approvals
Hancock Prospecting Pty Limited
T: 07 3231 9600
E: paul_taylor@hancockexplorationhq.com.au

Table 1

Typical HCPL Sample Classification Changes for Alpha Project Cross Sections using Total Sulfur Cut-Off Threshold of 0.1%

Drill Hole	Sample Number	From	To	Total Sulfur	Lithology	SRK Classification	HCPL Classification
1406D	ARD07	46.66	47.82	0.06	Siltstone	PAF	NAF
1406D	ARD08	56.82	59.41	0.02	Sandstone	PAF	NAF
1277D	ARD11	55.38	57.84	0.09	Siltstone	PAF	NAF
1426D	ARD01	25	26	0.02	Claystone	PAF	NAF
1427D	ARD01	9	10	0.02	Sand	PAF	NAF
1427D	ARD05	56.56	57.1	0.03	Siltstone	PAF	NAF
1439R	ARD05	73	74	0.01	Coal	PAF	NAF
1415D	ARD01	8.85	10	0.02	Sand	PAF	NAF
1420D	ARD01	3	6	0.02	Sand	PAF	NAF
1420D	ARD03	40.5	42	0.02	Claystone	PAF	NAF
1420D	ARD04	47.11	47.61	0.03	Sand	PAF	NAF
1420D	ARD06	58.2	59.5	0.04	Claystone	PAF	NAF
1425D	ARD05	50.36	50.15	0.04	Sandstone	PAF	NAF
1425D	ARD06	60.57	62.76	0.03	Sandstone	PAF	NAF

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9 March 2011

HCK002

Hancock Coal Pty Ltd
Level 8, 307 Queen St
Brisbane QLD 4000

Attention: Mr Paul Taylor

Dear Paul

RE: ALPHA COAL PROJECT EIS – GEOCHEMISTRY REPORT

I acknowledge receipt of your letter dated 4 March 2011 regarding the Alpha Coal Project Geochemistry Report. In general I agree with the points made in your letter but would like to take this opportunity to stress the need to justify any sulphur threshold adopted in classifying samples.

First, I note that your letter quotes SRK as classifying all samples listed in Table 1 (attached to your letter) as potentially acid forming (PAF). This is not the case, the two samples 1427D ARD05 and 1439 ARD05 were in fact reported in 'Geochemical Characterisation of the Alpha Project' revision 2 as NAF.

As you stated, SRK did use two schemes (that are generally accepted) to classify samples in relation to their potential to be acid forming. One of those schemes was the NPR approach. As SRK reported, and you stated in your letter, low sulphur content samples have low acid producing potential and therefore pose a low or negligible risk in regard to producing acid drainage. In some assessments conducted for other mining projects, SRK has classified samples with total sulphur content below a threshold value as non-acid forming (NAF). The sulphur content threshold, the presumed low risk and the consequent NAF classification however must all be justified. Generally, justification would be via further geochemical testing which would include kinetic testing of low sulphur content samples representing each of the dominant rock types at the Alpha project site. Based on experience elsewhere, typically this cut-off ranges from less than 0.1 % to about 0.2 % total sulphur, depending on the reaction kinetics and the material properties including occurrence of the sulphides and any ANC that may be present.

You indicate in your letter that laboratory scale kinetic leach tests are being conducted on overburden materials with varying sulphur content. You also imply that a sulphur threshold of 0.1 wt% S will be used (see for example the reclassification in table 1) in your letter. Whilst SRK has not seen the results for the kinetic tests, we generally concur with the adoption of a 0.1% sulphur threshold. Nevertheless, we recommend that the kinetic testing being undertaken for the Alpha project be reviewed to ensure that it will provide data to support the 0.1 wt% S value. (We presume that samples with total S contents both above and below 0.1 wt% S from the major rock types are included in your testing programme.

Please do not hesitate to contact me if further clarification is required.

Yours sincerely
SRK Consulting

Andrew Garvie
Principal Consultant

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Project Memo

Client:	RGS	**Date:**	28 February 2011
Attention:	Alan Robertson	**From:**	Andrew Garvie
Project/Proposal No:	HCK002	**Revision No**	0
Project/Proposal Name:	Alpha geochemical characterisation		
Subject:	Amendments to report 'Geochemical characterisation of the Alpha project' September 2010		

SRK requests that the following items are included in the amendments to the Alpha project EIS. The amendments are to the report titled 'Geochemical Characterisation of the Alpha Project' issued by SRK Australasia Pty Ltd in September 2010.

Possibly other modifications will be needed to address the concerns of the respondents. I am happy to talk about these and make changes as appropriate.

Item 1

Page i. Change of authors from

From	**To**
Andrew Garvie	Andrew Garvie
	Danny Kentwell
	Alex Watson
	Diane Walker

Item 2

Replace Table 4-12 (on page 30) with the table below.

Table 4-12: Percentage of total mass in each AMIRA class

Percentage	NAF - Barren	NAF	UC (NAF)	UC	UC (PAF)	PAF-LC	PAF	Total
Carbonaceous	0	1	0	0	1	0	1	3
Clay & Soil	8	14	1	0	0	0	0	24
Rem	44	12	5	0	0	0	2	63
Sand & Gravel	10	0	0	0	0	0	0	10
Total waste	62	27	6	0	1	0	3	100