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Christmas Creek Preliminary Waste Rock Characterisation of Vasse WRD and Eyre Pit

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Executive Summary

Fortescue Metals Group (hereafter referred to as Fortescue) requested that Tetra Tech complete preliminary geochemical and geotechnical characterisation of the waste rock at the Christmas Creek Iron Ore Mine. Thereafter Tetra Tech was to compare the geochemical test results from this initial work with the available Cloud Break mine data in order to address the question of whether or not it is reasonable to present an argument that the waste materials at the two mines are generally similar, and hence should be subject to the same waste rock management practices (and hence WRD basis of design).

The preliminary geochemical characterisation of the waste rock at Christmas Creek was based on samples collected from the Vasse waste rock dump (WRD) and the Eyre mine pit (ie one of the seven WRDs and one of the eight open pits active at the time this report was prepared). All samples were collected in a single site visit in June 2012. Ten bulk samples of in situ waste rock material were collected from the Eyre Pit for geochemical analysis. Bulk samples of waste rock material were collected at the Vasse WRD from 29 test pits excavated to a maximum depth of 3.0 m. Only the samples taken from the Vasse WRD were subject to geotechnical characterisation.

All samples were analysed for total element concentrations, to identify metals or metalloids of potential concern, and assessed for leaching potential with simulated precipitation according to the Australian Standard Leachate Procedure (ASLP). In addition, acid-base accounting was conducted on 65 samples in order to predict the potential acid drainage. A total of eight samples were also investigated by quantitative x-ray diffraction.

A visual inspection of the excavated rock indicated that the Vasse WRD appears to be relatively homogenous with respect to lithological/mineralogical components. Unsurprisingly, mineralogical analysis of the sampled waste rock from both the pit and WRD identified predominantly Fe-oxide minerals. Whilst no sulfide minerals were observed during the site visit, operations personnel report the occasional presence of carbonaceous shales.

Elemental analysis of the samples revealed the waste rock to have a low sulphur content and the associated calculations indicate that the waste has a low acid generation potential. (Clearly, in the event that a shale lithotype is subsequently found, this should be characterised.) The results of the elemental analysis were screened to identify elements with relatively high concentrations as compared to average crustal abundance. This method identified two elements with notionally 'high concentrations'; these being arsenic and antimony.

ASLP analysis of the waste rock samples identified relatively high concentrations of aluminium, cadmium, chromium, lead and zinc in multiple samples.

Polarised Light Microscopy identified no asbestiform materials.

A preliminary review of the Christmas Creek groundwater chemistry revealed that statistically significant changes have been seen in the results for Barium, Iron and Zinc; each appearing to have increased over time.

24 January 2013

Christmas Creek





A comparison of the geochemical characteristics of the waste rock samples taken from the Eyre Pit and Vasse WRD suggest they are very similar; ie there is no statistically significant difference in their metal concentrations. Further the mineralisation of the samples from the two locations appear similar as is their limited potential to generate acid.

A comparison of the geochemical characteristics of the waste rock samples taken from the Christmas Creek and Cloudbreak sites demonstrate that whilst the mineralogical composition is broadly similar and the acid generating potential of both is generally low, the elemental analysis and ASLP results are sufficiently different to negate an argument that Christmas Creek and Cloudbreak sites have comparable waste from a geochemical perspective. Consequently whilst most of the waste may be regarded as benign from the perspective of potential to cause an unacceptable environmental impact, some waste may be problematic in so far as it may leach metals. Given this, and notwithstanding the limitations of this preliminary review, it appears likely that Fortescue may need to segregate some waste rock lithotypes during disposal into either WRDs or as backfill.

In summary, from a geochemical perspective, the various lithotypes examined at Christmas Creek and Cloudbreak sites do not have sufficiently similar characteristics to justify an assumption that they're similar when making design decisions. Further, the results suggest that some site specific waste rock management practices may be required.

This report also presents the geotechnical analyses of the samples collected from the Vasse WRD. The analytical tests included Moisture Content, Particle size distribution, Atterberg Limits, Emerson Crumb Dispersion, Falling Head Permeability, Direct Shear, Consolidation Oedometer, Triaxial shear, Slake Durability, Moisture/Density Relationship. Insufficient data was available for TetraTech to draw any substantive conclusions as to whether or not the the Christmas Creek and Cloudbreak sites are similar or otherwise in terms of the geotechnical characteristics of the various lithotypes present. Both intra and inter site specific sampling and analysis will be required on an ongoing basis to ensure accurate characterisation of the waste rock and sound engineering design of the waste rock disposal facilities.





Table of Contents

1.0	INTR	INTRODUCTION					
	1.1	Geology	1-1				
	1.2	Climate	1-2				
2.0	GEO	CHEMICAL CHARACTERISATION & COMPARISON	2-3				
	2.1	Sampling	2-3				
		2.1.1 Eyre Pit Sample Collection	2-3				
		2.1.2 Vasse WRD Sample Collection	2-3				
	2.2	Geochemical Analytic Methodology	2-5				
		2.2.1 Acid-base Accounting	2-6				
		2.2.2 Rietveld X-ray Diffraction	2-6				
		2.2.3 Leachate Analysis	2-9				
		2.2.4 Total Elemental Analysis					
		2.2.5 Asbestos Testing					
	2.3	Geochemical Results and Discussion					
		2.3.1 Acid-base Accounting					
		2.3.2 Elemental Analysis					
		2.3.3 Leachate Analysis					
		2.3.4 Milleralogy					
		2.3.6 Comparison of Evre Pit and Vasse WRD	2-17				
		2.3.7 Comparison of Christmas Creek and Cloudbreak Samples					
		2.3.8 Changes in Groundwater Chemistry	2-20				
	2.4	Conclusions	2-25				
3.0	GEO	TECHNICAL CHARACTERISATION	3-28				
	3.1	Sampling	3-28				
	3.2	Geotechnical Analysis	3-31				
	3.3	Conclusions	3-38				
4.0	REFE	RENCES	4-40				

List of Tables

Table 2-1	Geochemical Sample Distribution and Analysis Summary	2-7
Table 2-2	Acid-base Accounting Criteria	2-8
Table 2-3	Acid-base Accounting Results	2-10
Table 2-4	Summary Statistics for Total Element Analysis (mg/L)	2-14
Table 2-5	Summary Statistics for Leachate Water Quality (mg/L)	2-16
Table 2-6	Quantitative XRD Analysis Results (%)	2-17
Table 2-7	T-tests between Eyre Pit and Vasse WRD Total Metals	2-17
Table 2-8	T-test Results for Waste Rock and Waste Rock Leachate Comparison	2-19
Table 3-1	Geotechnical Sample Distributions	3-29
Table 3-2	Geotechnical Sample Quantities	3-30
Table 3-3	Geotechnical Laboratory Testing	3-31
Table 3-4	Summary of Atterberg Limits and Moisture Content Results	3-32
Table 3-5	Summary of Direct Shear Test Results	3-33
Table 3-6	Design strength values	3-35
Table 3-7	Triaxial test results	3-35
Table 3-8	Summary of falling head permeability test results	3-35
Table 3-9	Emerson Class Number & Slake Durability Index	3-35





Table 3-10	Moisture Content & Maximum Dry Density	3-36
Table 3-11	Oedometer Testing Sample #2 (0.00-3.00m depth)	3-37
Table 3-12	Oedometer Testing Sample #4 (0.00-3.00m depth)	3-37
Table 3-13	Oedometer Testing Sample #9 (0.00-3.00m depth)	3-38
Table 3-14	Oedometer Testing Sample #19 (0.00-3.00m depth)	3-38

List of Figures

Sampling Locations at Eyre Pit	2-4
Sampling Locations at Vasse WRD	
ANC vs MPA for Christmas Creek Samples	2-13
NPR vs Total Sulfur for Christmas Creek Samples	2-13
Comparison of MPA vs ANC for Christmas Creek (orange) and	
Cloudbreak Samples (blue)	2-19
Christmas Creek Pit Locations and Plotted Groundwater Bores	2-20
Groundwater Bore Data	2-22
Major Groundwater Constituents (Box and Whisker Plot)	2-23
Minor Groundwater Constituents (Box and Whisker Plot)	2-23
Major Groundwater Constituents (Mean and Standard Error)	2-24
Minor Groundwater Constituents (Mean and Standard Error)	2-25
Geotechnical Sampling Locations at Vasse WRD	
Moisture Content Variation with Depth	
Plasticity Chart for Fines	
Stress Plot for Residual Shear Strength Determination	
Stress Plot for Peak Shear Strength Determination	3-34
	Sampling Locations at Eyre Pit Sampling Locations at Vasse WRD ANC vs MPA for Christmas Creek Samples NPR vs Total Sulfur for Christmas Creek Samples Comparison of MPA vs ANC for Christmas Creek (orange) and Cloudbreak Samples (blue) Christmas Creek Pit Locations and Plotted Groundwater Bores Groundwater Bore Data Major Groundwater Constituents (Box and Whisker Plot) Minor Groundwater Constituents (Box and Whisker Plot) Major Groundwater Constituents (Mean and Standard Error) Minor Groundwater Constituents (Mean and Standard Error) Stress Plot for Residual Shear Strength Determination Stress Plot for Peak Shear Strength Determination

List of Appendices

Appendix A	Supplementary Geochemistry Data & ABA calculations

- Appendix B Geochemical Laboratory Data
- Appendix C Geotechnical Laboratory Data and testpit logs

Glossary

Units of Measure

Centimetre	cm
Kilogram	kg
Kilopascal	kPa
Litre	L
Metre cubic	m³
Metre square	m²
Metre	m
Milligram	mg
Parts per million	ppm
Percent	%
Weight percent	wt %





Abbreviations and Acronyms

Acid-Base Accounting	ABA
Acid Neutralisation Capacity	ANC
Australian Standard Leaching Procedure	ASLP
Channel Iron Deposit	CID
Factors of Safety	FOS
Fortescue Metals Group Ltd.	Fortescue
Geochemical Abundance Index	GAI
International Centre for Diffraction Database	ICDD
Inductive Coupled Plasma	ICP
Maximum Potential Acidity	MPA
Net Acid Production Potential	NAPP
Neutralisation Potential Ratio	NPR
Non-Acid Forming	NAF
Potentially Acid Forming	PAF
Public Environmental Review	PER
Standard Maximum Dry Density	SMDD
Total Dissolved Solids	TDS
Uniaxial Compressive Strength	UCS
Uniaxial Compressive Strength	UCS
Waste Rock Dump	WRD
X-ray Diffraction	XRD

Christmas Creek



1.0 Introduction

Fortescue Metals Group (Fortescue)'s Christmas Creek Iron Ore Mine (the Project) is located in the Pilbara region of Western Australia, approximately 110 km north of Newman.

Fortescue requested that Tetra Tech complete preliminary geochemical and geotechnical characterisation the waste rock at the Christmas Creek Iron Ore Mine. Thereafter Tetra Tech was to compare the geochemical results from this initial work with the available Cloud Break mine data in order to address the question of whether or not it is reasonable to present an argument that the waste materials at the two mines are generally similar, and hence should be subject to the same waste rock management practices (and hence WRD basis of design).

At the time of the preparation of this report, the Christmas Creek mine comprised seven WRDs and eight open pits. At Fortescue's direction, Tetra Tech completed an initial geochemical characterisation of the Christmas Creek waste rock was based on samples collected from only the Eyre Pit and Vasse WRD facility. The geotechnical characterisation of waste was limited to samples collected from the Vasse WRD.

1.1 Geology

The regional stratigraphy in the Pilbara region of Western Australia is relatively continuous, with similar geological processes occurring across the region which have resulted in the enrichment of the iron deposits (Fortescue, 2009). The project area lies within the Hamersley Basin where granitoid rocks of the Pilbara Craton (2,800 – 3,500 Ma) are overlain by the Archaean Fortescue Group. This formation is in turn overlain by the Archaean-proterozoic Hamersley Group of which the Marra Mamba Iron Formation (MMIF) is the lowermost unit (Environ Australia, 2005).

Mineralisation is confined to the Nammuldi Member of the MMIF, which is characterised by extensive, thick and podded iron enriched Banded Iron Formation, separated by equally extensive units of siliceous and carbonate rich chert and shale (Fortescue, 2009). The Nammuldi Member is overlain by various Tertiary detrital deposits of varying maturity which may also contain iron mineralisation.

The mineralogy of the ore units is dominated by iron oxides (> 55 %) comprising goethite, hematite and to a lesser extent martite, together with ochreous goethite. Other minerals present are kaolinite (alumina <5%) with free and matrix quartz (silica <10%). High grade ore frequently occurs as lenses within low grade ore, often contains high levels of silica, and can be in contact with waste rock zones.

Overburden includes silts, clays, sands and shales (goethitic & hematitic) of the Nammuldi Member. The geochemistry of a range of mine waste samples from the Christmas Creek Deposit has previously been assessed by Graeme Campbell and Associates (GCA, 2005) with regard to the implications for mine waste management. Based on the results of this previous study, the regolith and waste-bedrocks to be excavated during open-pit mining is expected to be non-acid forming (NAF) sulfide minerals. Enrichment in minor elements from NAF lithotypes is expected to be low and soluble-salt concentrations low to moderate (GCA, 2005).





The Roy Hill Shales, located below the ore zone, are classified as potentially-acid forming (PAF). However, open-pit mining is not anticipated to extend to a depth where the Roy Hill Shales will be intersected (GCA, 2005).

1.2 Climate

The Project is in the semi-arid climatic region with an average maximum daily temperature between 26.8 °C in July and 39.0°C in January. The region experiences an arid tropical climate with the majority of rainfall occurring in the summer months. Rainfall is typically associated with cyclone or thunderstorm activity. Long term average (1970-2009) annual rainfall is 461 mm whilst long term average (1968-2007) annual pan evaporation is 3,059 mm (Fortescue, 2011).



2.0 GEOCHEMICAL CHARACTERISATION & COMPARISON

2.1 Sampling

This section describes the sampling methodology used to characterise the Christmas Creek waste rock.

Samples were collected from purpose excavated pits or directly from surficial materials. The locations of the sampling pits and surface sampling sites are presented in Figures 2-1 and 2-2. Sample site selection was completed so as to achieve a representative horizontal and vertical spatial distribution across the WRD and pit given the pre-defined constraints on the total number of samples to be collected and sampling method (ie the use of a backhoe).

All test pits were systematically excavated, logged and sampled, where by all excavated spoil was initially placed in separate stockpiles of 1 m depth increments. The majority of WRD sample collection was completed by use of a CAT backhoe. Where backhoe access was not available (Vasse WRD samples #1, #11, #14 and #27), samples were collected manually with a spade as surface samples (0.0 m) and from the base of shallow pits (0.3 m).

Samples were collected from the corresponding stockpiles as soon as it was safe to do so following excavation, and sealed in tagged polyurethane mine bags for shipping to the respective laboratory facility. Following sample collection all spoil was logged in regards to relative grain size fractions and lithologic proportions present. Lithologic proportions were determined by combination of scratch plate and hammer/bash plate. All logs were cross checked against any observations of layering noted during excavation. Excavated materials were described for mineralogical and lithological characteristics to assist in categorising potential lithological differences within the interior of the WRDs. Sampling logs are provided in Appendix C.

2.1.1 Eyre Pit Sample Collection

Sample collection at the Eyre Pit facility was conducted in June 2011. Ten bulk samples (labelled as Eyre Pit #1-10, Figure 2-1) were collected from bench cuts within the Eyre Pit. Two additional samples (Eyre Pit #10b – Crystalline, #10b – Globular) were collected from an area adjacent to a temporary waste rock stockpile. This stockpile was associated with active mining at the north eastern corner of Eyre Pit where visible precipitation of solutes was observed at the base and downslope of the stockpile. An additional sample (Eyre Pit #10b) was collected from the stockpile itself. Samples were sealed in tagged polyurethane mine bags for shipping to the sellected analytical laboratories.

2.1.2 Vasse WRD Sample Collection

Sample collection at the Vasse WRD facility was conducted between 12 and 14 June 2012. The Vasse WRD is comprised of two discrete dumps (the north western Vasse WRD and the south western Vasse WRD). In total, 28 of the 33 originally planned pits were excavated across the two Vasse dumps and sellected adjacent areas; each pit being approximately 3m deep. Fifteen pits were excavated within the north western dump, five were taken on the south western dump, five samples were taken from within fill benched, service and stockpile areas, and two samples were taken from areas of undisturbed or cut ground (i.e. in situ;





Figure 2-2). Four pits planned at locations 17, 23, 24, & 32 were not excavated as access was not possible. Pit 33 was used for geotechnical sample collection only.

Samples for geochemical analysis were collected from each of the 28 pits. Two samples were taken from each pit. The first sample was taken from the material excavated from a depth of 0.0 to 1.5 m, and a second from the material excavated from a depth of 1.5 to 3.0 m. Composite samples taken from the entire depth profile were taken from six pits for the purpose of testing for asbestiform materials. Thus a total of 62 geochemical samples were collected from the Vasse WRD facility.



Figure 2-1 Sampling Locations at Eyre Pit







Figure 2-2 Sampling Locations at Vasse WRD

2.2 Geochemical Analytic Methodology

Static test results were used to evaluate the potential for acid formation and short-term release of solutes. Samples were subjected to the following analytical tests:

- Quantitative X-ray diffraction (XRD) with Rietveld analysis
- Total Elemental analysis by Inductively Coupled Plasma Atomic Emission Spectroscopy; - Mass Spectroscopy (ICP-AES;-MS)
- Leachate analysis by Australian Standard Leaching Procedure (ASLP)

Fortescue

- Acid-base Accounting (ABA) by the modified Sobek method
- Asbestos testing by method AN602.

A summary of the Geochemical Analysis Summary for each sample is presented in Table 2.1. A summary of the analytical methods used for the geochemical analysis of Project waste rock samples is discussed below. All analyses were conducted at SGS-Newburn in Perth, unless otherwise stated.

Supplemental data and raw laboratory data is provided in Appendix A and Appendix B, respectively.

2.2.1 Acid-base Accounting

Acid-base accounting (ABA) was used to estimate the capacity of the waste rock to either produce or neutralise acid. ABA methods compare the maximum potential acidity (MPA) with the acid neutralisation capacity (ANC) for a given material using either the total sulfur or sulfide sulfur content.

ABA results were used to determine the Neutralisation Potential Ratio (NPR = ANC/MPA) and the Net Acid Production Potential (NAPP), where NAPP is the difference between the ANC and MPA (NAPP = MPA-ANC). These criteria are commonly used to categorise material into potentially acid forming (PAF) or non-acid forming (NAF) material. Many interpretation schemes have been developed to assess the potential for acid generation using either criterion. Industry standard criteria categorise samples with NPR \geq 2 and NAPP < 0 kg of H2SO4 per tonne of material (kg H2SO4/t) as NAF (Table2-2). In contrast, materials with NPR < 1 and NAPP >5 kg H2SO¬/t are considered PAF. Values between these designations are considered to have uncertain acid-generating characteristics and it is generally recommended that they undergo additional testing to assess the dissolution rates of acid-generating (e.g. pyrite) and acid-neutralising (e.g. calcite) minerals.

2.2.2 Rietveld X-ray Diffraction

Quantitative X-ray diffraction (XRD) was conducted on five samples from Eyre Pit. All tests were done by Microanalysis of Victoria Park, WA. Vasse WRD samples were excluded from XRD analysis because the excavated material was mixed with limited insight in the dominant lithology. This exclusion limits the occurrence of a grab sample that may not be representative of the entire sample.

Samples were lightly ground such that 90% passed through a 20 µm mesh to eliminate preferred orientation during analysis. The International Centre for Diffraction Database (ICDD) was used to identify all crystalline material. These amounts represent the relative amounts of crystalline phases normalised to 100%. The complete laboratory reports including the Rietveld refinement plots are provided in Appendix B.





Table 2-1	Geochemical Sample Distribution and Analysis Summary
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				Analysis	;	
Location	Interval (m)	Total Elemental Analysis	ABA	XRD Mineralogy	Asbestos	ASLP X X X X X X X X X X X X X X X X X X
	l	E	yre Pit		1	
Eyre Pit #1	Surface	Х	Х	Х		Х
Eyre Pit #2	Surface	Х	Х	Х		Х
Eyre Pit #3	Surface	Х	Х	Х		Х
Eyre Pit #4	Surface	Х	Х			Х
Eyre Pit #5	Surface	Х	Х			Х
Eyre Pit #6	Surface	Х	Х	Х		Х
Eyre Pit #7	Surface	Х	Х			Х
Eyre Pit #8	Surface	Х	Х	Х		Х
Eyre Pit #9	Surface	Х	Х			Х
Eyre Pit #10	Surface	Х	Х	Х		Х
Eyre Pit #10b - Bulk	Surface	х	Х			Х
Eyre Pit #10b – Crystalline	Surface			х		
Eyre Pit #10b - Globular	Surface			х		
		Vas	sse WRD	l.		
Vasse WRD #1	Surface	Х	Х			Х
Vasse WRD #1	0.3	Х	Х			Х
Vasse WRD #2	0.0-1.5	Х	Х			Х
Vasse WRD #2	1.5-3.0	Х	Х			Х
Vasse WRD #3	0.0-1.5	Х	Х			Х
Vasse WRD #3	1.5-3.0	Х	Х			Х
Vasse WRD #4	0.0-1.5	Х	Х			Х
Vasse WRD #4	1.5-3.0	Х	Х			Х
Vasse WRD #5	0.0-1.5	Х	Х			Х
Vasse WRD #5	1.5-3.0	Х	Х			Х
Vasse WRD #5	0.0-3.0				Х	
Vasse WRD #6	0.0-1.5	Х	Х			Х
Vasse WRD #6	1.5-3.0	Х	Х			Х
Vasse WRD #7	0.0-1.5	Х	Х			Х
Vasse WRD #7	1.5-3.0	Х	Х			Х
Vasse WRD #8	0.0-1.5	Х	Х			Х
Vasse WRD #8	1.5-3.0	Х	Х			Х
Vasse WRD #9	0.0-1.5	Х	Х			Х
Vasse WRD #9	1.5-3.0	Х	Х			Х
Vasse WRD #10	0.0-1.5	Х	Х			Х
Vasse WRD #10	1.5-3.0	Х	Х			Х
Vasse WRD #10	0.0-3.0				Х	
Vasse WRD #11	Surface	Х	Х			Х
Vasse WRD #11	0.3	Х	Х			Х
Vasse WRD #12	0.0-1.5	Х	Х			Х
Vasse WRD #12	1.5-3.0	Х	Х			Х





				Analysis	i	
Location	Interval (m)	Total Elemental Analysis	ABA	XRD Mineralogy	Asbestos	ASLP
Vasse WRD #13	0.0-1.5	Х	Х			Х
Vasse WRD #13	1.5-3.0	Х	Х			Х
Vasse WRD #14	Surface	Х	Х			Х
Vasse WRD #14	0.3	Х	Х			Х
Vasse WRD #15	0.0-1.5	Х	Х			Х
Vasse WRD #15	1.5-3.0	Х	Х			Х
Vasse WRD #15	0.0-3.0				Х	
Vasse WRD #16	0.0-1.5	Х	Х			Х
Vasse WRD #16	1.5-3.0	Х	Х			Х
Vasse WRD #18	0.0-1.5	Х	Х			Х
Vasse WRD #18	1.5-3.0	Х	Х			Х
Vasse WRD #19	0.0-1.5	Х	Х			Х
Vasse WRD #19	1.5-3.0	Х	Х			Х
Vasse WRD #20	0.0-1.5	Х	Х			Х
Vasse WRD #20	1.5-3.0	Х	Х			Х
Vasse WRD #20	0.0-3.0				Х	
Vasse WRD #21	0.0-1.5	Х	Х			Х
Vasse WRD #21	1.5-3.0	Х	Х			Х
Vasse WRD #22	0.0-1.5	Х	Х			Х
Vasse WRD #22	1.5-3.0	Х	Х			Х
Vasse WRD #25	0.0-1.5	Х	Х			Х
Vasse WRD #25	1.5-3.0	Х	Х			Х
Vasse WRD #25	0.0-3.0				Х	
Vasse WRD #26	0.0-1.5	Х	Х			Х
Vasse WRD #26	1.5-3.0	Х	Х			Х
Vasse WRD #27	Surface	Х	Х			Х
Vasse WRD #27	0.3	Х	Х			Х
Vasse WRD #28	0.0-1.5	Х	Х			Х
Vasse WRD #28	1.5-3.0	Х	Х			Х
Vasse WRD #29	0.0-1.5	Х	Х			Х
Vasse WRD #29	1.5-3.0	Х	Х			Х
Vasse WRD #30	0.0-1.5	Х	Х			Х
Vasse WRD #30	1.5-3.0	Х	Х			Х
Vasse WRD #30	0.0-3.0				Х	
Vasse WRD #31	0.0-1.5	Х	Х			Х
Vasse WRD #31	1.5-3.0	Х	Х			Х

Note: Surface and 0.3 m samples were collected from discrete depths

Table 2-2 Acid-base Accounting Criteria

Criteria	NPR	NAPP (kg H ₂ SO ₄ /tonnes)			
Non-acid forming (NAF)	> or equal to 2	< 0			
Uncertain	1 up to 2	0 up to 5			





Potentially acid forming (PAF) < 1 > or equal to 5

2.2.3 Leachate Analysis

The purpose of conducting water leachability testing ("water leaching") was to provide an assessment of the potential for release of constituents due to exposure to meteoric precipitation (e.g., rain and runoff). Water leaching was conducted using Australian Standard Leaching Procedure (ASLP) (Australian Standards AS4439.2 and 44396.3) with de-ionised water. The procedure utilises 500 ml of de-ionised water and 25 g of sample resulting in a 20:1 water to rock ratio. The samples are shaken for 18 hours before being filtered and the extract analysed. This dilution factor is reasonable for a site with heavy rainfall in excess of 250 to 320 mm /annum as seen at Christmas Creek. Leachate analysis was completed on all samples.

2.2.4 Total Elemental Analysis

Multi-element assay data provides the near-total elemental composition and gives an indication of the total potential load (100%) of constituents to the environment. Elemental analysis was completed on 67 samples (56 from the WRD and 11 from the pit). Solid samples were digested in acid and analysed for elements by ICP. A total of 48 whole rock elemental concentrations were determined.

2.2.5 Asbestos Testing

Asbestos testing involves the qualitative identification of silicate minerals that have a tendency to form thin fibrous crystals. Prolonged inhalation of fibers can cause serious illness. Asbestos testing involved the qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy in conjunction with dispersion staining. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic indicators, which provide a reasonable degree of certainty; dispersion staining is a mandatory protocol for positive identification.

Asbestos qualitative testing was completed on the following six samples: (note the numbers at the end of the sample name refer to the depth in meters from top of WRD sampled):

- Vasse WRD #5 Bulk 0.0-3.0
- Vasse WRD #10 Bulk 0.0-3.0
- Vasse WRD #15 Bulk 0.0-3.0
- Vasse WRD #20 Bulk 0.0-3.0
- Vasse WRD #25 Bulk 0.0-3.0
- Vasse WRD #30 Bulk 0.0-3.0.

2.3 Geochemical Results and Discussion

Results from the geochemical characterisation are discussed in the following sections. Tables and figures are included to provide supporting information. Appendix A contains supplemental results while data directly from the laboratories are provided in Appendix B.





2.3.1 Acid-base Accounting

A summary of the waste rock ABA results is provided in Table 2-3. Graphical representation is presented in Figures 2-3 and 2-4. Complete ABA calculations are presented in Appendix A.

All 11 samples from Eyre Pit were classified as NAF based on both NPR and NAPP values. Total and sulfide sulfur was less than 0.24 wt.% in all samples. The majority of Eyre Pit samples were at or near detection limit of 0.005 wt. % for sulfide sulfur. The highest total sulfur value was 0.049 wt. %.

Of the 54 samples taken from the Vasse WRD one of the was classified as PAF based on an NPR ratio of 0.5. The NAPP value for this one sample was 3.5 kg H2SO4/tonne which classified it as uncertain. Seven of the samples were classified as having uncertain potential based on NPR values between 1 and 2. All of these were classified as NAF based on NAPP calculations. The Vasse WRD had a mean total sulfur concentration of 0.01 wt. % with a maximum concentration of 0.24 wt. %.

	Sulfate	Sulfide	Total	MPA	ANC	NAPP		
Sample	Sulfur	Sulfur	Sulfur	(kg	H ₂ SO ₄ /to	onne)	NPR	Criteria
(wt. %) (wt. %) (wt. %)								
		[Lyrern	Γ	[[NAE
Eyre Pit #1	0.007	0.006	0.013	<0.5	<1	-0.25	2.0	
Eyre Pit #2	<0.005	<0.005	<0.005	<0.5	<1	-0.25	2.0	NAF
Eyre Pit #3	0.01	<0.005	<0.005	<0.5	1.5	-1.25	6.0	NAF
Eyre Pit #4	<0.005	<0.005	<0.005	<0.5	<1	-0.25	2.0	NAF
Eyre Pit #5	0.008	<0.005	<0.005	<0.5	<1	-0.25	2.0	NAF
Eyre Pit #6	<0.005	<0.005	<0.005	<0.5	<1	-0.25	2.0	NAF
Eyre Pit #7	0.018	<0.005	<0.005	<0.5	<1	-0.25	2.0	NAF
Eyre Pit #8	0.008	<0.005	<0.005	<0.5	<1	-0.25	2.0	NAF
Eyre Pit #9	0.029	<0.005	<0.005	<0.5	<1	-0.25	2.0	NAF
Eyre Pit #10	0.014	<0.005	<0.005	<0.5	3.4	-3.15	13.6	NAF
Eyre Pit #10b Bulk	0.036	0.013	0.049	1.5	3.2	-1.70	2.1	NAF
	1	<u>۱</u>	Vasse WRD	I	r		1	
Vasse WRD, #1 Bulk 0.3	0.01	<0.005	<0.005	<0.5	2.2	-1.95	8.8	NAF
Vasse WRD, #2 Bulk 0.0-1.5	<0.005	<0.005	<0.005	<0.5	2.2	-1.95	8.8	NAF
Vasse WRD, #2 Bulk 1.5-3.0	<0.005	<0.005	<0.005	<0.5	1.5	-1.25	6.0	NAF
Vasse WRD, #3 Bulk 0.0-1.5	0.019	<0.005	<0.005	<0.5	3.4	-3.15	13.6	NAF

Table 2-3 Acid-base Accounting Results





Vasse WRD, #3 Bulk 1.5-3.0	0.016	<0.005	<0.005	<0.5	2.2	-1.95	8.8	NAF
Vasse WRD, #4 Bulk 0.0-1.5	0.011	<0.005	<0.005	<0.5	2.2	-1.95	8.8	NAF
Vasse WRD, #4 Bulk 1.5-3.0	0.015	<0.005	<0.005	<0.5	3.4	-3.15	13.6	NAF
Vasse WRD, #5 Bulk 0.0-1.5	0.019	<0.005	<0.005	<0.5	8	-7.75	32.0	NAF
Vasse WRD, #5 Bulk 1.5-3.0	0.007	<0.005	<0.005	<0.5	4.4	-4.15	17.6	NAF
Vasse WRD, #6 Bulk 0.0-1.5	<0.005	<0.005	<0.005	<0.5	5.1	-4.85	20.4	NAF
Vasse WRD, #6 Bulk 1.5-3.0	<0.005	<0.005	<0.005	<0.5	3.4	-3.15	13.6	NAF
Vasse WRD, #7 Bulk 0.0-1.5	0.008	<0.005	<0.005	<0.5	4.6	-4.35	18.4	NAF
Vasse WRD, #7 Bulk 1.5-3.0	<0.005	0.041	0.046	1.4	3.4	-2.00	2.4	NAF
Vasse WRD, #8 Bulk 0.0-1.5	<0.005	0.009	0.005	<0.5	1.7	-1.45	6.8	NAF
Vasse WRD, #8 Bulk 1.5-3.0	<0.005	<0.005	<0.005	<0.5	3.4	-3.15	13.6	NAF
Vasse WRD, #9 Bulk 1.5-3.0	<0.005	0.055	0.059	1.8	2.4	-0.60	1.3	Uncertain
Vasse WRD, #10 Bulk 0.0- 1.5	<0.005	<0.005	<0.005	<0.5	2.4	-2.15	9.6	NAF
Vasse WRD, #10 Bulk 1.5- 3.0	<0.005	0.013	0.015	<0.5	1.9	-1.65	7.6	NAF
Vasse WRD, #11 Bulk 0.3	<0.005	<0.005	<0.005	<0.5	2.9	-2.65	11.6	NAF
Vasse WRD, #12 Bulk 0.0- 1.5	0.006	<0.005	<0.005	<0.5	4.8	-4.55	19.2	NAF
Vasse WRD, #12 Bulk 1.5- 3.0	0.007	<0.005	<0.005	<0.5	2.4	-2.15	9.6	NAF
Vasse WRD, #13 Bulk 0.0- 1.5	<0.005	0.036	0.041	1.3	3.1	-1.80	2.4	NAF
Vasse WRD, #13 Bulk 1.5- 3.0	<0.005	0.014	0.017	0.5	1.4	-0.90	2.8	NAF
Vasse WRD, #14 Bulk 0.3	<0.005	0.036	0.034	1	1.9	-0.90	1.9	Uncertain
Vasse WRD, #15 Bulk 0.0- 1.5	<0.005	0.033	0.036	1.1	3.4	-2.30	3.1	NAF
Vasse WRD, #15 Bulk 1.5- 3.0	<0.005	<0.005	<0.005	<0.5	2.2	-1.95	8.8	NAF
Vasse WRD, #16 Bulk 0.0- 1.5	<0.005	0.021	0.021	0.6	2.6	-2.00	4.3	NAF
Vasse WRD, #16 Bulk 1.5- 3.0	<0.005	0.04	0.037	1.1	2.2	-1.10	2.0	NAF
Vasse WRD, #18 Bulk 0.0- 1.5	0.012	<0.005	0.017	0.5	1.9	-1.40	3.8	NAF
Vasse WRD, #18 Bulk 1.5- 3.0	0.013	0.01	0.024	0.7	2.6	-1.90	3.7	NAF
Vasse WRD, #19 Bulk 0.0- 1.5	0.015	<0.005	0.006	<0.5	19	-18.75	76.0	NAF
Vasse WRD, #19 Bulk 1.5- 3.0	0.009	<0.005	<0.005	<0.5	14	-13.75	56.0	NAF



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Vasse WRD, #20 Bulk 0.0- 1.5	0.023	0.22	0.24	7.4	3.9	3.50	0.5	PAF
Vasse WRD, #20 Bulk 1.5- 3.0	0.025	<0.005	<0.005	<0.5	6.1	-5.85	24.4	NAF
Vasse WRD, #21 Bulk 0.0- 1.5	0.015	<0.005	0.019	0.6	2.4	-1.80	4.0	NAF
Vasse WRD, #21 Bulk 1.5- 3.0	0.017	0.042	0.059	1.8	2.4	-0.60	1.3	Uncertain
Vasse WRD, #22 Bulk 0.0- 1.5	<0.005	0.008	0.012	<0.5	1.7	-1.45	6.8	NAF
Vasse WRD, #25 Bulk 0.0- 1.5	0.012	<0.005	<0.005	<0.5	4.6	-4.35	18.4	NAF
Vasse WRD, #25 Bulk 1.5- 3.0	0.013	<0.005	<0.005	<0.5	3.9	-3.65	15.6	NAF
Vasse WRD, #26 Bulk 0.0- 1.5	0.013	<0.005	<0.005	<0.5	4.1	-3.85	16.4	NAF
Vasse WRD, #26 Bulk 1.5- 3.0	0.009	0.048	0.057	1.7	2.9	-1.20	1.7	Uncertain
Vasse WRD, #27 Bulk 0.3	0.043	<0.005	0.039	1.2	2.2	-1.00	1.8	Uncertain
Vasse WRD, #28 Bulk 0.0- 1.5	0.013	0.047	0.06	1.8	2.4	-0.60	1.3	Uncertain
Vasse WRD, #28 Bulk 1.5- 3.0	0.072	0.026	0.097	3	4.4	-1.40	1.5	Uncertain
Vasse WRD, #29 Bulk 0.0- 1.5	0.02	<0.005	<0.005	<0.5	7	-6.75	28.0	NAF
Vasse WRD, #29 Bulk 1.5- 3.0	0.019	0.017	0.036	1.1	2.4	-1.30	2.2	NAF
Vasse WRD, #30 Bulk 0.0- 1.5	0.028	0.008	0.036	1.1	2.7	-1.60	2.5	NAF
Vasse WRD, #30 Bulk 1.5- 3.0	0.015	<0.005	<0.005	<0.5	5.1	-4.85	20.4	NAF
Vasse WRD, #31 Bulk 0.0- 1.5	0.018	0.04	0.058	1.8	4.4	-2.60	2.4	NAF
Vasse WRD, #31 Bulk 1.5- 3.0	0.015	<0.005	<0.005	<0.5	5.3	-5.05	21.2	NAF
Vasse WRD, #1 Bulk Surface	0.01	<0.005	<0.005	<0.5	2.4	-2.15	9.6	NAF
Vasse WRD, #11 Bulk Surface	0.015	<0.005	<0.005	<0.5	2.4	-2.15	9.6	NAF
Vasse WRD, #14 Bulk Surface	0.039	<0.005	<0.005	<0.5	1.7	-1.45	6.8	NAF

Note: All calculations involving values below reporting limit were done using 0.5 x the reporting limit. * Total sulfur calculated by adding sulfate and sulfide sulfur values

Graphical representation of samples (Figures 2-3 and 2-4) confirm that the majority of samples are NAF, with a smaller population being uncertain. One sample was classified as PAF.









Figure 2-3 ANC vs MPA for Christmas Creek Samples



Figure 2-4 NPR vs Total Sulfur for Christmas Creek Samples

Given the above, it appears that waste rock from both Christmas Creek and Cloudbread can be characterised as non-acid forming.

Christmas Creek



2.3.2 Elemental Analysis

Samples of waste rock from the Eyre pit and Vasse WRD were analysed. A statistical summary of selected elements is presented in Table 2-4.

For the purpose of screening, each element was compared to the Geochemical Abundance Index (GAI). The GAI compares the actual concentration of an element in a sample with the median abundance for that element in the most relevant media (such as crustal abundance as used in this review). The main purpose of the GAI is to provide an indication of any elemental 'enrichment' that may be of environmental importance. The GAI is expressed in integer increments where a GAI-0 indicates the element is present at similar concentration as the crustal abundance. As a general rule, a GAI-3 (approximately a twelve-fold enrichment) or greater indicates enrichment that warrants further examination. However, it should be noted that enrichment does not necessarily mean that an element poses an environmental hazard.

Elemental concentrations compared to the relevant GAI value are provided in Appendix A.

With the exception of Eyre Pit #4 and Vasse WRD #12 1.5-3.0, all samples contained arsenic concentrations greater than GAI 3 GAI (or 12 ppm). Approximately half of samples (34 out of 66) exceeded the GAI-3 value for antimony (2.4 ppm). All other constituents of interest were below the relevant GAI-3 value.

With the exception of Eyre Pit #10, all returned selenium concentrations were at method detection limit (2 ppm, c.f. GAI-3 of 0.6 ppm). Anomalously high selenium levels in Eyre Pit #10 (7 ppm) were statistical outliers both within the Christmas Creek data set, and in comparison to previous Cloudbreak analyses (Section 4.7.2). Due to ongoing works in the vicinity of Eyre Pit, the location of the anomalous selenium result has been buried beneath haul road construction and so receptor pathways and atmospheric exposure have been removed. Should any future excavation take place in the vicinity of sample Eyre #10, additional validation sampling should be undertaken.

		Eyre Pit (n=11)				Vasse WRD (n=54)				
Element	Mean	Minimum	Maximum	Standard Deviation	Mean	Minimum	Maximum	Standard Deviation		
Ag	0.1	<0.1	0.3	0.1	<0.1	<0.1	0.1	<0.1		
AI	58 943	5 040	142 000	47 076	36 907	10 300	74 100	15 199		
As	81	10	229	77	33	11	69	13		
Ba	104	6	655	187	166	24	975	165		
Cd	<0.1	<0.1	0.5	0.2	<0.01	<0.01	0.1	<0.1		
Cr	85	<10	260	858	63	<10	150	44		
Fe	326 845	24 700	549 000	184 282	451 074	234 000	584 000	60 087		
К	1 520	<100	7 180	2 163	569	<100	4 080	784		
Mg	672	190	2 490	696	776	330	2 010	349		
Mn	7 310	64.1	67 300	19 940	2 738.1	159	13 400	2 542		
Ni	61	8	211	72	28	12	63	11		

 Table 2-4
 Summary Statistics for Total Element Analysis (mg/L)



		Eyre P	'it (n=11)		Vasse WRD (n=54)				
Element	Mean	Minimum	Maximum	Standard Deviation	Mean	Minimum	Maximum	Standard Deviation	
Pb	32	9	68	19	25	11	60	9	
S	315	80	690	214	521	240	1 1 50	180	
Sb	2.4	1.0	5.2	1.4	2.8	1.0	6.7	1.2	
Se	1	<2	7	2	1	<2	3	1	
Ti	3 421	410	12 700	3 596	1998	540	4 000	938	
Zn	34	9	84	24	50	22	166	29	

2.3.3 Leachate Analysis

A statistical summary of results is shown in Table 2-5 and results of all leachate testing are included in Appendix A. Most of the samples taken from Eyre Pit had leachate pH that was slightly higher or lower than the expected range of 6.5-8.5. The average pH of all the Eyre Pit samples was 6.4 with the highest pH at 8.9 and the lowest at 5.8. For samples taken from Vasse WRD the average pH was 6.8. Six of the 55 Vasse WRD samples had pH values slightly lower than the expected minimum of 6.5.

For the purpose of screening only, the leachate results were compared to ANZECC water quality guidelines (ANZECC 2000, Freshwater 95% protection level). This process identified results that were subject to further consideration. (It should be noted however that background groundwater concentrations for many elements naturally exceed ANZECC water quality guidelines for freshwater protection. Any assessment of potential impacts can only be made by comparing the potential leachate results with the naturally occurring groundwater concentrations. This matter is addressed in Section 4.8.)

Within the above context, for the Eyre Pit, all elemental leachate samples were below ANZECC guideline concentrations with the exception of chromium and zinc. A relatively high concentration of chromium was detected in the vicinity of samples Eyre #7 to Eyre #10, indicating enriched concentrations in the north eastern section of the Eyre pit mining area. Chromium concentrations elsewhere in the Eyre pit mining area were below detection limit. Relatively high zinc concentrations were detected in all samples with the exception of Eyre #10 in the north eastern corner of the area.

Relatively high levels of aluminium, cadmium, chromium, lead and zinc were all detected in analyses of Vasse WRD samples. Concentrations of aluminium, up to 2.5 times the ANZECC value, were detected in 3 samples including an in situ sample from Vasse #2, at a level of 2 times the ANZECC limit.

Relatively high cadmium, up to two orders of magnitude greater than ANZECC limits was detected in approximately 37% of samples. Relatively high levels of chromium, lead and zinc up to one order of magnitude greater than ANZECC limits was detected in 17% (Cr), 28% (Pb) and 98% (Zn) of samples respectively.



			Eyre F	Pit (n=10)		Vasse WRD (n=54)			
Analyte	ANZECC	Mean	Minimum	Maximum	Standard Deviation	Mean	Minimum	Maximum	Standard Deviation
pН	-	7.3	5.8	8.9	1.2	7.2	6	8.4	0.6
TDS	-	40	<10	56	59	76	<10	264	57
Al	0.055	0.022	<0.001	0.110	0.035	0.017	<0.001	0.130	0.024
As	0.013	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
В	0.37	0.035	0.014	0.069	0.017	0.039	<0.005	0.086	0.017
Ва	-	0.063	0.024	0.120	0.027	0.176	0.058	0.370	0.070
Са	-	1.3	<0.2	4	1.2	10.5	0.7	48.0	8.3
Cd	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0034	<0.0001	0.0510	0.0082
ΣCr (A)	0.0033	0.004	<0.001	0.011	0.004	<0.001	< 0.001	0.005	< 0.001
F	-	0.3	<0.1	0.6	0.2	0.6	0.2	1.2	0.3
Fe	-	0.020	<0.005	0.071	0.025	0.022	<0.005	0.180	0.031
К	-	0.8	0.3	2.2	0.6	1.4	0.2	5.7	1.2
Mn	1.9	0.098	<0.001	0.7	0.221	0.014	<0.001	0.320	0.055
Pb	0.0034	<0.001	<0.001	<0.001	<0.001	0.007	<0.001	0.046	0.012
Sb	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Se	0.011	<0.002	<0.002	<0.01	<0.01	<0.002	<0.001	<0.002	<0.002
Sr	-	0.014	<0.001	0.037	0.012	0.055	<0.001	0.200	0.039
SO ₄	-	6	<1	20	7	16	2	85	14
Zn	0.008	0.015	< 0.001	0.021	0.006	0.042	0.007	0.077	0.018

Table 2-5	Summary	/ Statistics f	or Loachato	Wator Quality	(ma/l)
	Summary	Jialislics	UI LEAGUALE		(IIIg/L)

Note: Figures in **bold** exceed ANZECC Freshwater Quality Guidelines (ANZECC 2000) (A) Low Reliability fresh water trigger value for CrIII ("Interim" working value only)

2.3.4 Mineralogy

Quantitative XRD analysis was conducted on five samples from Eyre Pit. Vasse WRD samples were excluded from XRD analysis because the excavated material was mixed and heterogeneous. This exclusion limits the occurrence of a grab sample that may not be representative of the entire sample.

Table 2-6 shows the mineralogical composition of these representative samples from Eyre Pit. Samples are dominated by Fe-oxide minerals. Goethite ranges from 14% to 51%, while hematite ranges from 15% to 56%. Kaolinite was identified in three of the samples with appreciable concentrations as high as 87%. Rutile and quartz were also observed in discrete samples.

No sulphidic minerals were identified in the samples which are consistent with the low sulfide sulfur and total sulfur concentrations reported with the ABA results.



Mineral	Formula	Eyre Pit #1	Eyre Pit #3	Eyre Pit #6	Eyre Pit #8	Eyre Pit #10
Goethite	FeO(OH)	47.4	35.8	38.8	13.5	51
Hematite	Fe _{1.85} H _{0.45} O ₃	19.2	56.5	14.8	0	25.1
Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	33.4	0	0	86.5	23.9
Pseudo-rutile	Fe _{9.48} Mn _{0.54} Ti _{19.32} O ₅₀	0	7.7	0	0	0
Quartz	SiO ₂	0	0	46.5	0	0

Table 2-6 Quantitative XRD Analysis Results (%)

2.3.5 Asbestos Testing

Asbestos was not found in any of the samples.

2.3.6 Comparison of Eyre Pit and Vasse WRD

A comparison of surface samples between Eyre Pit and Vasse WRD was undertaken using T-tests which are a statistical method to compare the distribution of two sets of normal distributed data. These tests were conducted to ascertain whether waste material is considered similar and comparable between Eyre Pit and Vasse WRD. Results shown in Table 2-7 indicate that the geochemical characters are indeed similar with exception of Calcium, although, these results should not be extrapolated to characterise the interior of the WRDs.

Analyte	df	t-value	p-value	Class
AI	10	1.5363	0.15	Similar
As	10	2.09	0.06	Similar
Ca	60	-4.3988	<0.05	Dissimilar
Fe	10	-2.212	0.05	Similar
Mg	11	-0.4821	0.64	Similar
Mn	10	0.7592	0.46	Similar
Pb	11	1.0955	0.30	Similar
Sb	13	-1.032	0.32	Similar
Sr	6	1.1583	0.28	Similar
Zn	17	-1.9694	0.066	Similar

Table 2-7 T-tests between Eyre Pit and Vasse WRD Total Metals

df equals degrees of freedom (n-1)

Set of values are considered similar if p-value > 0.05

2.3.7 Comparison of Christmas Creek and Cloudbreak Samples

The following sections discuss a comparison between the lithologies and chemical character of the waste rock material between the Christmas Creek and Cloudbreak mines. Additional geochemical characterisation of waste material at Cloudbreak is provided in Tetra Tech (2012).



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Lithologic Comparison

A geological comparison was completed to determine if lithological units from Christmas Creek were similar to the lithological composition from the Cloudbreak site. Geological interpretation of borehole samples was conducted by Tetra Tech at the Cloudbreak site between March 2012 and April 2012.

Visual observations from Christmas Creek show that the samples are also dominated by Feoxide minerals goethite and hematite, with considerable amounts of shale in numerous intermixed waste samples. Operations personnel report the occasional presence of carbonaceous shales but none were found in the samples collected. No detrital alluvium material was observed in the samples which may be due to the samples being collected from the top 3 m of the WRD and at the Eyre Pit floor. The Fe-oxide proportions are fairly similar between the two sites.

Visual observations of sampled intervals from the Cloudbreak site were dominated by mesoand micro-scale banded Fe-oxide minerals. Hematite clasts were typically blue-grey with a metallic lustre with variable concentrations of ochreous coating. Goethite was typically ochreous and friable. Generally, these Fe-oxide minerals accounted for the majority of the collected sample. Minor components observed in the samples were detrital material, composed of chert, shale and clay minerals. Visual observations were supported by mineralogical quantification of representative samples. With the exception of two detrital samples, the majority of samples had cumulative proportions of goethite and hematite ranging from 15% to 66% and 21% to 39%, respectively (Tetra Tech, 2012).

Quantitative mineralogical results between the two sites were comparable. Goethite at Christmas Creek ranges from 14 % to 47 % which is similar to the goethite range observed at Cloudbreak. Likewise, hematite concentrations at Christmas Creek were between 19 % and 56 % (Table 2-6). Excluding the detrital material analysed at the Cloudbreak site, accessory minerals were consistent between the sites.

Geochemical Comparison

The following sections discuss the geochemical character of waste rock samples between the two sites.

Acid-Base Accounting

At Christmas Creek 1.8% of the WRD samples exhibited PAF and 13% presented uncertain characteristics, whereas as at Cloudbreak 8% exhibited PAF characteristics and 16% of the samples exhibited uncertain characteristics. Waste rock at Christmas Creek appears to have a lower acid generating potential than that at Cloudbreak (Figure 2-5).

Leachate and Metal Concentration Comparisons

The ASLP results for waste rock obtained from Cloudbreak and Christmas Creek sites were subject to statistical comparison. Table 2-8 provides the results of the T-tests. While several elements have statistically similar mean concentrations (p-value>0.05) there are enough inconsistencies in the number of valid results above detection limit to suggest that any extrapolation between sites is unadvised and not supported by the elemental concentrations

Christmas Creek







and leachate water quality content. Of particular note is the mean Cadmium result for Christmas Creek.



Figure 2-5 Comparison of MPA vs ANC for Christmas Creek (orange) and Cloudbreak Samples (blue)

Analyte	Christmas Creek Mean	Cloudbreak Mean	Degrees of freedom (n-1)	t-value	p-value	Class			
	Analysis of waste rock								
	mg/l	mg/l							
AI	40 636	36 579	112	1.0928	0.27	similar			
As	41.4	28.2	82	2.6679	0.01	dissimilar			
Cd	0.18	0.23	9	-0.3208	0.76	similar			
Ca	949.4	2 302	88	-4.78	<0.05	dissimilar			
Fe	430 050	387 750	120	2.1989	0.03	dissimilar			
K	733	2 023	92	-4.2741	<0.05	dissimilar			
Mg	758	1 151	103	-4.123	<0.05	dissimilar			
Mn	3511	4 009	107	-0.4034	0.69	similar			
Pb	26.25	17.8	112	4.9346	<0.05	dissimilar			
Sb	2.76	2.3	119	2.4145	0.02	dissimilar			
Se	2.6	2.17	19	1.1575	0.26	similar			
Sr	11.93	23.7	103	-4.6499	<0.05	dissimilar			
Zn	47.52	36.8	118	2.3726	0.02	dissimilar			
	Analysis of leachate from waste rock								
AI	0.018	0.02	108	-1.2595	0.21	similar			
Cd	0.003	0.00005	64	2.9668	<0.05	dissimilar			

 Table 2-8
 T-test Results for Waste Rock and Waste Rock Leachate Comparison





Analyte	Christmas Creek Mean	Cloudbreak Mean	Degrees of freedom (n-1)	t-value	p-value	Class
Fe	0.031	0.03	89	0.4333	0.67	similar
K	1.298	2.51	103	-4.5915	<0.05	dissimilar
Mg	2.328	2.318	115	0.0249	0.98	similar
Mn	0.027	0.004	65	1.8128	0.07	similar
Sr	0.048	0.099	66	-2.2133	0.03	dissimilar
Zn	0.038	0.022	123	5.0132	<0.05	dissimilar

df equals degrees of freedom (n-1)

Set of values are similar if p-value is > 0.05

2.3.8 Changes in Groundwater Chemistry

The following sections provide a) a preliminary review of changes in groundwater chemistry over time at Christmas Creek and b) a comparison of the chemical concentrations as seen in the Christmas Creek waste rock leachate (as characterised be ASLP laboratory testing) and the regional groundwater.

Groundwater Monitoring

For the purpose of completing this initial comparison, groundwater concentrations have been sourced from 13 wells in the region. As some wells have multiple sample depths, these provide a total of 31 individual sampling locations. Records for each of these sampling locations were available for the period 2007 to 2012. Of the 150 records available for this period, 106 are for the period post the commencement of land disturbing activities whilst 44 were available for the pre-disturbance period.

Well locations are shown on Figure 2-6.



Figure 2-6 Christmas Creek Pit Locations and Plotted Groundwater Bores



Changes in Groundwater Chemistry over time

Figure 2-7 shows the groundwater composition on a piper diagram indicating a high degree of water type variability. Box and Whisker plots of recorded groundwater chemistry are shown in Figures 2-8 and 2-9. Mean and standard error plots are presented in Figures 2-10 and 2-11.

Statistical analysis of the pre and post disturbance concentrations of the analytes suggest that the levels of pH, TDS, calcium, magnesium, potassium, aluminium and sulfate have not changed appreciably since commencement of land disturbance activity in early 2009. Similarly there have been no statistically significant changes in the concentrations of aluminium, chromium and manganese.

In contrast, statistically significant (at the 95% confidence limit) changes have been seen the results for Barium, Iron and Zinc; each appearing to have increased over time. Whilst there was no statistically significant change in the mean aluminium result, some of the individual results were notable high in the post disturbance results.

Christmas Creek







Figure 2-7 Groundwater Bore Data

Green diamonds = Pre-disturbance background groundwater composition Red crosses = Post-disturbance groundwater composition







Figure 2-8 Major Groundwater Constituents (Box and Whisker Plot)

Red diamonds = Pre-mining means

Blue diamonds = Post-disturbance means



Figure 2-9 Minor Groundwater Constituents (Box and Whisker Plot)

Red diamonds = Pre-mining means Blue diamonds = Post-disturbance means

Fortescue





Figure 2-10 Major Groundwater Constituents (Mean and Standard Error)

Diamonds = Pre-mining means Squares = Post-disturbance means





Diamonds = Pre-mining means Squares = Post-disturbance means

Comparison of Leachate and Groundwater Concentrations

As discussed previously, the ALSP testing of the Christmas Creek waste rock samples identified the following predominant elements: Al, Cd, Fe, K, Mg Mn, Sr and Zn. Α comparison of these mean leachate values with the mean regional groundwater values at Christmas (both pre and post disturbance) identified only the one element with a statistically significant mean; that being cadmium.

2.4 Conclusions

The general conclusions based on the analytical data for waste rock material at Christmas Creek are summarised below:

Mineralogy

- The waste rock samples were dominated by goethite and hematite with the exception • of one sample that contains 86% kaolinite.
- No sulfidic minerals were identified.

Total Metal Analysis

The waste rock samples generally contained arsenic and antimony concentrations greater than the GAI 3 value. All other constituents were below the applicable GAI 3 value.

Christmas Creek





Leachate Water Quality

- The majority of metal concentrations found in the leached waste rock samples were below the ANZECC freshwater guidelines (95% protection).
- Notwithstanding the above, the ANZECC freshwater guideline fails to provide a meaningful guide when examining changes to a number of metals the groundwater in the Christmas creek region as their baseline values already exceed the defined trigger levels in the guide (eg Zinc and Chromium).
- Multiple samples from Vasse WRD exceeded the ANZECC freshwater guidelines for cadmium, chromium, lead and zinc by one to two orders of magnitude. Relatively high levels of aluminium were also measured in three samples, including one in situ background sample.
- Relatively high concentrations of arsenic and antimony which were observed in the total elemental analysis were not enriched in the effluents suggesting these metals are not readily soluble and are unlikely to pose an environmental issue.

Acid-Base Accounting

- Total sulfur content is low ranging from below reporting limit to 0.24 wt. %. Sulfide ranges from below reporting limit to 0.22 wt. %. On average, sulfide sulfur is greater for Vasse WRD (0.016 wt. %) than Eyre Pit samples (0.004 wt. %).
- Samples contain little potential to generate or consume acid.
- The potential to generate acid from the waste material is considered low.

Asbestos

No asbestos was found in any of the samples.

Comparison of Waste Material at Christmas Creek

Total metals for surficial samples between Eyre Pit and Vasse WRD are similar, however these results should not be extrapolated to the interior of the WRDs.

Comparison between Christmas Creek and Cloudbreak

- Lithologies between the two sites are fairly consistent, dominated by Fe-oxide minerals. Shale was identified in many of the Christmas Creek samples. Excluding detrital material from Cloudbreak, mineralogical comparisons were similar between the two sites.
- Generally, samples from both Cloudbreak and Christmas Creek are NAF with low sulfide and total sulfur values.
- T-tests performed using elemental concentrations show that many metals are not comparable between the two sites and metal concentrations should not universally used across the Chichester Hub.

Changes in Groundwater Chemistry at Christmas Creek

• Pre-disturbance groundwater chemistry indicates variable water type.







• Statistically significant changes in groundwater quality have occurred from the pre disturbance to the post disturbance period. Specifically there have been increases in Barium, Iron and Zinc. Whilst there was no statistically significant change in the mean aluminium result, some of the individual results were notable high in the post disturbance results.

Comparison of leachate with groundwater

• A comparison of mean leachate values with the mean regional groundwater values at Christmas (both pre and post disturbance) identified only the one element with a statistically significant mean; that being cadmium.





3.0 GEOTECHNICAL CHARACTERISATION

TetraTech completed a program of lithotype sample collection within and on the Eyre Pit and Vasse WRD respectively. This section describes methods and results. Some preliminary camparison of the geotechnical properties lithotypes found at Christmas Creek and Cloudbreak was attempted, however this was not persued given the limited data available. Consequently this report provides no commentary as to whether or not the the Christmas Creek and Cloudbreak sites are similar or otherwise in terms of the geotechnical characteristics of the various lithotypes present.

3.1 Sampling

Geotechnical sample collection at the Vasse WRD facility was conducted between 12 and 14 June 2012. Sampling pits were excavated by means of a CAT backhoe. Samples for geotechnical analysis were collected from 12 pits. The locations of each sample pit site was determined in consultation with Fortescue. These locations are presented in Figure 3-1 and are listed in Table 3-1 below. Four samples were taken from each pit. The first sample was taken from the material excavated from a depth of 0.0 to 1 m, the second from the material excavated from a depth of between 1 to 2 m and the third from a depth of between 2 to 3 m. A forth composite sample was also produced for the entire profile of each pit. Thus a total of 48 geotechnical samples were collected from the Vasse WRD facility.

The quantities and field description of the excavated mateterials are listed in Table 3-2. Sampling logs and laboratory data are provided in Appendix C.

All samples were sent to Tri-Lab for geotechnical testing.

Note: No geotechnical samples were taken for the Eyre pit.







Figure 3-1 Geotechnical Sampling Locations at Vasse WRD

	•		
Test Pit No.	Easting (m)	Northing (m)	Depth (m)
TP 2	780094	7525515	3.0
TP 3	780351	7526175	3.0
TP 4	780508	7526166	3.0
TP 8	780706	7526526	3.0
TP 9	780591	7526435	3.0
TP 13	780583	7526551	3.0
TP 19	780596	7525898	3.0
TP 21	780592	7525446	3.0
TP 25	780322	7524945	3.0
TP 26	780282	7525317	3.0
TP 30	780184	7525024	3.0
TP 33	781204	7525245	2.0

Table 3-1 Geotechnical Sample Distributions

Note: Easting & northing measured with Garmin handheld GPS unit accuracy + 3m


Test	Sample	Quantity	Size	Sample	Field Description
2 PIT NO	Deptn (m)	2	(KG)	Natural Ground	Reddish Brown gravelly sand with some silt
-	1	1	0.5	Natural ground	Reddish Brown gravelly sand with some silt
	2	1	0.5	Natural Ground	Reddish Brown gravelly sand with some silt
	3	1	0.5	Natural Ground	Reddish Brown gravelly sand with some silt
3	0-3	2	15	WRD	Reddish Brown gravelly Silt
	1	1	0.5	WRD	Reddish Brown gravelly Silt
	2	1	0.5	WRD	Reddish Brown gravelly Silt
	3	1	0.5	WRD	Reddish Brown gravelly Silt
4	0-3	2	15	WRD	Reddish Brown silty SAND
	1	1	0.5	WRD	Reddish Brown silty SAND
	2	1	0.5	WRD	Reddish Brown silty SAND
	3	1	0.5	WRD	Reddish Brown silty SAND
8	0-3	2	15	WRD	Reddish Brown Sandy GRAVEL
	1	1	0.5	WRD	Reddish Brown Sandy GRAVEL
	2	1	0.5	WRD	Reddish Brown Sandy GRAVEL
	3	1	0.5	WRD	Reddish Brown Sandy GRAVEL
9	0-3	2	15	WRD	Reddish Brown silty SAND
	1	1	0.5	WRD	Reddish Brown silty SAND
	2	1	0.5	WRD	Reddish Brown silty SAND
	3	1	0.5	WRD	Reddish Brown silty SAND
13	0-3	2	15	WRD	Reddish Brown Sandy GRAVEL
	1	1	0.5	WRD	Reddish Brown Sandy GRAVEL
	2	1	0.5	WRD	Reddish Brown Sandy GRAVEL
	3	1	0.5	WRD	Reddish Brown Sandy GRAVEL
19	0-3	2	15	WRD	Reddish Brown silty SAND
	1	1	0.5	WRD	Reddish Brown silty SAND
	2	1	0.5	WRD	Reddish Brown silty SAND
	3	1	0.5	WRD	Reddish Brown silty SAND
21	0-3	2	15	Fill	Reddish Brown SAND
	1	1	0.5	Fill	Reddish Brown SAND
	2	1	0.5	Fill	Reddish Brown SAND
	3	1	0.5	Fill	Reddish Brown SAND
25	0-3	2	15	WRD	Reddish Brown gravelly SILT
	1	1	0.5	WRD	Reddish Brown gravelly SILT
	2	1	0.5	WRD	Reddish Brown gravelly SILT
	3	1	0.5	WRD	Reddish Brown gravelly SILT
26	0-3	2	15	WRD	Reddish Brown Sandy GRAVEL
	1	1	0.5	WRD	Reddish Brown Sandy GRAVEL
	2	1	0.5	WRD	Reddish Brown Sandy GRAVEL
	3	1	0.5	WRD	Reddish Brown Sandy GRAVEL
30	0-3	2	15	WRD	Reddish Brown Sandy GRAVEL
	1	1	0.5	WRD	Reddish Brown Sandy GRAVEL

Table 3-2 Geotechnical Sample Quantities

Christmas Creek





Test Pit No	Sample Depth (m)	Quantity	Size (kg)	Sample Location	Field Description
	2	1	0.5	WRD	Reddish Brown Sandy GRAVEL
	3	1	0.5	WRD	Reddish Brown Sandy GRAVEL
33	0-3	2	15	Natural Ground	Reddish Brown Sandy GRAVEL
	1	1	0.5	Natural Ground	Reddish Brown Sandy GRAVEL
	2	1	0.5	Natural Ground	Reddish Brown Sandy GRAVEL
	3	1	0.5	Natural Ground	Reddish Brown Sandy GRAVEL

3.2 Geotechnical Analysis

A laboratory testing programme was completed to characterise the strength, permeability, settlement potential, liquefaction potential, shrink and swell potential, dispersion potential and susceptibility to weathering of each sample.

Shear strength (triaxial & direct shear), consolidation and permeability testing were carried out on remoulded samples in the laboratory. This was done to replicate field conditions.

The laboratory test results are enclosed in Appendix B and are summarised in Table 3-3.

 Table 3-3
 Geotechnical Laboratory Testing

Laboratory Test	Test Pit No.	Number of tests performed
Moisture Content	2, 3, 4, 8, 9, 13, 19, 21, 26, 30, 33	32
Particle size distribution	2, 8, 19, 33	4
Atterberg Limits	2, 4, 13, 21, 26, 33	6
Emerson Crumb Dispersion	2, 9, 21, 33	4
Falling head Permeability	2, 8, 26, 30	4
Direct Shear	3, 9, 21, 30	4
Consolidation Oedometer	2, 4, 9, 19	4
Triaxial shear	2, 33	2
Slake Durability	2	1
Moisture/Density Relationship	2, 4, 8, 9, 13, 19, 21, 26, 33	9

Summary of Laboratory Test Results

All laboratory test results are summarised in Tables 3-4 to 3-10.





Sample ID	Depth (m)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Moisture Content (%)	Classification
2	0-3	22	13	9	3	3.3	Silty Sandy GRAVEL
4	0-3	30	25	5	2.0	9.9	No PSD
8	NT	NT	NT	NT	NT	NT	Sandy Silty GRAVEL with traces of Cobbles
13	0-3	31	24	7	1.5	11.1	No PSD
19	NT	NT	NT	NT	NT	NT	Cobbly GRAVEL with traces of sand & silt
21	0-3	NP	NP	NP	1.0	8.4	No PSD
26	0-3	31	21	10	4.5	10.2	No PSD
33	0-3	27	15	12	5.5	6.2	Silty Sandy GRAVEL

Table 3-4	Summary of Atterbe	erg Limits and Moistur	e Content Results

Note: NT = not tested – non plastic



Figure 3-2 Moisture Content Variation with Depth





Plasticity Chart



Figure 3-3 Plasticity Chart for Fines

The following general conclusions are presented based on the test results shown in Table 3-4.

- Moisture content generally increases with depth
- Finer fractions of the WRD materials tested are classified as silts or clays of low plasticity with a low medium moisture content
- All materials tested for particle size distribution with a maximum particle size range of 150 mm to a minimum size of 0.035 mm are classified as Sandy Silty GRAVEL with varying amounts of cobbles.

Shear Strength

The shear strength parameters are given in Table 3-5 to Table 3-7.

			Pe	ak	Residual	
Sample ID	Depth(m)	Soil type	Cohesion (kPa)	Friction angle (°)	Cohesion (kPa)	Friction angle(°)
3	0.00-3.00	Gravelly SILT	0.0	40.0	0.0	39.0
9	0.00-3.00	Silty SAND	0.0	40.5	0.0	39.0
21	0.00-3.00	SAND	37.1	28.4	32.3	28.3
30	0.00-3.00	Silty/sandy GRAVEL	12.0	28.7	12.7	28.2

Table 3-5Summary of Direct Shear Test Results

Since several of the direct shear tests results indicate a cohesion value higher than expected, a stress graph of shear stress versus normal stress from the test results was plotted to determine the shear strength parameters of cohesion (C) and friction angle phi





(Ø). The results are shown in Figures 3-4 and 3-5 for residual and peak shear strengths respectively.



Figure 3-4 Stress Plot for Residual Shear Strength Determination



Figure 3-5Stress Plot for Peak Shear Strength Determination

The line, through the origin, represents a sandy material with low or no cohesion. The line is based on a best fit and was determined to obtain the effective friction angle for a material with very low or no cohesion. Based on these results a set of design strength values have been adopted (Table 3-6).

Christmas Creek





Table 3-6Design strength values

Pe	ak	Residual		
Cohesion (C')	Friction (Ø')	Cohesion (C')	Friction(Ø')	
0	35	0	34	

The results of the triaxial tests are presented in Table 3-7.

Table 3-7Triaxial test results

BH ID	Depth(m)	Soil Type	Effective Cohesion (kPa)	Effective Friction angle (°)
2	0.00-3.00	Silty Sandy GRAVEL	14.0	37.6
33	0.00-3.00	Silty Sandy GRAVEL	15.4	39.9

Permeability Characteristics

The permeability test results are summarised in Table 3-8. Falling head permeability testing was carried out on selected samples because of the high percentage of fines (clays and silts) within the otherwise gravelly material.

Table 3-8Summary of falling head permeability test results

Sample ID	Sample Type	Depth (m)	Soil Type	Permeability (m/sec)
2	Disturbed	0.00-3.00	Silty Sandy GRAVEL	1.1 E-09
8	Disturbed	0.00-3.00	Sandy Silty GRAVEL with traces of Cobbles	2.3 E-07
26	Disturbed	0.00-3.00	Silty/sandy GRAVEL	8.4 E-07
30	Disturbed	0.00-3.00	Silty/sandy GRAVEL	4.6 E-07

Dispersion Potential and Slake Durability

The results of the dispersion test and slake durability are summarised in Table 3-9.

Table 3-9 Emerson Class Number & Slake Durability Index

BH ID	Depth (m)	Soil Type	Emerson Class Number	Slake Durability (1 st Cycle) (%)Slake Durability (2nd Cycle) (%)	
2	0.00-3.00	Sandy SILT	5	38.0	36.1
9	0.00-3.00	Silty SAND	5	Not Tested	
21	0.00-3.00	SAND	6	Not Tested	
33	0.00-3.00	Silty/sandy GRAVEL	5	Not Tested	

Two conclusions are given on the basis of the slake durability and Emerson Class tests:

- The WRD materials are classified as having low durability. This implies that the material could undergo disintegration under the process of weathering
- High Emerson class numbers imply the WRD materials are less susceptible to dispersion, i.e. the finer material composition within the WRD are non- dispersive.

Christmas Creek



Compaction Characteristics

All the compaction test results for the WRD materials are presented in Table 3-10.

BH ID	Depth(m)	Moisture Content %	Maximum Dry Density (t/m³)	Optimum Moisture Content (%)	
2	1.0	3.3			
2	2.0	2.8	2.53	9.5	
2	3.0	3.1			
3	1.0	11.5			
3	2.0	11.3	Not Tested	Not Tested	
3	3.0	7.7			
4	1.0	3.0			
4	2.0	7.0	2.27	15.0	
4	3.0	8.9			
8	1.0	6.8			
8	2.0	6.1	2.59	11.5	
8	3.0	5.6			
9	1.0	5.2		9.5	
9	2.0	7.6	2.67		
9	3.0	5.8		1	
13	1.0	9.0			
13	2.0	11.2	2.31	13.5	
13	3.0	12.3			
19	1.0	5.6			
19	2.0	9.2	2.37	12.01	
19	3.0	8.2			
21	1.0	5.9			
21	2.0	8.1	2.48	12.0	
21	3.0	7.9			
26	1.0	6.8			
26	2.0	6.7	2.51	10.0	
26	3.0	7.1			
30	1.0	11.3			
30	2.0	13.2	Not Tested	Not Tested	
30	3.0	11.8			
33	1.0	7.2	2.55	0.5	
33	2.0	6.8	2.00	9.5	

 Table 3-10
 Moisture Content & Maximum Dry Density



Consolidation Characteristics

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The test results from the Oedometer consolidation tests are summarised in Tables 3-11 to 3-14.

0		Cv (m ²	²/year)	
Stage	CC	t ₅₀	t ₉₀	MV (KPa x10 ⁻)
1	0.001	1.34	45.00	0.012
2	0.013	5.30	51.66	0.052
3	0.018	32.57	53.15	0.036
4	0.025	53.00	45.72	0.025
5	0.057	44.04	73.41	0.030
6	0.120	56.55	71.92	0.032
7	0.011	4.25	68.05	0.004
8	0.009	15.91	48.52	0.012

Table 3-11Oedometer Testing Sample #2 (0.00-3.00m depth)

Table 3-12	Oedometer Testin	g Sample #4	(0.00-3.00m	depth)
		g campic "+	(0.00 0.000	aopuij

01000	0.	Cv (n	n²/ year)	Max (I-D- ⁻¹ 40 ⁻³)
Stage	66	t ₅₀	t ₉₀	MV (KPa x10°)
1	0.000	0.81	64.38	0.004
2	0.002	0.62	109.51	0.022
3	0.015	1.00	61.67	0.068
4	0.025	0.58	39.47	0.060
5	0.089	11.46	28.79	0.105
6	0.149	60.72	33.52	0.090
7	0.154	73.32	40.61	0.049
8	0.008	18.78	63.26	0.004
9	0.007	10.49	66.09	0.012



Charte	0.5	Cv (r	n²/yr)	$M_{\rm H}$ ($L_{\rm D} = \frac{1}{2} \times 40^{-3}$)
Stage	5	t ₅₀	t ₉₀	MV (KPa x10)
1	1 0.000 0		25.92	0.004
2	0.004	0.40	27.96	0.005
3	0.014	0.34	59.10	0.053
4	0.016	0.96	32.92	0.030
5	0.022	1.10	62.65	0.021
6	0.040	1.46	29.83	0.019
7	0.147	17.74	39.11	0.035
8	0.009	29.82	41.38	0.003
9	0.008	22.51	29.68	0.010

Table 3-13Oedometer Testing Sample #9 (0.00-3.00m depth)

Table 3-14	Oedometer Testing Sample #19 (0.00-3.00m de	pth)
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O tani		Cv (n	n²/yr)	
Stage		t ₅₀	t ₉₀	MV (KPa * X10 *)
1	0.002	0.22	75.26	0.025
2	0.002	1.45	36.64	0.018
3	0.006	0.86	28.09	0.023
4	0.012	0.57	65.11	0.023
5	0.013	0.73	51.16	0.013
6	0.019	0.45	23.43	0.010
7	0.003	0.43	56.49	0.008
8	0.009	28.95	70.60	0.003
9	0.007	13.03	72.97	0.009

3.3 Conclusions

Based on the results of the laboratory and field work, the following conclusions are presented.

- Moisture content generally increases with depth
- Waste material has a permeability value of 2.0 E-07 m/sec at a density of 2.6 t/m3
- All materials tested for particle size distribution with a maximum particle size range of 150mm to a minimum size of 0.035mm are classified as Sandy Silty GRAVEL with varying amounts of cobbles
- The WRD materials are classified as having low durability. This implies that the material could undergo disintegration during the process of weathering
- The finer material composition within the WRD is non- dispersive

TetraTech recommends that the geotechnical results presented herein should be integrated with the results derived from the concurrent testing completed by third parties as





commissioned by Fortescue. Further, TetraTech recommends that future testing programs should extend to other waste dumps and potentially some in-pit sampling of waste, and that this testing be used to validate the results gathered to date.



4.0 **REFERENCES**

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APPENDIX A

Supplementary Geochemistry Data



Parameter	Ag	As	Ва	Be	Bi	Cd	Со	Cu	Mn	Мо	Ni
Detection Limit	0.1	1	2	0.1	0.1	0.1	0.1	2	0.5	0.1	2
Crustal Abundance	0.08	1	250			0.098		75	1400	1	105
GAI-3	0.96	12	3000	4	0.2	1.1/6	0 7	900	16800	12	1260
Eyre Pit #1	0.1	40	60	13	0.3	0.1	0.7	29	64.1	1.0	12
Eyre Pit #3	0.1	33	30	0.4	0.1	0.1	6.4	12	3160	0.8	22
Evre Pit #4	0.2	10	54	0.5	0.8	0.1	5.6	61	284	1	179
Evre Pit #5	0.1	41	9	0.5	0.2	0.1	3.9	8	1650	0.7	15
Eyre Pit #6	0.3	82	36	0.5	0.2	0.1	1.4	4	1160	1.3	8
Eyre Pit #7	0.1	187	6	0.8	0.5	0.1	1.8	10	646	1.7	19
Eyre Pit #8	0.1	86	9	0.2	2	0.1	5.1	9	347	1.8	103
Eyre Pit #9	0.1	160	65	0.7	0.7	0.1	9.7	24	487	2.2	211
Eyre Pit #10	0.1	229	152	0.5	0.7	0.1	8	59	4310	1.6	51
Vasse WRD, #1 Bulk 0.3	0.1	40	43	0.0	0.0	0.1	32.3	10	12400	0.0	20
Vasse WRD, #2 Bulk 1.5-	0.1	40	155	0.0	0.5	0.1	10.5	39	1280	2.5	36
Vasse WRD, #2 Bulk 0.0-	0.1	21	76	0.5	0.2	0.1	12.3	35	3240	1	28
Vasse WRD, #3 Bulk 1.5-	0.1	24	107	0.5	0.3	0.1	12.5	26	3040	1	30
Vasse WRD, #4 Bulk 0.0-	0.1	14	47	0.4	0.1	0.1	6	14	1190	0.5	14
Vasse WRD, #4 Bulk 1.5-	0.1	20	59	0.4	0.2	0.1	10.2	21	2620	0.8	21
Vasse WRD, #5 Bulk 0.0-	0.1	22	53	0.4	0.1	0.1	8.9	22	2680	0.7	22
Vasse WRD, #5 Bulk 1.5-	0.1	34	60	0.6	0.3	0.1	11.7	33	2840	0.8	27
Vasse WRD, #6 Bulk 0.0-	0.1	31	102	0.5	0.2	0.1	16.4	31	2580	0.8	20
Vasse WRD, #6 Bulk 1.5-	0.1	30	95	0.5	0.3	0.1	10	25	2210	1	31
Vasse WRD, #7 Bulk 0.0-	0.1	45	446	1	0.6	0.1	10.5	20	/06	1.8	43
Vasse WRD, #7 Bulk 1.5-	0.1	17	300 49	0.3	0.3	0.1	10.4	39 16	2770	0.8	60
Vasse WRD, #8 Bulk 1.5-	0.1	22	138	0.3	0.2	0.1	5.9	17	1730	0.8	13
Vasse WRD, #9 Bulk 1.5-	0.1	32	168	0.4	0.4	0.1	8.2	28	1270	1.4	15
Vasse WRD, #10 Bulk 0.0-	0.1	19	124	0.4	0.3	0.1	7.3	20	2210	0.7	21
Vasse WRD, #10 Bulk 1.5-	0.1	31	122	0.6	0.7	0.1	21.9	25	2880	0.9	28
Vasse WRD, #11 Bulk 0.3	0.1	34	130	0.4	0.5	0.1	9.8	30	1290	1.2	23
Vasse WRD, #12 Bulk 0.0-	0.1	17	280	0.5	0.2	0.1	7.9	26	1610	0.9	25
Vasse WRD, #12 Bulk 1.5-	0.1	11	102	0.4	0.1	0.1	7.7	17	1310	0.6	17
Vasse WRD, #13 Bulk 0.0-	0.1	31	157	0.7	0.4	0.1	12.8	30	2340	1	25
Vasse WRD, #13 Bulk 1.3-	0.1	43	96	0.0	0.4	0.1	20.0	28	1010	12	20
Vasse WRD, #14 Bulk 0.5	0.1	29	41	0.5	0.4	0.1	20.3	20	5630	0.8	26
Vasse WRD, #15 Bulk 1.5-	0.1	14	49	0.5	0.2	0.1	7.5	13	1760	0.8	14
Vasse WRD, #16 Bulk 0.0-	0.1	44	292	1	0.4	0.1	9.4	42	1110	2.4	42
Vasse WRD, #16 Bulk 1.5-	0.1	45	178	0.9	0.4	0.1	8.6	36	1100	2.5	34
Vasse WRD, #18 Bulk 0.0-	0.1	43	181	0.4	0.4	0.1	6.8	37	1090	1.1	14
Vasse WRD, #18 Bulk 1.5-	0.1	43	180	0.5	0.4	0.1	10.3	34	1390	1.1	17
Vasse WRD, #19 Bulk 0.0-	0.1	18	318	0.4	0.3	0.1	10.3	28	1070	0.7	29
Vasse WRD, #19 Bulk 1.5-	0.1	10	602	0.4	0.3	0.1	10.0	30	1210	0.7	29
Vasse WRD, #20 Bulk 0.0-	0.1	30	975	0.0	0.2	0.1	12.3	32	4040	0.7	33
Vasse WRD, #20 Bulk 1.3-	0.1	28	109	0.6	0.3	0.1	9.2	24	2810	1.1	25
Vasse WRD, #21 Bulk 1.5-	0.1	24	94	0.6	0.2	0.1	9	25	2210	2.5	20
Vasse WRD, #22 Bulk 0.0-	0.1	69	101	1.1	0.4	0.1	7.5	52	566	2.8	45
Vasse WRD, #25 Bulk 0.0-	0.1	32	282	1	0.4	0.1	21.3	54	5660	0.9	25
Vasse WRD, #25 Bulk 1.5-	0.1	30	141	0.8	0.4	0.1	17.4	46	4090	1.1	31
Vasse WRD, #26 Bulk 0.0-	0.1	57	291	0.9	0.5	0.1	11	27	3780	1.6	26
Vasse WRD, #26 Bulk 1.5-	0.1	45	157	0.6	0.3	0.1	5.2	20	2750	1	14
Vasse WRD, #27 Bulk 0.3	0.1	26	24	0.8	0.6	0.1	9.2	16	7010	1.5	30
Vasse WRD, #28 Bulk 0.0-	0.1	50	237	0.9	0.0	0.1	9.7	20	6020	1.2	20
Vasse WRD, #20 Bulk 0.0-	0.1	33	<u>∠00</u> 85	0.6	0.0	0.1	3.7 12.3	29 27	2700	0.7	20
Vasse WRD, #29 Bulk 1.5-	0.1	30	398	0.9	0.5	0.1	25	42	4980	1	37
Vasse WRD, #30 Bulk 0.0-	0.1	31	104	0.8	0.5	0.1	14.8	33	3030	1	33
Vasse WRD, #30 Bulk 1.5-	0.1	33	70	0.7	0.4	0.1	11.3	25	2700	0.9	22
Vasse WRD, #31 Bulk 0.0-	0.1	42	76	0.4	0.6	0.1	3	47	159	1.6	27
Vasse WRD, #31 Bulk 1.5-	0.1	37	114	0.6	0.7	0.1	4.5	44	246	1.6	30
Vasse WRD, #1 Bulk	0.1	49	29	0.7	0.6	0.1	43.2	19	13400	0.9	63
Vasse WRD, #11 Bulk	0.1	44	114	0.4	0.5	0.1	8.1	40	1390	1.5	26
Vasse WRD, #14 Bulk	0.1	23	68 25	0.3	0.2	0.1	6.1 11 A	18 22	1530	1 วว	14
Fyre Pit #10b Rulk	0.7	41	20 655	C.U A N	0.7	0.7	83.7	22	67300	2.3	37
Italics show values at or	V.2	17	000	0.0	0.1	0.0	00.7	- 1	01000	0.0	13

below the detection limit Data in red indicates the result is above GAI-3



Parameter	Pb	Rb	Sb	Se	Sn	Те	Th	TI	U	W	Zn	Li
Detection Limit	1	0.05	0.1	2	0.3	0.1	0.05	0.1	0.05	0.1	5	0.1
Crustal Abundance	8		0.2	0.05				0.36	0.91		80	
GAI-3	96		2.4	0.6				4.32	10.92		960	
Eyre Pit #1	21	4.17	3.3	2	1.1	0.1	4.41	0.1	1.71	1.8	54	1.6
Eyre Pit #2	12	16.2	1.8	2	2.5	0.3	11.9	0.1	2.83	2.5	11	17
Eyre Pit #3	9	1.26	1.4	2	0.6	0.1	2.15	0.1	1.74	0.8	24	1.3
Eyre Pit #4	39	14.3	17	2	2.1	0.1	2.76	0.1	3.09	2.1	04 10	19
Eyre Pit #5	17	0.34	1.7	2	0.0	0.1	2.70	0.1	0.51	1.2	13	0.4
Evre Pit #7	31	0.32	3.4	2	2.3	0.1	8.56	0.1	2.23	3.2	.0	7.4
Eyre Pit #8	68	0.36	2.1	2	7.4	0.4	41.5	0.1	9.37	10.4	28	14
Eyre Pit #9	42	4.35	3.9	2	3.3	0.6	17.3	0.1	3.91	4.9	59	10
Eyre Pit #10	59	29.2	5.2	7	4	0.4	14.9	0.5	4.74	3.8	31	6.2
Vasse WRD, #1 Bulk 0.3	30	0.55	4.3	2	2.8	0.2	9.1	0.2	4.08	1.9	74	6.4
Vasse WRD, #2 Bulk 0.0-	29	30	4	2	3	0.3	14.8	0.3	2.53	1.8	59	6.5
Vasse WRD, #2 Bulk 1.5-	30	30.6	4.0	2	2.9	0.3	15.4	0.3	2.38	1.9	54 75	1.0
Vasse WRD, #3 Bulk 0.0-	20	1.77	2.0	2	1.1	0.1	4.20	0.1	3.34	2.7	75	1.0
Vasse WRD, #5 Bulk 1.5-	13	0.86	1.4	2	0.5	0.1	1.88	0.1	1.33	1.0	28	14
Vasse WRD, #4 Bulk 1.5-	15	1.12	2	2	0.7	0.1	3.26	0.1	1.71	1.4	38	1.9
Vasse WRD, #5 Bulk 0.0-	11	0.64	1.8	2	0.6	0.1	2.57	0.1	1.65	1.2	52	1.0
Vasse WRD, #5 Bulk 1.5-	17	2.25	3.1	2	1.1	0.1	4.72	0.1	2.37	1.8	55	5.0
Vasse WRD, #6 Bulk 0.0-	17	1.01	1.9	2	0.9	0.1	4.18	0.3	2.15	1.1	52	2.8
Vasse WRD, #6 Bulk 1.5-	22	0.86	2.4	2	1.2	0.1	6.19	0.1	1.96	1.6	47	3.0
Vasse WRD, #7 Bulk 0.0-	31	10.1	4.2	3	2.7	0.3	17.2	0.1	2.92	2	51	20
Vasse WRD, #7 Bulk 1.5-	26	5.49	3.8	2	2.5	0.3	11.8	0.1	2.08	1.7	49	8.6
Vasse WRD, #8 Bulk 0.0-	19	1.24	1.6	2	0.9	0.1	3.75	0.1	1.44	8.2	28	2.7
Vasse WRD, #8 Bulk 1.5-	21	1.25	2.2	2	0.8	0.1	4.55	0.1	1.54	2.3	24	2.1
Vasse WRD, #9 Bulk 1.3-	24	0.82	21	2	1.0	0.2	9.93 7.08	0.1	2.04	1.7	36	21
Vasse WRD, #10 Bulk 0.0-	37	0.66	2.9	2	3	0.1	16.5	0.1	2.89	1.0	76	3.4
Vasse WRD, #11 Bulk 0.3	26	1.11	3.2	2	1.7	0.3	11.4	0.1	1.82	1.5	43	4.9
Vasse WRD, #12 Bulk 0.0-	18	2.99	2.4	2	0.9	0.1	4.96	0.1	2.03	2.1	43	3.9
Vasse WRD, #12 Bulk 1.5-	12	1.31	1.1	2	0.4	0.1	2.39	0.1	1.74	3.6	35	1.6
Vasse WRD, #13 Bulk 0.0-	28	2.31	2.5	2	1.7	0.2	10.2	0.1	2.68	1.5	60	5.3
Vasse WRD, #13 Bulk 1.5-	27	1.01	3.2	2	1.6	0.2	7.97	0.1	2.31	1.2	166	3.4
Vasse WRD, #14 Bulk 0.3	24	1.27	2.4	2	1.2	0.1	7.61	0.1	1.78	1.7	39	6.7
Vasse WRD, #15 Bulk 0.0-	42	0.6	2.9	2	1.6	0.1	9.13	0.1	3.07	1.5	61	1.4
Vasse WRD, #15 Bulk 1.5-	10	0.09	1.5	2	0.0	0.7	3.44	0.1	1.47	22	31	0.9
Vasse WRD, #16 Bulk 1.5-	29	8.85	4.2	2	2.5	0.2	12.8	0.2	2.75	2.2	33	11
Vasse WRD, #18 Bulk 0.0-	25	2.22	2.5	2	1.5	0.3	8.06	0.1	1.6	1.2	63	7.1
Vasse WRD, #18 Bulk 1.5-	28	2.21	2.6	2	1.4	0.3	8.67	0.1	1.66	1.1	62	5.7
Vasse WRD, #19 Bulk 0.0-	18	3.28	1.7	2	1.2	0.1	6.99	0.1	1.57	1.4	31	6.6
Vasse WRD, #19 Bulk 1.5-	15	2.89	1.5	2	1.1	0.1	6.14	0.1	1.44	1.3	26	4.7
Vasse WRD, #20 Bulk 0.0-	23	3.2	1	3	0.6	0.1	5.07	0.5	1.7	0.5	108	1.8
Vasse WRD, #20 Bulk 1.5-	25	5.88	2.1	2	1	0.1	7.07	0.3	2.14	1.1	80	7.0
Vasse WRD, #21 Bulk 0.0-	20	1.18	1.9	2	0.8	0.1	5.01	0.1	2./1	1.7	64	2.4
Vasse WRD, #21 Bulk 1.5-	50 29	0.86	1.8	2	0.5	0.1	3.19	0.1	∠.5 3 27	1.1	156	1.2
Vasse WRD #25 Bulk 0.0-	20 60	1 62	4.2	2	<u>2.2</u> 11	0.3	9.59	0.2	3.62	1.0	30	21
Vasse WRD, #25 Bulk 0.0-	25	2.28	2.6	2	1	0.2	8.14	0.3	3.32	1.7	34	17
Vasse WRD, #26 Bulk 0.0-	26	5.91	2.4	3	1.6	0.3	12.5	0.3	2.87	1.3	30	7.9
Vasse WRD, #26 Bulk 1.5-	19	3.93	1.6	2	1	0.2	9	0.1	1.96	1	23	4.4
Vasse WRD, #27 Bulk 0.3	15	1.17	3.6	2	1.3	0.2	9.25	0.1	2.4	1.5	30	24
Vasse WRD, #28 Bulk 0.0-	27	5.61	3.1	2	1.8	0.2	15.2	0.2	2.77	1.4	33	8.9
Vasse WRD, #28 Bulk 1.5-	29	4.75	3.1	2	2	0.2	15.1	0.2	2.3	1.5	29	13
Vasse WRD, #29 Bulk 0.0-	22	1.46	2.1	2	1.1	0.1	7.2	0.1	2.7	1.5	22	8.4
Vasse WRD, #29 Bulk 1.5-	∠1 24	0.74	2.0	2	1.5	0.2	11.2	0.1	4.17	2.2	22	28 17
Vasse WRD, #30 Bulk 0.0-	22	1 4 9	3.2 2.1	2	1.2	0.2	7 1	0.5	4.1 2 79	1.0	22	77
Vasse WRD #31 Bulk 0.0-	37	2 69	31	2	27	0.2	14	0.1	2.10	24	42	16
Vasse WRD, #31 Bulk 1.5-	39	3.58	3.3	2	2.5	0.4	13.5	0.1	2.07	2.3	57	18
Vasse WRD. #1 Bulk	34	0.31	6.7	2	2.7	0.3	8.03	0.1	3.76	1.8	89	2.7
Vasse WRD, #11 Bulk	26	1.25	4.7	2	2.4	0.4	11.1	0.1	1.83	2.1	50	4.4
Vasse WRD, #14 Bulk	17	0.56	2.5	2	0.9	0.1	3.69	0.1	1.3	1.2	42	1.3
Vasse WRD, #27 Bulk	17	0.57	6.1	2	1.6	0.3	9.45	0.1	2.46	2	36	12
Eyre Pit #10b Bulk	25	3.33	1.1	2	0.4	0.1	1.43	2	1.1	0.8	44	2.5

Eyre Pit #10b Bulk Italics show values at or below the detection limit Data in red indicates the result is above GAI-3



Parameter	Ce	Cs	Ga	Hf	In	La	Nb	Sc	Та	AI	Cr	Fe
Detection Limit	0.05	0.05	0.2	0.05	0.02	0.05	0.1	0.2	0.05	100	10	100
Crustal Abundance												7.06
GAI-3	22	0.45	7.0	4.24	0.05	7.65	4 5	44 E	0.52	24400	20	84.72
Eyre Pit #1	12.2	0.15	21.6	3.76	0.05	4 77	4.5	11.5	0.53	84700	30 110	59600
Evre Pit #3	35.3	0.09	3.5	0.57	0.02	12.9	2.2	2.9	0.28	16000	10	513000
Eyre Pit #4	108	0.72	7.9	3.38	0.02	30.2	10.7	14.6	1.3	116000	10	24700
Eyre Pit #5	27	0.09	4	0.69	0.02	5.35	2.2	2.7	0.22	5040	30	549000
Eyre Pit #6	24.2	0.09	4.6	0.52	0.02	15.8	1.9	2	0.17	5340	20	402000
Eyre Pit #7	18.8	0.07	15.8	2.56	0.07	11.8	7.9	7.6	0.81	60300	90	416000
Eyre Pit #8	150	0.12	70.3	5.83	0.12	87.2	27.0	21.0	2.32	93900	100	268000
Evre Pit #10	89.3	5.48	46	3.98	0.12	52.6	10.6	14.1	1.40	73800	260	300000
Vasse WRD, #1 Bulk 0.3	94	0.13	15.4	2.92	0.09	29.1	8.5	13.6	0.86	44900	20	487000
Vasse WRD, #2 Bulk 0.0-	40	2.03	19.8	3.95	0.16	17.7	9.8	15	0.86	49100	140	364000
Vasse WRD, #2 Bulk 1.5-	42.6	2.04	20.6	4	0.16	19.7	10.1	14.3	0.89	47900	150	373000
Vasse WRD, #3 Bulk 0.0-	43.7	0.19	6.5	1.24	0.04	9.67	3.8	7	0.37	21700	20	501000
Vasse WRD, #3 Bulk 1.5-	30.4	0.2	2.0	0.5	0.03	5 28	4.4	9.0 4 3	0.39	10300	20	437000
Vasse WRD, #4 Bulk 0.0	25	0.14	4.7	0.89	0.02	6.67	2.6	8.2	0.25	17900	40	500000
Vasse WRD, #5 Bulk 0.0-	16.2	0.09	4.1	0.7	0.02	6.39	2.3	5.7	0.22	13800	40	516000
Vasse WRD, #5 Bulk 1.5-	33.1	0.29	7.5	1.33	0.04	7.59	4	9.4	0.43	30200	10	477000
Vasse WRD, #6 Bulk 0.0-	47.8	0.11	6.2	1.15	0.04	7.32	3.2	10.2	0.3	23600	20	493000
Vasse WRD, #6 Bulk 1.5-	32.5	0.1	7.9	1./1	0.06	15.0	4.5	11 20	0.45	2/600	10	499000
Vasse WRD, #7 Bulk 0.0-	22.4	0.09	20.4	4.74	0.17	7 95	9.4	13.7	0.92	50200	130	425000
Vasse WRD, #7 Bulk 1.5	23	0.1	6.1	1.11	0.03	8.26	3.3	7.2	0.3	17200	10	409000
Vasse WRD, #8 Bulk 1.5-	17.7	0.13	5.6	1.25	0.03	3.71	3.3	8.5	0.29	17000	90	478000
Vasse WRD, #9 Bulk 1.5-	50.4	0.24	11.1	2.73	0.08	6.83	6.4	15.2	0.59	37000	100	455000
Vasse WRD, #10 Bulk 0.0-	40.8	0.07	8.5	1.93	0.05	9.73	4.8	12.5	0.43	28300	50	493000
Vasse WRD, #10 Bulk 1.5-	47.1	0.07	21.5	5.31	0.15	15.9	13.1	19.7	1.12	45200	70	456000
Vasse WRD, #11 Bulk 0.3	34.0	0.09	66	3.20	0.08	5 25	7.1	9.6	0.7	25200	10	441000
Vasse WRD, #12 Bulk 0.0-	13.6	0.12	3.3	0.65	0.02	4.78	3.0	5.1	0.30	14300	10	501000
Vasse WRD, #13 Bulk 0.0-	34.1	0.17	13.6	3.1	0.09	12.2	7.7	16.2	0.7	40900	60	454000
Vasse WRD, #13 Bulk 1.5-	32.7	0.08	11.2	2.56	0.08	10.5	6.2	15.2	0.55	30300	70	490000
Vasse WRD, #14 Bulk 0.3	28.7	0.1	9	2.15	0.06	5.45	4.8	11.1	0.47	27800	70	480000
Vasse WRD, #15 Bulk 0.0-	41.3	0.05	12.4	2.65	0.07	9.95	7.1	18.4	0.64	34600	50	482000
Vasse WRD, #15 Bulk 1.5-	32.3	0.07	4.0	3.61	0.03	0.04 11 5	2.5	7.0 15.4	0.23	48500	130	223000
Vasse WRD, #16 Bulk 0.0-	27.4	0.53	19.3	3.89	0.11	9.44	11.7	14.7	1.14	43900	130	430000
Vasse WRD, #18 Bulk 0.0-	21.5	0.18	10.9	2.49	0.08	5.69	5.7	14.5	0.54	34100	90	432000
Vasse WRD, #18 Bulk 1.5-	28.6	0.17	10.3	2.5	0.08	8.14	5.2	15.8	0.5	35900	70	446000
Vasse WRD, #19 Bulk 0.0-	26.6	0.23	9.6	1.9	0.05	8.7	5.1	11	0.5	32400	40	460000
Vasse WRD, #19 Bulk 1.5-	20.4	0.2	8.5	1.66	0.05	6.89	4.5	9.9	0.48	27700	10	4/2000
Vasse WRD, #20 Bulk 0.0-	34.9 40.9	0.19	5.4	1.25	0.04	3.55	4 2	13.1	0.2	38400	20	433000
Vasse WRD, #20 Bulk 1.9	32.1	0.00	6.7	1.5	0.04	6.93	3.9	1.9	0.38	25700	30	484000
Vasse WRD, #21 Bulk 1.5-	22.3	0.07	4.7	0.85	0.02	4.64	2.4	1.8	0.25	16600	20	531000
Vasse WRD, #22 Bulk 0.0-	22.6	0.78	17.3	4.28	0.13	8.14	9.5	4.2	1.03	55200	120	421000
Vasse WRD, #25 Bulk 0.0-	246	0.14	11.3	2.91	0.05	13.8	5.2	2.5	0.58	46300	50	420000
Vasse WRD, #25 Bulk 1.5-	/8./	0.22	10.9	2.44	0.04	12.1	4.8	2.6	0.52	43000	80 120	451000
Vasse WRD, #26 Bulk 0.0-	43.0	0.4	14.3	2 76	0.06	5.02	4.5	2.4	0.79	29500	120	444000
Vasse WRD, #20 Bulk 0.3	31.7	0.09	11.9	3.19	0.04	11.3	6.3	3.6	0.73	45600	30	234000
Vasse WRD, #28 Bulk 0.0-	43.4	0.39	16.9	4.76	0.1	7.04	8.3	3.1	0.9	52700	90	424000
Vasse WRD, #28 Bulk 1.5-	69.1	0.28	19.1	5.05	0.1	7.73	9.5	3.1	1.03	63200	80	353000
Vasse WRD, #29 Bulk 0.0-	58.5	0.11	10.3	2.24	0.05	10.1	4.8	2.1	0.52	34000	70	466000
Vasse WRD, #29 Bulk 1.5-	36.2	0.09	13.2	3.51	0.07	19.7	6.3	2.6	0.71	57300	70	424000
Vasse WRD, #30 Bulk 0.0-	20.4	0.08	9.4	2 16	0.06	9.47	5.1 4 3	3.Z 2 1	0.58	40400	50 10	407000
Vasse WRD, #30 Bulk 1.5-	33.4	0.23	20.8	5.06	0.05	12.2	10.7	3.1	1.14	74100	130	361000
Vasse WRD, #31 Bulk 1.5-	39.9	0.28	20.2	5.12	0.13	13.6	10.1	3.3	1.08	68300	130	343000
Vasse WRD, #1 Bulk	73.8	0.11	16	3.33	0.09	33.1	7.4	12.5	1.01	49700	70	534000
Vasse WRD, #11 Bulk	34.1	0.16	16.3	4.1	0.13	10	7.5	17.5	0.93	43700	110	494000
Vasse WRD, #14 Bulk	22.5	0.14	5	1.45	0.05	4.5	2.6	7	0.35	21500	90	584000
Fyre Bit #10b Bulk	30	0.12	5.1	3.6	0.06	15.3	1.2	5.4	0.00	20200	70 60	462000

Italics show values at or

below the detection limit Data in red indicates the result is above GAI-3

Parameter	Fe	Sr	Ti	V	Zr	Ca	K	Mg	Mg	Na	Р	S
Detection Limit	100	1	10	1	1	50	100	20	20	50	20	20
Crustal Abundance	7.06	260	5300	230				3.2	3.2			
GAI-3	84.72	3120	63600	2760				38.4	38.4			
Eyre Pit #1	47.0	2	1570	69	42	300	590	290	0.03	160	630	330
Eyre Pit #2	51.2	5	4360	19	110	210	2/30	640	0.06	230	30	210
Eyre Pit #3	25	13	4330	10	110	160	2570	440	0.00	250	900	110
Evre Pit #5	54.9	1	510	19	25	110	0	210	0.04	70	800	190
Eyre Pit #6	40.2	1	650	22	21	90	120	190	0.02	0	450	100
Eyre Pit #7	41.6	1	2820	67	88	330	0	210	0.02	400	320	350
Eyre Pit #8	13.4	1	12700	32	391	460	0	270	0.03	350	130	200
Eyre Pit #9	26.8	27	5570	163	164	230	1130	640	0.06	400	830	440
Eyre Pit #10	30.0	41	4010	111	131	1050	7180	2490	0.25	570	220	670
Vasse WRD, #1 Bulk 0.3	48.7	4	2730	104	100	240	110	63U 910	0.06	490	220	380
Vasse WRD, #2 Bulk 0.0-	37.3	13	3730	202	104	740	4070	790	0.08	520	560	200
Vasse WRD, #2 Bulk 0.0-	50.1	5	1430	40	44	840	310	1040	0.10	420	490	410
Vasse WRD, #3 Bulk 1.5-	50.9	4	1470	50	56	520	340	790	0.08	290	520	450
Vasse WRD, #4 Bulk 0.0-	43.7	1	540	20	19	470	140	460	0.05	260	450	300
Vasse WRD, #4 Bulk 1.5-	50.0	4	840	33	32	810	200	950	0.10	310	370	430
Vasse WRD, #5 Bulk 0.0-	51.6	5	710	32	26	2160	150	1320	0.13	490	360	450
Vasse WRD, #5 Bulk 1.5-	47.7	7	1450	50	45	1420	410	990	0.10	470	480	560
Vasse WRD, #6 Bulk 0.0-	49.3	9	1070	47	37	1710	240	820	0.08	200	250	450
Vasse WRD, #6 Bulk 1.5-	49.9	0 22	1550	57	60 157	950	160	1000	0.07	240	280	4/0
Vasse WRD, #7 Bulk 1.0-	42.5	14	2710	124	121	1040	850	590	0.10	380	200	680
Vasse WRD, #8 Bulk 0.0-	40.9	2	1120	36	41	360	170	430	0.04	140	430	240
Vasse WRD, #8 Bulk 1.5-	47.8	7	1110	41	45	930	220	450	0.05	160	280	390
Vasse WRD, #9 Bulk 1.5-	45.5	14	2140	91	94	690	430	440	0.04	180	310	640
Vasse WRD, #10 Bulk 0.0-	49.3	10	1560	54	64	690	200	500	0.05	230	280	580
Vasse WRD, #10 Bulk 1.5-	45.6	4	4000	131	176	380	130	410	0.04	160	260	520
Vasse WRD, #11 Bulk 0.3	44.1	8	2550	93	102	550	190	430	0.04	220	240	490
Vasse WRD, #12 Bulk 0.0-	45.8	10	1300	44	45	1260	470	800	0.08	410	360	600
Vasse WRD, #12 Bulk 1.5-	50.1	4	04U 2510	19	100	550	230	720	0.07	400	310	420
Vasse WRD, #13 Bulk 0.0-	45.4	2	1850	83	84	420	350	400	0.07	330	200	510
Vasse WRD, #13 Bulk 0.3	48.0	6	1640	61	72	430	280	380	0.04	150	310	500
Vasse WRD, #15 Bulk 0.0-	48.2	5	2170	70	85	510	100	610	0.06	240	340	510
Vasse WRD, #15 Bulk 1.5-	52.3	1	800	29	31	520	110	390	0.04	180	460	410
Vasse WRD, #16 Bulk 0.0-	43.0	6	3550	144	127	370	1200	490	0.05	240	310	450
Vasse WRD, #16 Bulk 1.5-	43.0	5	3770	149	137	430	1320	460	0.05	250	300	450
Vasse WRD, #18 Bulk 0.0-	43.2	6	1840	81	84	480	320	330	0.03	230	220	570
Vasse WRD, #18 Bulk 1.5-	44.6	8	1/50	83	80	500	540	380	0.04	190	200	590
Vasse WRD, #19 Bulk 0.0-	40.0	19	1760	49	57	4450	450	1250	0.13	280	270	430
Vasse WRD, #19 Bulk 0.0-	45.3	17	700	35	41	1160	620	540	0.05	350	140	920
Vasse WRD, #20 Bulk 1.5-	43.3	16	1510	66	62	1890	850	640	0.06	300	250	880
Vasse WRD, #21 Bulk 0.0-	48.4	6	1320	47	53	550	210	670	0.07	380	370	580
Vasse WRD, #21 Bulk 1.5-	53.1	4	820	38	30	580	160	740	0.07	460	420	610
Vasse WRD, #22 Bulk 0.0-	42.1	5	3170	170	122	300	1580	390	0.04	270	250	350
Vasse WRD, #25 Bulk 0.0-	42.0	23	1790	62	81	1100	460	2010	0.20	1020	180	320
Vasse WKD, #25 Bulk 1.5-	45.1	18	1640	120	12	4270	510	1640	0.16	088	250	330
Vasse WRD, #26 Bulk 0.0-	44.4 48.2	<u></u> 6	2330	68	80	540	950	930	0.09	200	320	200
Vasse WRD, #27 Bulk 0.3	23.4	11	2290	71	88	390	160	860	0.09	770	310	610
Vasse WRD, #27 Bulk 0.0-	42.4	11	2620	118	133	620	800	610	0.06	260	210	600
Vasse WRD, #28 Bulk 1.5-	35.3	26	3150	121	139	1970	850	860	0.09	670	190	1150
Vasse WRD, #29 Bulk 0.0-	46.6	<u>1</u> 5	1450	50	69	2170	320	1240	0.12	670	280	450
Vasse WRD, #29 Bulk 1.5-	42.4	17	2130	77	99	510	210	1250	0.13	1010	230	460
Vasse WRD, #30 Bulk 0.0-	46.7	10	1800	69	88	670	170	1010	0.10	630	290	610
Vasse WRD, #30 Bulk 1.5-	49.3	13	1480	50	61	1470	300	1200	0.12	650	300	410
Vasse WRD, #31 Bulk 0.0-	36.1	53	3530	137	150	1930	1060	880	0.09	500	250	10/0
Vasse WRD #1 Bulk 1.5-	53 /	20	2550	137	149	540	<u>620</u> ∩	1000	0.08	400	210	320
Vasse WRD, #11 Bulk	49.4	1	2630	114	119	1090	220	1090	0.11	310	240	500
Vasse WRD, #14 Bulk	58.4	1	810	33	40	950	130	420	0.04	160	340	740
Vasse WRD, #27 Bulk	31.8	4	2610	81	100	480	130	1040	0.10	900	420	660
Eyre Pit #10b Bulk	46.2	46	410	13	13	510	2220	1390	0.14	1070	270	690

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Parameter	пg	ĸe	Ge
Detection Limit	0.1	0.05	0.5
Crustal Abundance			
GAI-3			
Evre Pit #1	0.1	0.05	3.7
Evre Pit #2	01	0.05	6.6
Eyro Dit #2	0.1	0.00	5.0
Eyro Dit #4	0.1	0.00	3.0
Eyre Pit #4	0.1	0.05	2.9
Eyre Pit #5	0.1	0.05	6.9
Eyre Pit #6	0.1	0.05	5.6
Eyre Pit #7	0.2	0.05	10.2
Eyre Pit #8	0.1	0.05	6.7
Eyre Pit #9	0.1	0.05	3.3
Evre Pit #10	0.3	0.05	2.8
Vasse WRD, #1 Bulk 0.3	0.1	0.05	2.5
Vasse WRD #2 Bulk 0.0-	0.1	0.05	44
Vasse WRD #2 Bulk 1.5-	0.1	0.00	4.5
Vasse WRD, #2 Bulk 0.0	0.1	0.05	4.3
Vasse WRD, #3 Bulk 0.0-	0.1	0.05	4.3
Vasse WRD, #3 Bulk 1.5-	0.1	0.05	4.7
Vasse WRD, #4 Bulk 0.0-	0.1	0.05	6.7
Vasse WRD, #4 Bulk 1.5-	0.1	0.05	5.7
Vasse WRD, #5 Bulk 0.0-	0.1	0.05	4.8
Vasse WRD. #5 Bulk 1.5-	0.1	0.05	6.2
Vasse WRD, #6 Bulk 0.0-	0.1	0.05	5.8
Vasse WRD #6 Bulk 1 5-	0.1	0.05	5 9
Vasse WRD #7 Bulk 0.0	0.1	0.00	5.0
Vasce WRD #7 Dulk 0.0-	0.1	0.00	5.2
Vasse WRD, #/ Bulk 1.5-	0.1	0.05	5.4
Vasse WRD, #8 Bulk 0.0-	0.1	0.05	5.7
Vasse WRD, #8 Bulk 1.5-	0.1	0.05	6.2
Vasse WRD, #9 Bulk 1.5-	0.1	0.05	6.4
Vasse WRD, #10 Bulk 0.0-	0.1	0.05	5.6
Vasse WRD, #10 Bulk 1.5-	0.1	0.05	4.0
Vasse WRD, #11 Bulk 0.3	0.1	0.05	5.1
Vasse WRD, #12 Bulk 0.0-	0.1	0.05	5.4
Vasse WRD, #12 Bulk 1 5-	0.1	0.05	4.7
Vasse WRD #13 Bulk 0.0-	0.1	0.05	47
Vasso WRD #13 Bulk 1.5	0.1	0.00	1.7
Vasse WRD, #13 Dulk 1.3-	0.1	0.00	4.0
Vasse WKD, #14 Bulk 0.3	0.1	0.05	J.8
vasse WRD, #15 Bulk 0.0-	0.1	0.05	4.7
Vasse WRD, #15 Bulk 1.5-	0.1	0.05	5.0
Vasse WRD, #16 Bulk 0.0-	0.1	0.05	4.7
Vasse WRD, #16 Bulk 1.5-	0.1	0.05	5.0
Vasse WRD, #18 Bulk 0.0-	0.1	0.05	6.3
Vasse WRD, #18 Bulk 1.5-	0.1	0.05	6.1
Vasse WRD, #19 Bulk 0 0-	0.1	0.05	5.1
Vasse WRD #19 Bulk 1.5-	0.1	0.05	4.8
Vasso WRD #20 Bulk 0.0	0.1	0.00	3.0
Vasse WRD, #20 Dulk 0.0-	0.1	0.00	3.9
Vasse WKD, #20 Bulk 1.5-	0.1	0.05	4.2
vasse WRD, #21 Bulk 0.0-	0.1	0.05	4.2
vasse WRD, #21 Bulk 1.5-	0.1	0.05	3.8
Vasse WRD, #22 Bulk 0.0-	0.1	0.05	3.5
Vasse WRD, #25 Bulk 0.0-	0.1	0.05	6.1
Vasse WRD, #25 Bulk 1.5-	0.1	0.05	5.1
Vasse WRD, #26 Bulk 0.0-	0.1	0.05	4.0
Vasse WRD, #26 Bulk 1.5-	0.1	0.05	5.6
Vasse WRD #27 Bulk 0.3	0.1	0.05	27
Vasso WRD #29 Bulk 0.0	0.1	0.00	2.7
Vasao WPD #20 Dulk 4 5	0.1	0.00	3.5
Vasse WKD, #28 Bulk 1.5-	0.1	0.05	3.2
Vasse WKD, #29 Bulk 0.0-	0.1	0.05	4.8
Vasse WRD, #29 Bulk 1.5-	0.1	0.05	3.6
Vasse WRD, #30 Bulk 0.0-	0.1	0.05	4.1
Vasse WRD, #30 Bulk 1.5-	0.1	0.05	4.8
Vasse WRD, #31 Bulk 0.0-	0.1	0.05	6.8
Vasse WRD, #31 Bulk 1.5-	0.1	0.05	5.9
Vasse WRD, #1 Bulk	0.1	0.05	2.1
Vasse WRD #11 Bulk	01	0.05	5.3
Vasso WRD #14 Bulk	0.1	0.00	6.0
Vasse WRD, #14 Dulk	0.1	0.00	0.2
	0.1	0.05	3.1
Eyre Pit #10b Bulk	0.6	0.05	2.7
Italics show values at or			

below the detection limit Data in red indicates the result is above GAI-3

			Bicarbonat	Carbonate	Hydroxide	Total			
	рН	TDS	e Alkalinity	Alkalinity	Alkalinity	Alkalinity	SO4	F	Na
			as HCO3	as CO3	as OH	(CaCO3)			
	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Australian Drinking Water	6.5-8.5	500		0.05	0.5	-	500, 250	1.5	180
Eyre Pit #1	8.9	16	6 2 E	0.05	2.5	5	5	0.2	4.4
Eyre Pit #2	0.0	10	2.0	0.05	2.0	2.0	0.05	0.005	2.4
Eyre Pit #3	0.Z	24	25	0.05	2.0	25	0.05	0.3	3.3 2.1
Eyre Pit #5	6.0	0.05	2.5	0.05	2.5	2.5	0.03	0.3	2.1 4.1
Eyre Pit #6	6.3	0.05	2.5	0.05	2.5	2.5	2	0.005	0.9
Evre Pit #7	6.4	52	2.5	0.05	2.5	2.5	19	0.2	15
Eyre Pit #8	6.6	20	2.5	0.05	2.5	2.5	1	0.4	10
Eyre Pit #9	5.8	56	2.5	0.05	2.5	2.5	20	0.1	14
Eyre Pit #10	7.1	200	25	0.05	2.5	21	2	0.6	5.7
Vasse WRD, #1 Bulk 0.3	6.2	0.05	2.5	0.05	2.5	2.5	6	0.4	2.9
Vasse WRD, #2 Bulk 0.0-1.5	6.7	36	33	0.05	2.5	27	2	0.005	0.8
Vasse WRD, #2 Bulk 1.5-3.0	6.4	32	14	0.05	2.5	11	2	0.005	0.8
Vasse WRD, #3 Bulk 0.0-1.5	7.3	108	47	0.05	2.5	38	23	1.2	16
Vasse WRD, #3 Bulk 1.5-3.0	7.1	64	20	0.05	2.5	17	16	0.6	10
Vasse WRD, #4 Bulk 0.0-1.5	/.6	32	30	0.05	2.5	25	11	0.6	/.0
Vasse WRD, #4 Bulk 1.5-3.0	C. 1 0 4	84 100	40	0.05	2.0	38	18	1.0	10
Vasse WRD, #5 Bulk 0.0-1.5	8.4	108	50	0.05	2.0	45	24	1.2	10
Vasse WRD, #5 Bulk 1.5-5.0	0.4	56	56	0.05	2.5	44	23	1.0	2.8
Vasse WRD, #6 Bulk 1.5-3.0	7.7	36	46	0.05	2.5	38	8	1.0	5.2
Vasse WRD, #7 Bulk 0.0-1.5	7.8	52	54	0.05	2.5	45	9	0.4	5.4
Vasse WRD, #7 Bulk 1.5-3.0	7.4	44	32	0.05	2.5	26	12	0.4	7.8
Vasse WRD, #8 Bulk 0.0-1.5	7.0	16	9	0.05	2.5	8	8	0.4	4.5
Vasse WRD, #8 Bulk 1.5-3.0	8.2	44	49	0.05	2.5	40	9	0.6	3.8
Vasse WRD, #9 Bulk 1.5-3.0	7.3	12	17	0.05	2.5	14	10	0.4	4.1
Vasse WRD, #10 Bulk 0.0-1.5	7.4	40	21	0.05	2.5	17	10	0.7	5.5
Vasse WRD, #10 Bulk 1.5-3.0	6.5	16	8	0.05	2.5	6	7	0.3	5.2
Vasse WRD, #11 Bulk 0.3	7.0	20	2.5	0.05	2.5	2.5	3	0.2	2.5
Vasse WRD, #12 Bulk 0.0-1.5	8.4	44	57	0.05	2.5	46	16	0.7	8.2
Vasse WRD, #12 Bulk 1.5-3.0	7.6	56	22	0.05	2.5	18	22	0.5	12
Vasse WRD, #13 Bulk 0.0-1.5	1.3	40	25	0.05	2.5	21	16	0.6	10
Vasse WRD, #13 Bulk 1.5-3.0	0.7 6.9	10	8	0.05	2.5	1	17	0.3	10
Vasse WRD, #14 Bulk 0.3	0.0	0.05	0	0.05	2.0	0	20	0.2	2.7
Vasse WRD, #15 Bulk 1.5-3.0	7.1	36	21	0.05	2.5	18	11	0.7	0.1 4.2
Vasse WRD, #16 Bulk 0.0-1.5	6.3	12	2.5	0.05	2.5	2.5	6	0.005	4.3
Vasse WRD, #16 Bulk 1.5-3.0	6.5	20	8	0.05	2.5	7	9	0.005	4.0
Vasse WRD, #18 Bulk 0.0-1.5	6.4	20	6	0.05	2.5	2.5	8	0.2	4.0
Vasse WRD, #18 Bulk 1.5-3.0	6.2	72	6	0.05	2.5	5	10	0.2	3.8
Vasse WRD, #19 Bulk 0.0-1.5	8.1	104	52	0.05	2.5	43	11	1.2	4.5
Vasse WRD, #19 Bulk 1.5-3.0	8.0	104	58	0.05	2.5	47	8	1.2	4.0
Vasse WRD, #20 Bulk 0.0-1.5	7.6	92	40	0.05	2.5	33	14	0.7	3.6
Vasse WRD, #20 Bulk 1.5-3.0	7.7	140	73	0.05	2.5	60	12	0.6	3.0
Vasse WRD, #21 Bulk 0.0-1.5	7.2	96	14	0.05	2.5	12	19	0.6	9.7
Vasse WRD, #21 Bulk 1.5-3.0	/.5	100	18	0.05	2.5	15	24	0.5	11
Vasse WRD, #22 Bulk 0.0-1.5	0.0 7.0	30	2.5	0.05	2.5	2.5	5	0.005	3.9
Vasse WRD, #25 Bulk 0.0-1.5	7.4	100	20	0.05	2.0	20	20	0.7	20
Vasse WRD, #25 Bulk 0.0-1 5	7.4	96	56	0.05	2.5	17	12	0.7	5.2
Vasse WRD, #26 Bulk 1.5-3.0	7.0	56	13	0.05	2.5	10	8	0.3	2.7
Vasse WRD, #27 Bulk 0.3	6.6	196	2.5	0.05	2.5	2.5	47	0.6	27
Vasse WRD, #28 Bulk 0.0-1.5	6.6	68	11	0.05	2.5	9	12	0.2	6.5
Vasse WRD, #28 Bulk 1.5-3.0	7.3	264	47	0.05	2.5	39	85	0.5	19
Vasse WRD, #29 Bulk 0.0-1.5	8.3	160	50	0.05	2.5	41	26	1.0	20
Vasse WRD, #29 Bulk 1.5-3.0	6.6	164	2.5	0.05	2.5	2.5	22	0.3	24
Vasse WRD, #30 Bulk 0.0-1.5	6.7	144	7	0.05	2.5	6	36	0.6	16
Vasse WRD, #30 Bulk 1.5-3.0	8.3	152	61	0.05	2.5	50	24	0.9	17
Vasse WRD, #31 Bulk 0.0-1.5	8.2	104	71	0.05	2.5	58	5	0.7	4.2
Vasse WRD, #31 Bulk 1.5-3.0	7.9	108	74	0.05	2.5	61	5	0.6	4.0
Vasse WRD, #1 Bulk Surface	6.8	32	12	0.05	2.5	9	7	1.1	1.5
Vasse WRD, #11 Bulk Surface	6.9	40	17	0.05	2.5	14	4	0.4	2.5
Vasse WRD, #14 Bulk Surface	6.6	76	6	0.05	2.5	2.5	45	0.3	1.7
Evro Dit #106 Dulk	6./	168	2.5	0.05	2.5	2.5	48	0.5	31
Eyre Pit # 100 Bulk	0./	100	6	0.05	2.5	2.5		0.3	19

	Potassium, K	Magnesium , Mg	Calcium, Ca	Phosphorus , P	Aluminium , Al	Iron, Fe	Silver, Ag	Copper, Cu
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Australian Drinking Water		-			0.2	0.3		2, 1
Eyre Pit #1	0.6	0.8	0.9	0.025	0.0250	0.071	0.00005	0.00005
Eyre Pit #2	1.7	0.5	0.4	0.025	0.0020	0.003	0.00005	0.00005
Eyre Pit #3	0.5	1.2	1.6	0.025	0.0001	0.003	0.00005	0.00005
Eyre Pil #4	0.7	0.1	<0.2	0.025	0.1100	0.034	0.00005	0.00005
Eyre Pil #5	0.4	1.2	1.2	0.025	0.0001	0.003	0.00005	0.00005
Eyre Pit #7	0.4	2.7	4.0	0.025	0.0001	0.003	0.00005	0.00005
Eyre Pit #8	0.3	0.1	0.3	0.025	0.0430	0.045	0.00005	0.00005
Eyre Pit #9	2.2	5.4	2.6	0.025	0.0050	0.043	0.00005	0.00005
Evre Pit #10	1.1	1.6	1.6	0.025	0.0340	0.039	0.00005	0.00005
Vasse WRD, #1 Bulk 0.3	0.5	1.3	1.0	0.025	0.0060	0.012	0.00005	0.00005
Vasse WRD, #2 Bulk 0.0-1.5	5.6	1.1	8.2	0.025	0.0001	0.008	0.00005	0.00005
Vasse WRD, #2 Bulk 1.5-3.0	5.7	0.5	2.6	0.025	0.1000	0.180	0.00005	0.00005
Vasse WRD, #3 Bulk 0.0-1.5	1.2	5.1	18	0.025	0.0110	0.016	0.00005	0.00005
Vasse WRD, #3 Bulk 1.5-3.0	1.2	2.9	7.1	0.025	0.0040	0.003	0.00005	0.00005
Vasse WRD, #4 Bulk 0.0-1.5	0.8	2.1	9.8	0.025	0.0030	0.008	0.00005	0.00005
Vasse WRD, #4 Bulk 1.5-3.0	1.1	4.0	15	0.025	0.0010	0.003	0.00005	0.00005
Vasse WRD, #5 Bulk 0.0-1.5	1.2	3.4	21	0.025	0.0010	0.005	0.00005	0.00005
Vasse WRD, #5 Bulk 1.5-3.0	0.9	2.1	19	0.025	0.0140	0.014	0.00005	0.00200
Vasse WRD, #6 Bulk 0.0-1.5	0.5	1.2	17	0.025	0.0210	0.020	0.00005	0.00005
Vasse WRD, #6 Bulk 1.5-3.0	0.6	1.6	13	0.025	0.0350	0.048	0.00005	0.00005
Vasse WRD, #7 Bulk 0.0-1.5	4.1	3.0	1/	0.025	0.0230	0.007	0.00005	0.00005
Vasse WRD, #7 Bulk 1.5-3.0	2.2	2.2	11	0.025	0.0180	0.008	0.00005	0.00005
Vasse WRD, #8 Bulk 0.0-1.5	0.7	1.4	3.9	0.025	0.0040	0.003	0.00005	0.00005
Vasse WRD, #o Bulk 1.5-3.0	0.7	1.0	5.2	0.025	0.0190	0.017	0.00005	0.00005
Vasse WRD, #9 Bulk 1.3-3.0	0.9	1.2	5.3	0.025	0.0130	0.013	0.00005	0.00005
Vasse WRD, #10 Bulk 1.5-3.0	0.0	1.5	2.2	0.025	0.0170	0.017	0.00005	0.00005
Vasse WRD #11 Bulk 0.3	0.0	0.3	0.7	0.025	0.0070	0.011	0.00005	0.00005
Vasse WRD, #12 Bulk 0.0-1.5	0.8	2.0	18	0.025	0.0190	0.019	0.00005	0.00005
Vasse WRD, #12 Bulk 1.5-3.0	1.0	3.7	8.4	0.025	0.0070	0.011	0.00005	0.00005
Vasse WRD, #13 Bulk 0.0-1.5	1.0	2.1	8.0	0.025	0.0160	0.014	0.00005	0.00005
Vasse WRD, #13 Bulk 1.5-3.0	0.9	2.2	4.9	0.025	0.0040	0.003	0.00005	0.00005
Vasse WRD, #14 Bulk 0.3	0.5	0.8	2.4	0.025	0.0060	0.010	0.00005	0.00005
Vasse WRD, #15 Bulk 0.0-1.5	0.5	2.8	7.8	0.025	0.0040	0.003	0.00005	0.00005
Vasse WRD, #15 Bulk 1.5-3.0	0.3	1.5	8.7	0.025	0.0060	0.005	0.00005	0.00005
Vasse WRD, #16 Bulk 0.0-1.5	1.9	0.7	2.1	0.025	0.0060	0.006	0.00005	0.00005
Vasse WRD, #16 Bulk 1.5-3.0	2.3	1.0	3.2	0.025	0.0070	0.011	0.00005	0.00005
Vasse WRD, #18 Bulk 0.0-1.5	0.7	1.0	2.3	0.025	0.0080	0.021	0.00005	0.00005
Vasse WRD, #18 Bulk 1.5-3.0	0.8	1.1	2.7	0.025	0.0110	0.038	0.00005	0.00005
Vasse WRD, #19 Bulk 0.0-1.5	1.7	2.2	1/	0.025	0.0280	0.003	0.00005	0.00005
Vasse WRD, #19 Bulk 1.3-3.0	1.3	2.1	10	0.025	0.0340	0.001	0.00005	0.00005
Vasse WRD, #20 Bulk 0.0-1.3	0.0	1.5	2/	0.025	0.0250	0.075	0.00005	0.00005
Vasse WRD, #20 Bulk 1.3-3.0	0.9	2.0	6.0	0.025	0.0200	0.000	0.00005	0.00005
Vasse WRD, #21 Bulk 1.5-3.0	0.6	2.0	8.1	0.025	0.0040	0.015	0.00005	0.00005
Vasse WRD, #22 Bulk 0.0-1.5	2.0	0.4	1.4	0.025	0.0050	0.003	0.00005	0.00005
Vasse WRD, #25 Bulk 0.0-1.5	1.6	4.5	7.4	0.025	0.0110	0.003	0.00005	0.00005
Vasse WRD, #25 Bulk 1.5-3.0	1.9	3.9	6.4	0.025	0.0260	0.080	0.00005	0.00005
Vasse WRD, #26 Bulk 0.0-1.5	2.1	2.6	17	0.025	0.0030	0.014	0.00005	0.00005
Vasse WRD, #26 Bulk 1.5-3.0	0.9	1.2	5.1	0.025	0.0130	0.007	0.00005	0.00005
Vasse WRD, #27 Bulk 0.3	1.9	9.2	9.1	0.08	0.0350	0.078	0.00005	0.00005
Vasse WRD, #28 Bulk 0.0-1.5	2.1	1.6	5.3	0.025	0.0001	0.003	0.00005	0.00005
Vasse WRD, #28 Bulk 1.5-3.0	4.2	6.1	48	0.025	0.0060	0.016	0.00005	0.00005
Vasse WRD, #29 Bulk 0.0-1.5	2.6	3.9	17	0.025	0.0090	0.044	0.00005	0.00005
Vasse WRD, #29 Bulk 1.5-3.0	0.4	1.4	1.1	0.025	0.0040	0.050	0.00005	0.00005
Vasse WRD, #30 Bulk 0.0-1.5	0.9	4.2	/.9	0.025	0.0400	0.032	0.00005	0.00005
Vasse WRD, #30 Bulk 1.5-3.0	1.6	3.8	18	0.025	0.0370	0.028	0.00005	0.00005
Vasse WRD, #31 BUIK U.U-1.5	2.2	2.9	10	0.025	0.0001	0.003	0.00005	0.00005
Vasse WRD, #31 Bulk 1.3-3.0	1.7 0.2	Z./ 1 ⊑	19	0.025	0.0090	0.015	0.00005	0.00005
Vasse WRD, #11 Bulk Surface	0.3	1.0	4.0 2 Q	0.025	0.0001	0.003	0.00005	0.00005
Vasse WRD #14 Bulk Surface	0.3	1.4	10	0.025	0.0001	0.003	0.00005	0.00005
Vasse WRD, #27 Bulk Surface	1.8	11	8.5	0.025	0.0001	0.003	0.00005	0.00005
Eyre Pit #10b Bulk	1.1	4.9	4.2	0.025	0.0070	0.030	0.00005	0.00005

	Zinc, Zn	Cadmium, Cd	Lead, Pb	Chromium , Cr	Nickel, Ni	Cobalt, Co	Manganes e, Mn	Tin, Sn	Strontium, Sr
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Australian Drinking Water	3	0.002	0.01	0.05	0.02		0.5, 0.1		
Eyre Pit #1	0.0120	0.000005	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.0130
Eyre Pit #2	0.0180	0.000005	0.0001	0.0001	0.0001	0.0001	0.0270	0.00005	0.0020
Eyre Pit #3	0.01/0	0.000005	0.0001	0.0001	0.0001	0.0001	0.0110	0.00005	0.0190
Eyre Pit #4	0.0130	0.000005	0.0001	0.0001	0.0001	0.0001	0.0070	0.00005	0.0001
Eyre Pil #5	0.0210	0.000005	0.0001	0.0001	0.0001	0.0001	0.2100	0.00005	0.0210
Eyre Pit #0	0.0130	0.000005	0.0001	0.0001	0.002	0.0001	0.7000	0.00005	0.0060
Eyre Pit #7	0.0180	0.000005	0.0001	0.0070	0.0001	0.0001	0.0140	0.00005	0.0250
Eyre Pit #8	0.0120	0.000005	0.0001	0.0110	0.0007	0.0001	0.0020	0.00005	0.0001
Eyre Dit #10	0.0210	0.000005	0.0001	0.0030	0.012	0.0001	0.0110	0.00005	0.0370
Vasse WRD #1 Bulk 0.3	0.0001	0.000005	0.0001	0.0020	0.0001	0.0001	0.0020	0.00005	0.0130
Vasse WRD, #2 Bulk 0.0-1.5	0.0120	0.000005	0.0001	0.0001	0.0001	0.0020	0.3200	0.00005	0.0430
Vasse WRD, #2 Bulk 1.5-3.0	0.0160	0.000005	0.0001	0.0001	0.0001	0.0020	0.2500	0.00005	0.0190
Vasse WRD, #3 Bulk 0.0-1.5	0.0140	0.000005	0.0001	0.0001	0.0001	0.0001	0.0060	0.00005	0.1100
Vasse WRD, #3 Bulk 1.5-3.0	0.0190	0.000005	0.0001	0.0001	0.0001	0.0001	0.0060	0.00005	0.0630
Vasse WRD, #4 Bulk 0.0-1.5	0.0100	0.000005	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.0510
Vasse WRD, #4 Bulk 1.5-3.0	0.0180	0.000005	0.0001	0.0001	0.0001	0.0001	0.0020	0.00005	0.0770
Vasse WRD, #5 Bulk 0.0-1.5	0.0070	0.000005	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.0970
Vasse WRD, #5 Bulk 1.5-3.0	0.0760	0.0510	0.0360	0.0020	0.001	0.0001	0.0001	0.00005	0.0580
Vasse WRD, #6 Bulk 0.0-1.5	0.0500	0.0250	0.0230	0.0010	0.001	0.0001	0.0001	0.00005	0.0540
Vasse WRD, #6 Bulk 1.5-3.0	0.0580	0.0140	0.0180	0.0020	0.001	0.0001	0.0010	0.00005	0.0410
Vasse WRD, #7 Bulk 0.0-1.5	0.0420	0.0130	0.0190	0.0010	0.0001	0.0001	0.0001	0.00005	0.0750
Vasse WRD, #7 Bulk 1.5-3.0	0.0570	0.0130	0.0230	0.0001	0.0001	0.0001	0.0001	0.00005	0.0590
Vasse WRD, #8 Bulk 0.0-1.5	0.0660	0.0100	0.0150	0.0001	0.0001	0.0001	0.0020	0.00005	0.0250
Vasse WRD, #8 Bulk 1.5-3.0	0.0500	0.0110	0.0310	0.0001	0.0001	0.0001	0.0001	0.00005	0.0600
Vasse WRD, #9 Bulk 1.5-3.0	0.0690	0.0067	0.0160	0.0001	0.0001	0.0001	0.0010	0.00005	0.0350
Vasse WRD, #10 Bulk 0.0-1.5	0.0570	0.0071	0.0270	0.0001	0.0001	0.0001	0.0001	0.00005	0.0470
Vasse WRD, #10 Bulk 1.5-3.0	0.0630	0.0000	0.0001	0.0001	0.0001	0.0001	0.0020	0.00005	0.0190
Vasse WRD, #11 Bulk 0.3	0.0610	0.0034	0.0340	0.0001	0.0001	0.0001	0.0010	0.00005	0.0060
Vasse WRD, #12 Bulk 0.0-1.5	0.0500	0.0	0.0020	0.0001	0.0001	0.0001	0.0001	0.00005	0.0620
Vasse WRD, #12 Bulk 1.5-3.0	0.0580	0.0	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.0460
Vasse WRD, #13 Bulk 0.0-1.5	0.0660	0.0	0.0350	0.0030	0.0001	0.0001	0.0001	0.00005	0.0330
Vasse WRD, #13 Bulk 1.5-3.0	0.0690	0.0	0.0007	0.0001	0.0001	0.0001	0.0020	0.00005	0.0300
Vasse WRD, #14 Bulk 0.015	0.0000	0.0	0.0170	0.0007	0.0001	0.0001	0.0020	0.00005	0.0200
Vasse WRD, #15 Bulk 1.5-3.0	0.0550	0.0	0.0001	0.0030	0.0001	0.0001	0.0001	0.00005	0.0440
Vasse WRD, #16 Bulk 0.0-1.5	0.0000	0.0	0.0460	0.0001	0.0001	0.0001	0.0410	0.00005	0.0330
Vasse WRD, #16 Bulk 0.0 1.3	0.0480	0.0	0.0001	0.0001	0.0001	0.0001	0.0300	0.00005	0.0190
Vasse WRD, #18 Bulk 0.0-1.5	0.0500	0.0	0.0001	0.0001	0.0001	0.0001	0.0020	0.00005	0.0190
Vasse WRD, #18 Bulk 1.5-3.0	0.0330	0.000005	0.0001	0.0001	0.0001	0.0001	0.0030	0.00005	0.0310
Vasse WRD, #19 Bulk 0.0-1.5	0.0220	0.000005	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.0910
Vasse WRD, #19 Bulk 1.5-3.0	0.0350	0.000005	0.0001	0.0010	0.0001	0.0001	0.0001	0.00005	0.1000
Vasse WRD, #20 Bulk 0.0-1.5	0.0270	0.000005	0.0001	0.0001	0.0001	0.0001	0.0030	0.00005	0.0860
Vasse WRD, #20 Bulk 1.5-3.0	0.0390	0.000005	0.0001	0.0020	0.0001	0.0001	0.0001	0.00005	0.0780
Vasse WRD, #21 Bulk 0.0-1.5	0.0330	0.000005	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.0490
Vasse WRD, #21 Bulk 1.5-3.0	0.0380	0.000005	0.0001	0.0001	0.0001	0.0001	0.0600	0.00005	0.0150
Vasse WRD, #22 Bulk 0.0-1.5	0.0320	0.000005	0.0001	0.0020	0.0001	0.0001	0.0020	0.00005	0.0550
Vasse WRD, #25 Bulk 0.0-1.5	0.0500	0.000005	0.0001	0.0030	0.0001	0.0001	0.0030	0.00005	0.0550
Vasse WRD, #25 Bulk 1.5-3.0	0.0520	0.000005	0.0001	0.0001	0.0001	0.0001	0.0030	0.00005	0.0400
Vasse WRD, #26 Bulk 0.0-1.5	0.0520	0.000005	0.0001	0.0001	0.0001	0.0001	0.0030	0.00005	0.0490
Vasse WRD, #26 Bulk 1.5-3.0	0.0390	0.0	0.0100	0.0001	0.0001	0.0001	0.0001	0.00005	0.0380
Vasse WRD, #27 Bulk 0.3	0.0320	0.000005	0.0001	0.0020	0.0001	0.0001	0.0001	0.00005	0.1500
Vasse WRD, #28 Bulk 0.0-1.5	0.0340	0.000005	0.0001	0.0001	0.0001	0.0001	0.0070	0.00005	0.0190
Vasse WRD, #28 Bulk 1.5-3.0	0.0270	0.000005	0.0001	0.0001	0.0001	0.0001	0.0060	0.00005	0.2000
Vasse WKD, #29 BUIK 0.0-1.5	0.0400	0.000005	0.0050	0.0001	0.0001	0.0001	0.0020	0.00005	0.0720
Vasse WRD, #29 BUIK 1.5-3.0	0.0310	0.000005	0.0001	0.0010	0.0001	0.0001	0.0010	0.00005	0.0150
Vasse WRD, #30 Bulk 0.0-1.5	0.0390	0.000005	0.0001	0.0010	0.0001	0.0001	0.0001	0.00005	0.0990
Vasse WRD, #30 Bulk 1.3-3.0	0.0300	0.000005	0.0001	0.0010	0.0001	0.0001	0.0001	0.00005	0.1100
Vasse WRD #31 Bulk 0.0-1.5	0.0300		0.0001	0.0001	0.0001	0.0001	0.0010	0.00005	0.0300
Vasse WRD #1 Rulk Surface	0.0410	0.000005	0.0007	0.0001	0.0001	0.0001	0.0007	0.00005	0.0070
Vasse WRD #11 Bulk Surface	0.0430	0.000005	0.0020	0.0001	0.0001	0.0001	0.0030	0.00005	0.0340
Vasse WRD #14 Bulk Surface	0.0370	0.000005	0.0020	0.0001	0.0001	0.0001	0.0030	0.00005	0.0320
Vasse WRD, #17 Bulk Surface	0.0460	0.000005	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005	0.1500
Eyre Pit #10b Bulk	0.0500	0.000005	0.0020	0.0001	0.0001	0.0001	0.0040	0.00005	0.0300

	Barium,	Thorium,	Uranium,	Thallium,	Vanadium,	Arsenic,	Bismuth,	Antimony,	Selenium,
	Ba	Th	U	TI	v	As	Bi	Sb	Se
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Australian Drinking Water	0.7		0.02			0.007		0.003	0.01
Eyre Pit #1	0.1200	0.0001	0.0001	0.00005	0.0001	0.00100	0.0001	0.0001	0.0010
Eyre Pit #2	0.0600	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Eyre Pit #3	0.0620	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Eyre Pit #4	0.0540	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Eyre Pit #6	0.0510	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Eyre Pit #7	0.0620	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Eyre Pit #8	0.0480	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Eyre Pit #9	0.0950	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Eyre Pit #10	0.0240	0.0001	0.0001	0.00005	0.0001	0.00200	0.0001	0.0001	0.0010
Vasse WRD, #1 Bulk 0.3	0.0620	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #2 Bulk 0.0-1.5	0.0980	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #2 Bulk 1.5-3.0	0.0820	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #3 Bulk 0.0-1.3	0.1000	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #4 Bulk 0.0-1.5	0.1900	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #4 Bulk 1.5-3.0	0.1600	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #5 Bulk 0.0-1.5	0.1400	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #5 Bulk 1.5-3.0	0.0960	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #6 Bulk 0.0-1.5	0.1800	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #6 Bulk 1.5-3.0	0.2100	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #7 Bulk 0.0-1.5	0.2900	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #7 Bulk 1.5-3.0	0.2400	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #8 Bulk 1.5-3.0	0.2000	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #9 Bulk 1.5-3.0	0.2600	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #10 Bulk 0.0-1.5	0.2500	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #10 Bulk 1.5-3.0	0.2700	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #11 Bulk 0.3	0.0980	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #12 Bulk 0.0-1.5	0.2100	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #12 Bulk 1.5-3.0	0.1600	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #13 Bulk 0.0-1.5	0.2000	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #13 Bulk 1.5-3.0	0.2100	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #14 Bulk 0.0-1 5	0.2200	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #15 Bulk 1.5-3.0	0.2000	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #16 Bulk 0.0-1.5	0.3700	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #16 Bulk 1.5-3.0	0.2500	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #18 Bulk 0.0-1.5	0.2400	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #18 Bulk 1.5-3.0	0.2100	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #19 Bulk 0.0-1.5	0.2300	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #19 Bulk 1.5-3.0	0.2400	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #20 Bulk 0.0-1.3	0.2400	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #21 Bulk 0.0-1.5	0.1500	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #21 Bulk 1.5-3.0	0.1400	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #22 Bulk 0.0-1.5	0.1300	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #25 Bulk 0.0-1.5	0.0850	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #25 Bulk 1.5-3.0	0.0730	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #26 Bulk 0.0-1.5	0.2300	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #26 Bulk 1.5-3.0	0.2100	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #27 Bulk 0.0-1 5	0.1000	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #28 Bulk 1.5-3.0	0.1100	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #29 Bulk 0.0-1.5	0.1300	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #29 Bulk 1.5-3.0	0.0720	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #30 Bulk 0.0-1.5	0.1100	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #30 Bulk 1.5-3.0	0.1100	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #31 Bulk 0.0-1.5	0.1300	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #31 Bulk 1.5-3.0	0.2200	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #1 Bulk Surface	0.0580	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #14 Bulk Surface	0.1300	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Vasse WRD, #27 Bulk Surface	0.1200	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010
Eyre Pit #10b Bulk	0.0710	0.0001	0.0001	0.00005	0.0001	0.00005	0.0001	0.0001	0.0010



	Molybden um, Mo	Boron, B	Mercury
	mg/L	mg/L	mg/L
Australian Drinking Water	0.05	4	0.001
Eyre Pit #1	0.0001	0.0390	0.0005
Eyre Pit #2	0.0001	0.0300	0.0005
Eyre Pit #3	0.0001	0.0240	0.0005
Eyre Pit #4	0.0001	0.0230	0.0005
Eyre Pit #5	0.0001	0.0280	0.0005
Eyre Pit #7	0.0001	0.0140	0.0005
Evre Pit #8	0.0001	0.0690	0.0005
Eyre Pit #9	0.0001	0.0280	0.0005
Eyre Pit #10	0.0001	0.0390	0.0005
Vasse WRD, #1 Bulk 0.3	0.0001	0.0470	0.0005
Vasse WRD, #2 Bulk 0.0-1.5	0.0001	0.0200	0.0005
Vasse WRD, #2 Bulk 1.5-3.0	0.0001	0.0270	0.0005
Vasse WRD, #3 Bulk 0.0-1.5	0.0001	0.0380	0.0005
Vasse WRD, #3 Bulk 1.5-3.0	0.0001	0.0420	0.0005
Vasse WRD, #4 Bulk 0.0-1.5	0.0001	0.0190	0.0005
Vasse WRD, #4 Bulk 0.0-1 5	0.0001	0.0370	0.0005
Vasse WRD, #5 Bulk 1.5-3.0	0.0001	0.0410	0.0005
Vasse WRD, #6 Bulk 0.0-1.5	0.0001	0.0300	0.0005
Vasse WRD, #6 Bulk 1.5-3.0	0.0001	0.0530	0.0005
Vasse WRD, #7 Bulk 0.0-1.5	0.0001	0.0580	0.0005
Vasse WRD, #7 Bulk 1.5-3.0	0.0001	0.0530	0.0005
Vasse WRD, #8 Bulk 0.0-1.5	0.0001	0.0300	0.0005
Vasse WRD, #8 Bulk 1.5-3.0	0.0001	0.0270	0.0005
Vasse WRD, #9 Bulk 1.5-3.0	0.0001	0.0560	0.0005
Vasse WRD, #10 Bulk 0.0-1.3 Vasse WRD #10 Bulk 1 5-3.0	0.0001	0.0300	0.0005
Vasse WRD, #11 Bulk 0.3	0.0001	0.0410	0.0005
Vasse WRD, #12 Bulk 0.0-1.5	0.0001	0.0300	0.0005
Vasse WRD, #12 Bulk 1.5-3.0	0.0001	0.0340	0.0005
Vasse WRD, #13 Bulk 0.0-1.5	0.0001	0.0350	0.0005
Vasse WRD, #13 Bulk 1.5-3.0	0.0001	0.0280	0.0005
Vasse WRD, #14 Bulk 0.3	0.0001	0.0220	0.0005
Vasse WRD, #15 Bulk 0.0-1.5	0.0001	0.0400	0.0005
Vasse WRD, #16 Bulk 0.0-1.5	0.0001	0.0200	0.0005
Vasse WRD, #16 Bulk 1.5-3.0	0.0001	0.0230	0.0005
Vasse WRD, #18 Bulk 0.0-1.5	0.0001	0.0280	0.0005
Vasse WRD, #18 Bulk 1.5-3.0	0.0001	0.0480	0.0005
Vasse WRD, #19 Bulk 0.0-1.5	0.0001	0.0490	0.0005
Vasse WRD, #19 Bulk 1.5-3.0	0.0001	0.0620	0.0005
Vasse WRD, #20 Bulk 0.0-1.5	0.0001	0.0330	0.0005
Vasse WRD, #20 Bulk 1.3-3.0 Vasse WRD #21 Bulk 0.0-1.5	0.0001	0.0370	0.0005
Vasse WRD, #21 Bulk 1.5-3.0	0.0001	0.0220	0.0005
Vasse WRD, #22 Bulk 0.0-1.5	0.0001	0.0740	0.0005
Vasse WRD, #25 Bulk 0.0-1.5	0.0001	0.0480	0.0005
Vasse WRD, #25 Bulk 1.5-3.0	0.0001	0.0290	0.0005
Vasse WRD, #26 Bulk 0.0-1.5	0.0001	0.0350	0.0005
Vasse WRD, #26 Bulk 1.5-3.0	0.0001	0.0720	0.0005
Vasse WRD, #27 Bulk 0.3	0.0001	0.0860	0.0005
Vasse WRD, #28 Bulk 0.0-1.5	0.0001	0.0740	0.0005
Vasse WRD, #29 Bulk 0.0-1.5	0.0001	0.0410	0.0005
Vasse WRD, #29 Bulk 1.5-3.0	0.0001	0.0720	0.0005
Vasse WRD, #30 Bulk 0.0-1.5	0.0001	0.0410	0.0005
Vasse WRD, #30 Bulk 1.5-3.0	0.0001	0.0440	0.0005
Vasse WRD, #31 Bulk 0.0-1.5	0.0001	0.0350	0.0005
Vasse WRD, #31 Bulk 1.5-3.0	0.0001	0.0580	0.0005
Vasse WRD, #T Bulk Surface	0.0001	0.0210	0.0005
Vasse WRD, #11 Bulk Surface	0.0001	0.0160	0.0005
Vasse WRD, #27 Bulk Surface	0.0001	0.0025	0.0005
Eyre Pit #10b Bulk	0.0001	0.0260	0.0005

Calculated

Statistics	Sulfate Sulphur	Sulfide Sulphu	Sulfur, Calculate d	Maximum Potenital Acidity*	Acid Neutralizing Capacity	Calculated Net Acid Production	NDD	Criteria Based on
Statistics		•		(MPA)	(ANC)			NPR
	(wt. %)	(wt. %)	(wt. %)	(kg H₂SO₄/tonn	(kg H₂SO₄/Tonn	(kg H₂SO₄/Tonne)		MER
						/		
Eyre Pit								
Eyre Pit #1	0.007	0.006	0.013	<0.5	<0.5	-0.25	2	non-pag
Eyre Pit #2	<0.005	<0.005	<0.005	<0.5	<0.5	-0.25	2	non-pag
Eyre Pit #3	0.01	<0.005	0.015	<0.5	1.5	-1.25	6	non-pag
Eyre Pit #4	<0.005	<0.005	<0.005	<0.5	<0.5	-0.25	2	non-pag
Eyre Pit #5	0.008	<0.005	0.013	<0.5	<0.5	-0.25	2	non-pag
Eyre Pit #6	<0.005	<0.005	<0.005	<0.5	<0.5	-0.25	2	non-pag
Eyre Pit #7	0.018	<0.005	0.023	<0.5	<0.5	-0.25	2	non-pag
Eyre Pit #8	0.008	<0.005	0.013	<0.5	<0.5	-0.25	2	non-pag
Eyre Pit #9	0.029	<0.005	0.034	<0.5	<0.5	-0.25	2	non-pag
Eyre Pit #10	0.014	<0.005	0.019	<0.5	3.4	-3.15	13.6	non-pag
Eyre Pit #10b Bulk	0.036	0.013	0.049	1.5	3.2	-1.7	2.1	non-pag
Vasse WRD								
Vasse WRD, #1 Bulk 0.3	0.01	<0.005	0.015	<0.5	2.2	-1.95	8.8	non-pag
Vasse WRD, #2 Bulk 0.0-1.5	<0.005	<0.005	<0.005	< 0.5	2.2	-1.95	8.8	non-pag
Vasse WRD, #2 Bulk 1.5-3.0	<0.005	<0.005	<0.005	<0.5	1.5	-1.25	6	non-pag
Vasse WRD, #3 Bulk 0.0-1.5	0.019	<0.005	0.024	<0.5	3.4	-3.15	13.6	non-pag
Vasse WRD, #3 Bulk 1.5-3.0	0.016	<0.005	0.021	<0.5	2.2	-1.95	8.8	non-pag
Vasse WRD, #4 Bulk 0.0-1.5	0.011	<0.005	0.016	<0.5	2.2	-1.95	8.8	non-pag
Vasse WRD, #4 Bulk 1.5-3.0	0.015	<0.005	0.02	<0.5	3.4	-3.15	13.6	non-pag
Vasse WRD, #5 Bulk 0.0-1.5	0.019	<0.005	0.024	<0.5	8	-7.75	32	non-pag
Vasse WRD, #5 Bulk 1.5-3.0	0.007	<0.005	0.012	<0.5	4.4	-4.15	17.6	non-pag
Vasse WRD, #6 Bulk 0.0-1.5	<0.005	<0.005	<0.005	<0.5	5.1	-4.85	20.4	non-pag
Vasse WRD, #6 Bulk 1.5-3.0	<0.005	<0.005	<0.005	<0.5	3.4	-3.15	13.6	non-pag
Vasse WRD, #7 Bulk 0.0-1.5	0.008	<0.005	0.013	<0.5	4.6	-4.35	18.4	non-pag
Vasse WRD, #7 Bulk 1.5-3.0	<0.005	0.041	0.046	1.4	3.4	-2	2.4	non-pag
Vasse WRD, #8 Bulk 0.0-1.5	<0.005	0.009	0.014	<0.5	1.7	-1.45	6.8	non-pag
Vasse WRD, #8 Bulk 1.5-3.0	<0.005	<0.005	<0.005	<0.5	3.4	-3.15	13.6	non-pag
Vasse WRD, #9 Bulk 1.5-3.0	<0.005	0.055	0.06	1.8	2.4	-0.6	1.3	Uncertain
Vasse WRD, #10 Bulk 0.0-1.5	<0.005	<0.005	<0.005	<0.5	2.4	-2.15	9.6	non-pag
Vasse WRD, #10 Bulk 1.5-3.0	<0.005	0.013	0.018	<0.5	1.9	-1.65	7.6	non-pag
Vasse WRD, #11 Bulk 0.3	<0.005	<0.005	<0.005	<0.5	2.9	-2.65	11.6	non-pag
Vasse WRD, #12 Bulk 0.0-1.5	0.006	<0.005	0.011	<0.5	4.8	-4.55	19.2	non-pag
Vasse WRD, #12 Bulk 1.5-3.0	0.007	<0.005	0.012	<0.5	2.4	-2.15	9.6	non-pag
Vasse WRD, #13 Bulk 0.0-1.5	<0.005	0.036	0.041	1.3	3.1	-1.8	2.4	non-pag
Vasse WRD, #13 Bulk 1.5-3.0	<0.005	0.014	0.019	0.5	1.4	-0.9	2.8	non-pag
Vasse WRD, #14 Bulk 0.3	<0.005	0.036	0.041	1	1.9	-0.9	1.9	Uncertain
Vasse WRD, #15 Bulk 0.0-1.5	<0.005	0.033	0.038	1.1	3.4	-2.3	3.1	non-pag
Vasse WRD, #15 Bulk 1.5-3.0	<0.005	<0.005	<0.005	<0.5	2.2	-1.95	8.8	non-pag
Vasse WRD, #16 Bulk 0.0-1.5	<0.005	0.021	0.026	0.6	2.6	-2	4.3	non-pag
Vasse WRD, #16 Bulk 1.5-3.0	<0.005	0.04	0.045	1.1	2.2	-1.1	2	non-pag
Vasse WRD, #18 Bulk 0.0-1.5	0.012	<0.005	0.017	0.5	1.9	-1.4	3.8	non-pag
Vasse WRD, #18 Bulk 1.5-3.0	0.013	0.01	0.023	0.7	2.6	-1.9	3.7	non-pag
Vasse WRD, #19 Bulk 0.0-1.5	0.015	<0.005	0.02	<0.5	19	-18.75	76	non-pag
Vasse WRD, #19 Bulk 1.5-3.0	0.009	<0.005	0.014	<0.5	14	-13.75	56	non-pag
Vasse WRD, #20 Bulk 0.0-1.5	0.023	0.22	0.243	7.4	3.9	3.5	0.5	PAG
Vasse WRD, #20 Bulk 1.5-3.0	0.025	<0.005	0.03	<0.5	6.1	-5.85	24.4	non-pag
Vasse WRD, #21 Bulk 0.0-1.5	0.015	<0.005	0.02	0.6	2.4	-1.8	4	non-pag
Vasse WRD, #21 Bulk 1.5-3.0	0.017	0.042	0.059	1.8	2.4	-0.6	1.3	Uncertain

Table X.X. ABA results of Eyre Pit and Vasse WRD

Statistics	Sulfate Sulphur	Sulfide Sulphu r	Sulfur, Calculate d	Maximum Potenital Acidity*	Acid Neutralizing Capacity	Calculated Net Acid Production Potential	NPR	Criteria Based on
				(MPA)	(ANC)	(NAPP)		NPR
	(wt. %)	(wt. %)	(wt. %)	(kg H₂SO₄/tonn	(kg H₂SO₄/Tonn	(kg H₂SO₄/Tonne)		
Vasse WRD, #22 Bulk 0.0-1.5	<0.005	0.008	0.013	<0.5	1.7	-1.45	6.8	non-pag
Vasse WRD, #25 Bulk 0.0-1.5	0.012	<0.005	0.017	<0.5	4.6	-4.35	18.4	non-pag
Vasse WRD, #25 Bulk 1.5-3.0	0.013	<0.005	0.018	<0.5	3.9	-3.65	15.6	non-pag
Vasse WRD, #26 Bulk 0.0-1.5	0.013	<0.005	0.018	<0.5	4.1	-3.85	16.4	non-pag
Vasse WRD, #26 Bulk 1.5-3.0	0.009	0.048	0.057	1.7	2.9	-1.2	1.7	Uncertain
Vasse WRD, #27 Bulk 0.3	0.043	<0.005	0.048	1.2	2.2	-1	1.8	Uncertain
Vasse WRD, #28 Bulk 0.0-1.5	0.013	0.047	0.06	1.8	2.4	-0.6	1.3	Uncertain
Vasse WRD, #28 Bulk 1.5-3.0	0.072	0.026	0.098	3	4.4	-1.4	1.5	Uncertain
Vasse WRD, #29 Bulk 0.0-1.5	0.02	<0.005	0.025	<0.5	7	-6.75	28	non-pag
Vasse WRD, #29 Bulk 1.5-3.0	0.019	0.017	0.036	1.1	2.4	-1.3	2.2	non-pag
Vasse WRD, #30 Bulk 0.0-1.5	0.028	0.008	0.036	1.1	2.7	-1.6	2.5	non-pag
Vasse WRD, #30 Bulk 1.5-3.0	0.015	<0.005	0.02	<0.5	5.1	-4.85	20.4	non-pag
Vasse WRD, #31 Bulk 0.0-1.5	0.018	0.04	0.058	1.8	4.4	-2.6	2.4	non-pag
Vasse WRD, #31 Bulk 1.5-3.0	0.015	<0.005	0.02	<0.5	5.3	-5.05	21.2	non-pag
Vasse WRD, #1 Bulk Surface	0.01	<0.005	0.015	<0.5	2.4	-2.15	9.6	non-pag
Vasse WRD, #11 Bulk Surface	0.015	<0.005	0.02	<0.5	2.4	-2.15	9.6	non-pag
Vasse WRD, #14 Bulk Surface	0.039	<0.005	0.044	<0.5	1.7	-1.45	6.8	non-pag
Vasse WRD, #27 Bulk Surface	0.051	<0.005	0.056	1.2	2.7	-1.5	2.25	non-pag

Table X.X. ABA results of Eyre Pit and Vasse WRD

Calculated values used 0.5 x the reporting limit if variables were below detection limit. If both sulfate and sulfide were below reporting limit, total sulfur was reported at the reporting lim.

Table X.X. Christmas Creek Groundwater statistical data

										probability		95%		
			UpperQ		Maximu				two sample t-	means are		confidence		
		Median	(1)	Minimum	m	LowerQ (3)	Mean	SD	statistic	equal	Standard Error	limits	lower limit	Upper limit
pre-disturbance	рΗ	7.465	7.125	6.35	8.36	7.9325	7.4928125	0.506494813	-1.372388517	9.01%	0.090969154	0.178299542	7.314512958	7.671112042
post-disturbance	рΗ	7.67	7.4275	6.87	8.36	7.855	7.639339623	0.311198203			0.055892847	0.109549981	7.529789642	7.748889603
pre-disturbance	TDS	1900	995	528	113000	3880	6070.697674	17330.30068	-0.69522892	24.61%	3112.613887	6100.723219	-30.02554416	12171.42089
post-disturbance	TDS	2590	1210	237	140000	5290	10012.22581	26383.03047			4738.532156	9287.523026	724.7027802	19299.74883
pre-disturbance	AI	0.005	0.005	0.005	0.046	0.005	0.006068182	0.006207264	-0.910338098	18.50%	0.001114858	0.002185121	0.003883061	0.008253303
post-disturbance	AI	0.005	0.005	0.005	1.14	0.005	0.031367925	0.154612469			0.027769219	0.05442767	-0.023059745	0.085795594
pre-disturbance	As	0.001	0.000625	0.0005	0.001	0.001	0.000833333	0.000258199	3.716281893	0.04%	4.63739E-05	9.08928E-05	0.000742441	0.000924226
post-disturbance	As	0.0005	0.0005	0.0005	0.002	0.0005	0.000571429	0.000295468			5.30677E-05	0.000104013	0.000467416	0.000675441
pre-disturbance	В	0.28	0.2275	0.18	1.94	0.415	0.410357143	0.364096875	0.163592048	43.56%	0.065393729	0.128171709	0.282185434	0.538528852
post-disturbance	В	0.23	0.18	0.08	3.17	0.3775	0.391415094	0.532022983			0.095554149	0.187286131	0.204128963	0.578701226
pre-disturbance	Ba	0.014	0.00675	0.003	0.03	0.025	0.015666667	0.011343133	-3.749830077	0.04%	0.002037287	0.003993082	0.011673584	0.019659749
post-disturbance	Ba	0.038	0.0245	0.009	0.288	0.06425	0.054821429	0.057019849			0.010241067	0.020072492	0.034748937	0.07489392
pre-disturbance	Ca	140	92.5	58	585	197	170.9318182	116.1193047	-0.743185423	23.16%	20.85564279	40.87705986	130.0547583	211.808878
post-disturbance	Ca	144	111	4	652	238.5	194.4245283	132.2607056			23.75472398	46.559259	147.8652693	240.9837873
pre-disturbance	Cd	0.00005	0.00005	0.00005	0.0001	0.0000875	6.66667E-05	2.58199E-05	-0.502164512	30.96%	4.63739E-06	9.08928E-06	5.75774E-05	7.57559E-05
post-disturbance	Cd	0.00005	0.00005	0.00005	0.0005	0.00005	0.000075	8.87151E-05			1.59337E-05	3.12301E-05	4.37699E-05	0.00010623
pre-disturbance	Cr	0.0005	0.0005	0.0005	0.004	0.0005	0.001083333	0.001428869	-1.662452245	5.34%	0.000256632	0.000503	0.000580334	0.001586333
post-disturbance	Cr	0.0005	0.0005	0.0005	0.014	0.00125	0.002321429	0.003892572			0.000699127	0.001370288	0.000951141	0.003691717
pre-disturbance	Fe	0.025	0.025	0.025	0.18	0.03125	0.035568182	0.026308013	-2.221024096	1.70%	0.004725059	0.009261115	0.026307067	0.044829297
post-disturbance	Fe	0.025	0.025	0.025	3.75	0.06625	0.319764151	0.711949497			0.127869904	0.250625013	0.069139138	0.570389164
pre-disturbance	Mg	94.5	61	36	3100	162.5	248.7954545	559.6626716	-0.368012939	35.77%	100.5183832	197.016031	51.77942353	445.8114856
post-disturbance	Mg	98	71.25	2	4660	246.25	310.3018868	743.4348233			133.524836	261.7086785	48.59320826	572.0105653
pre-disturbance	Mn	0.0055	0.0005	0	1.19	0.1	0.119488636	0.247171852	-1.738549834	4.62%	0.044393375	0.087011015	0.032477621	0.206499652
post-disturbance	Mn	0.031	0.00625	0	1.95	0.26625	0.29015566	0.48748481			0.087554857	0.171607519	0.118548142	0.461763179
pre-disturbance	K	29.5	19.75	14	2100	52.25	120.3409091	332.2992447	-0.685912852	24.90%	59.68270621	116.9781042	3.36280491	237.3190133
post-disturbance	K	34	22.25	5	4820	56.75	219.6226415	734.2018206			131.8665397	258.4584179	-38.83577638	478.0810594
pre-disturbance	Sr	0.4885	0.3665	0.18	6.56	0.87	0.919142857	1.28462915	-0.327572943	37.28%	0.230726206	0.452223365	0.466919492	1.371366222
post-disturbance	Sr	0.552	0.38175	0.024	12.2	1.0065	1.048330189	1.780804579			0.319841944	0.626890211	0.421439978	1.675220399
pre-disturbance	Zn	0.0195	0.018	0.01	0.045	0.02175	0.022333333	0.011877149	-2.684095053	0.59%	0.002133199	0.00418107	0.018152263	0.026514403
post-disturbance	Zn	0.032	0.024	0.005	0.098	0.041	0.0345	0.022268563			0.003999552	0.007839122	0.026660878	0.042339122
pre-disturbance	SO4	456	246	33	26000	947.5	1582.090909	4460.115348	-0.071490513	47.17%	801.0603642	1570.078314	12.01259518	3152.169223
post-disturbance	SO4	495	273.75	24	24700	687.25	1666.604167	4840.451866			869.3708193	1703.966806	-37.36263908	3370.570972





APPENDIX B

Geochemical Laboratory Data





- CLIENT DETAILS		LABORATORY DETAI	LS
Contact	Michael Lundstrom	Manager	Ros Ma
Client	Tetra Tech Australia Pty. Ltd	Laboratory	SGS Newburn Environmental
Address	Level 5, 220 St Georges Tce Perth WA 6000	Address	10 Reid Rd Newburn WA 6105
Telephone	+61.(0)8.6140.9000	Telephone	(08) 9373 3500
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Email	Michael.lundstrom@tetratech.com	Email	au.environmental.perth@sgs.com
Project	FMG Christmas Creek Ref 1296580100	SGS Reference	PE068612 R0
Order Number	(Not specified)	Report Number	0000044855
Samples	73	Date Reported	21 Aug 2012
		Date Received	25 Jun 2012

COMMENTS _

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

Fibre Identification performed by Approved Identifier Karin White.

Four Acid Digest Metals subcontracted to SGS Perth Minerals, 10 Reid Rd Newburn WA, NATA Accreditation Number 1936, WM142946 and WM142962

XRD subcontracted to Microanalysis Australia, Suite 6 642 Albany Hwy Victoria Park WA 6100, Job NUmber 12_0735

ASLP DI AI, Cd and Pb replicate RPD for sample "Vasse WRD, #9 Bulk 1.5-3.0" was outside acceptance criteria due to sample heterogeneity. ASLP DI Zn, Pb and Ba replicate RPD for sample "Vasse WRD, #15 Bulk 0.0-1.5" was outside acceptance criteria due to sample heterogeneity. ASLP DI Pb replicate RPD for sample "Vasse WRD, #18 Bulk 0.0-1.5" was outside acceptance criteria due to sample heterogeneity. ASLP DI Mn replicate RPD for sample "Vasse WRD, #25 Bulk 0.0-1.5" was outside acceptance criteria due to sample heterogeneity. ASLP DI AI and Fe replicate RPD for sample "Eyre Pit #10b Bulk" was outside acceptance criteria due to sample heterogeneity.

SIGNATORIES .

Corey Will

Corey Williams National Operations Manager

Michael McKay Inorganic Team Leader - Waters



Hue Thanh Ly Spectroscopy Chemist

Ohmar David Spectroscopy Chemist

K white

Karin White Hygiene Signatory

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PE068612 R0

	Sampl Samj Sar Sam	e Number ple Matrix nple Date ple Name	PE068612.001 Soil 11 Jun 2012 Eyre Pit #1	PE068612.002 Soil 11 Jun 2012 Eyre Pit #2	PE068612.003 Soil 11 Jun 2012 Eyre Pit #3	PE068612.004 Soil 11 Jun 2012 Eyre Pit #4	PE068612.005 Soil 11 Jun 2012 Eyre Pit #5
Parameter	Units	LOR					
Total Sulfur by LECO Furnace Method: AN20	2						
Total Sulfur*	%w/w	0.005	0.013	<0.005	<0.005	<0.005	<0.005
Maximum Potential Acidity*	kg H2SO4/T	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN	014					
Acid Soluble Sulphur (SHCI)	%w/w	0.005	0.007	<0.005	0.010	<0.005	0.008
Acid Neutralising Capacity or Neutralisation Po	otential(ANC/I	NP) Met	thod: AN212				
Fizz Rating Reaction*	No unit	-	NIL	NIL	NIL	NIL	NIL

Initial Effervescence* No unit No No No No No -Effervescence on Warming* No unit No No No No No Titration - Green Colouration?* No unit No No No No No Titration - Precipitate Formed?* No unit -Yes Yes Yes Yes No ANC as % CaCO₃ % CaCO3 0.1 <0.1 0.1 <0.1 <0.1 <0.1 ANC as % CaMg(CO₃)2 %w/w 0.1 0.1 <0.1 0.2 <0.1 <0.1 Acid Neutralisation Capacity/Neutralisation kg CaCO3/T <1.0 1 <1.0 <1.0 1.5 <1.0 Acid Neutralisation Capacity/Neutralisation kg H2SO4/T 1 <1.0 <1.0 1.5 <1.0 <1.0

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Net Acid Production Potential	kg H2SO4/T	-400	-1	0	-2	0	-1
Total Oxidisable Sulphur	%w/w	0.005	0.006	<0.005	<0.005	<0.005	<0.005

Metals in soil by Four Acid digest, ICPMS Method: IMS40Q

Silver, Ag*	ppm	0.1	0.1	0.1	0.1	0.2	0.1
Arsenic, As*	ppm	1	40	16	33	10	41
Barium, Ba*	ppm	2	71	60	30	54	9
Beryllium, Be*	ppm	0.1	1	1.3	0.4	0.5	0.5
Bismuth, Bi*	ppm	0.1	0.3	0.7	0.1	0.8	0.2
Cadmium, Cd*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	8.7	0.8	6.4	5.6	3.9
Copper, Cu*	ppm	2	29	5	12	61	8
Manganese, Mn*	ppm	0.5	1000	64.1	3160	284	1650
Molybdenum, Mo*	ppm	0.1	1.5	3.1	0.8	1	0.7
Nickel, Ni*	ppm	2	37	12	22	179	15
Lead, Pb*	ppm	1	21	12	9	39	24
Rubidium, Rb*	ppm	0.05	4.17	16.2	1.26	14.3	0.54
Antimony, Sb*	ppm	0.1	3.3	1.8	1.4	1	1.7
Selenium, Se*	ppm	2	<2	<2	<2	<2	<2
Tin, Sn*	ppm	0.3	1.1	2.5	0.6	2.1	0.6
Tellurium, Te*	ppm	0.1	0.1	0.3	<0.1	<0.1	<0.1
Thorium, Th*	ppm	0.05	4.41	11.9	2.15	7.72	2.76
Thallium, TI*	ppm	0.1	<0.1	0.1	<0.1	1.1	<0.1
Uranium, U*	ppm	0.05	1.71	2.83	1.74	3.09	1.02
Tungsten, W*	ppm	0.1	1.8	2.5	0.8	2.1	1.2
Zinc, Zn*	ppm	5	54	11	24	84	19
Lithium, Li*	ppm	0.1	1.6	17	1.3	19	0.4
Cerium, Ce*	ppm	0.05	22	12.2	35.3	108	27
Cesium, Cs*	ppm	0.05	0.15	0.61	0.09	0.72	0.09
Gallium, Ga*	ppm	0.2	7.9	21.6	3.5	7.9	4
Hafnium, Hf*	ppm	0.05	1.31	3.76	0.57	3.38	0.69
Indium, In*	ppm	0.02	0.05	0.08	<0.02	<0.02	<0.02
Lanthanum, La*	ppm	0.05	7.65	4.77	12.9	30.2	5.35
Niobium, Nb*	ppm	0.1	4.5	10.6	2.2	10.7	2.2
Scandium, Sc*	ppm	0.2	11.5	12.7	2.9	14.6	2.7
Tantalum, Ta*	ppm	0.05	0.53	1.26	0.28	1.3	0.22



	Sampl Sam Sa Sam	e Number ple Matrix mple Date ple Name	PE068612.001 Soil 11 Jun 2012 Eyre Pit #1	PE068612.002 Soil 11 Jun 2012 Eyre Pit #2	PE068612.003 Soil 11 Jun 2012 Eyre Pit #3	PE068612.004 Soil 11 Jun 2012 Eyre Pit #4	PE068612.005 Soil 11 Jun 2012 Eyre Pit #5
Parameter	Units	LOR					
ICPAES after Four Acid Digest Digest Method	: ICP40Q						
Aluminium, Al*	ppm	100	31100	84700	16000	116000	5040
Chromium, Cr*	ppm	10	30	110	<10	<10	30
Iron, Fe*	ppm	100	467000	59600	513000	24700	549000
Strontium, Sr*	ppm	1	2	1	5	13	<1
Titanium, Ti*	ppm	10	1570	4380	680	4330	510
Vanadium, V*	ppm	1	69	73	18	14	19
Zirconium, Zr*	ppm	1	42	118	19	110	25
Calcium, Ca*	ppm	50	300	180	210	160	110
Potassium, K*	ppm	100	590	2730	190	2570	<100
Magnesium, Mg*	ppm	20	290	620	640	440	210
Sodium, Na*	ppm	50	160	230	80	250	70
Phosphorus, P*	ppm	20	630	30	980	90	800
Sulphur, S*	ppm	20	330	80	310	110	190
Rare Earth Metals in soil by ICPMS Method: II	MS12S						
Mercury, Hg*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Rhenium, Re*	ppm	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS M	ethod:					
Ge*	ppm	0.5	3.7	6.6	5.8	2.9	6.9
ASLP (Australian Standard Leaching Procedure) DI Water	Method: A	AN007	_	_	_	

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	50	50	50
Mass of leaching solution used	g	-	1000	1000	1000	1000	1000
Leaching solution used*	No unit	-	DI Water				
pH of solids leachate	pH Units	-	8.9	8.6	8.2	8.6	6.1
Conductivity @25C	µS/cm	1	43	26	42	18	50



	Sample	e Number	PE068612.001	PE068612.002	PE068612.003	PE068612.004	PE068612.005
	Sam	nole Date	5011 11 Jun 2012	50ii 11 Jun 2012	50ii 11 Jun 2012	50ii 11 Jun 2012	50ii 11 Jun 2012
	Sam	ple Name	Eyre Pit #1	Eyre Pit #2	Eyre Pit #3	Eyre Pit #4	Eyre Pit #5
Parameter	Units	LOR					
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	hod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	16	16	24	<10	<10
Alkalinity in ASLP DI Water Extract Method: A	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	6	<5	7	<5	5
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	5	<5	6	<5	<5
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	5	<1	6	<1	4
	1					1	
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	te Meth	od: AN141				
Eluarida hu ISE	mall	0.1	0.2	-0.1	0.9	0.5	0.1
Fluoride by ISE	IIIg/L	0.1	0.2	40.1	0.3	0.0	0.1
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	0.9	0.4	1.6	<0.2	1.2
Magnesium, Mg	mg/L	0.1	0.8	0.5	1.2	0.1	1.2
Phosphorus, P	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium, K	mg/L	0.1	0.6	1.7	0.5	0.7	0.4
Sodium, Na	mg/L	0.5	4.4	2.4	3.3	2.1	4.1
Trace Metals in ASLP DI Extract by ICPMS M	ethod: AN318						
Aluminium, Al	µg/L	1	25	2	<1	110	<1
Antimony, Sb	µg/L	1	<1	<1	<1	<1	<1
Arsenic, As	µg/L	1	1	<1	<1	<1	<1
Barium, Ba	μg/L	1	120	60	62	54	54
Bismuth, Bi	μg/L	1	<1	<1	<1	<1	<1
Boron, B	µg/L	5	39	30	24	23	28
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	<1	<1	<1	<1	<1
Cobalt, Co	µg/L	1	<1	<1	<1	<1	<1
Copper, Cu	µg/L	1	<1	<1	<1	<1	<1
Iron, Fe	µg/L	5	71	<5	<5	34	<5
Lead, Pb	µg/L	1	<1	<1	<1	<1	<1
Manganese, Mn	µg/L	1	<1	27	11	7	210
Molybdenum, Mo	µg/L	1	<1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	<1	<1	<1	<1	<1
Selenium, Se	µg/L	2	<2	<2	<2	<2	<2
Silver, Ag	µg/L	1	<1	<1	<1	<1	<1
Strontium, Sr	µg/L	1	13	2	19	<1	21
Thallium, TI	µg/L	1	<1	<1	<1	<1	<1
Thorium, Th	µg/L	1	<1	<1	<1	<1	<1
Tin, Sn	µg/L	1	<1	<1	<1	<1	<1
Uranium, U	µg/L	1	<1	<1	<1	<1	<1
Vanadium, V	µg/L	1	<1	<1	<1	<1	<1
Zinc, Zn	µg/L	1	12	18	17	13	21



	Sample	e Number	PE068612.001	PE068612.002	PE068612.003	PE068612.004	PE068612.005			
	Sam	ple Matrix	Soil	Soil	Soil	Soil	Soil			
	Sar	nple Date	11 Jun 2012							
	Sam	ple Name	Evre Pit #1	Evre Pit #2	Evre Pit #3	Evre Pit #4	Evre Pit #5			
Parameter	Units	LOR								
Mercury in ASLP DI Water Extract Method: AN311/AN312										
Mercury	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005			
Sample Subcontracted Method:										
Sample Subcontracted*	No unit	-	-	-	-	-	-			
Fibre ID in bulk materials Method: AN602										
FibreID										
Asbestos Detected	No unit	-	-	-	-	-	-			



PE068612 R0

	Sampl Sam Sai Sam	e Number ple Matrix nple Date ple Name	PE068612.006 Soil 11 Jun 2012 Eyre Pit #6	PE068612.007 Soil 11 Jun 2012 Eyre Pit #7	PE068612.008 Soil 11 Jun 2012 Eyre Pit #8	PE068612.009 Soil 11 Jun 2012 Eyre Pit #9	PE068612.010 Soil 11 Jun 2012 Eyre Pit #10
Parameter	Units	LOR					
Total Sulfur by LECO Furnace Method: AN20	2						
Total Sulfur*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Maximum Potential Acidity*	kg H2SO4/T	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN	014					
Acid Soluble Sulphur (SHCI)	%w/w	0.005	<0.005	0.018	0.008	0.029	0.014
Acid Neutralising Capacity or Neutralisation Po	otential(ANC/I	NP) Met	hod: AN212				

Fizz Rating Reaction*	No unit	-	NIL	NIL	NIL	NIL	NIL
Initial Effervescence*	No unit	-	No	No	No	No	No
Effervescence on Warming*	No unit	-	No	No	No	No	No
Titration - Green Colouration?*	No unit	-	No	No	No	No	No
Titration - Precipitate Formed?*	No unit	-	No	No	No	Yes	Yes
ANC as % CaCO ₃	% CaCO3	0.1	<0.1	<0.1	<0.1	<0.1	0.3
ANC as % CaMg(CO ₃)2	%w/w	0.1	<0.1	<0.1	<0.1	<0.1	0.4
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	<1.0	<1.0	<1.0	<1.0	3.5
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	<1.0	<1.0	<1.0	<1.0	3.4

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Net Acid Production Potential	kg H2SO4/T	-400	-1	-1	0	-1	-4
Total Oxidisable Sulphur	%w/w	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Metals in soil by Four Acid digest, ICPMS Method: IMS40Q

Silver, Ag*	ppm	0.1	0.3	0.1	<0.1	<0.1	<0.1
Arsenic, As*	ppm	1	82	187	86	160	229
Barium, Ba*	ppm	2	36	6	9	65	152
Beryllium, Be*	ppm	0.1	0.5	0.8	0.2	0.7	0.5
Bismuth, Bi*	ppm	0.1	0.2	0.5	2	0.7	0.7
Cadmium, Cd*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	1.4	1.8	5.1	9.7	8
Copper, Cu*	ppm	2	4	10	9	24	59
Manganese, Mn*	ppm	0.5	1160	646	347	487	4310
Molybdenum, Mo*	ppm	0.1	1.3	1.7	1.8	2.2	1.6
Nickel, Ni*	ppm	2	8	19	103	211	51
Lead, Pb*	ppm	1	17	31	68	42	59
Rubidium, Rb*	ppm	0.05	0.84	0.32	0.36	4.35	29.2
Antimony, Sb*	ppm	0.1	1.3	3.4	2.1	3.9	5.2
Selenium, Se*	ppm	2	<2	<2	<2	<2	7
Tin, Sn*	ppm	0.3	0.6	2.3	7.4	3.3	4
Tellurium, Te*	ppm	0.1	<0.1	<0.1	0.4	0.6	0.4
Thorium, Th*	ppm	0.05	2.29	8.56	41.5	17.3	14.9
Thallium, TI*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	0.5
Uranium, U*	ppm	0.05	0.51	2.23	9.37	3.91	4.74
Tungsten, W*	ppm	0.1	1.5	3.2	10.4	4.9	3.8
Zinc, Zn*	ppm	5	13	9	28	59	31
Lithium, Li*	ppm	0.1	0.7	7.4	14	10	6.2
Cerium, Ce*	ppm	0.05	24.2	18.8	22.1	159	89.3
Cesium, Cs*	ppm	0.05	0.09	0.07	0.12	0.3	5.48
Gallium, Ga*	ppm	0.2	4.6	15.8	76.3	31.3	46
Hafnium, Hf*	ppm	0.05	0.52	2.56	11	5.83	3.98
Indium, In*	ppm	0.02	<0.02	0.07	0.12	0.12	0.14
Lanthanum, La*	ppm	0.05	15.8	11.8	10.7	87.2	52.6
Niobium, Nb*	ppm	0.1	1.9	7.9	27.8	13.7	10.6
Scandium, Sc*	ppm	0.2	2	7.6	21.8	25.9	14.1
Tantalum, Ta*	ppm	0.05	0.17	0.81	2.32	1.46	1.1



	Samp Sam Sa San	le Number Iple Matrix Imple Date Inple Name	PE068612.006 Soil 11 Jun 2012 Eyre Pit #6	PE068612.007 Soil 11 Jun 2012 Eyre Pit #7	PE068612.008 Soil 11 Jun 2012 Eyre Pit #8	PE068612.009 Soil 11 Jun 2012 Eyre Pit #9	PE068612.010 Soil 11 Jun 2012 Eyre Pit #10
Parameter	Units	LOR					
ICPAES after Four Acid Digest Digest Method	I: ICP40Q						
Aluminium, Al*	ppm	100	5340	60300	142000	93900	73800
Chromium, Cr*	ppm	10	20	90	150	190	260
Iron, Fe*	ppm	100	402000	416000	134000	268000	300000
Strontium, Sr*	ppm	1	<1	<1	<1	27	41
Titanium, Ti*	ppm	10	650	2820	12700	5570	4010
Vanadium, V*	ppm	1	22	67	32	163	111
Zirconium, Zr*	ppm	1	21	88	391	164	131
Calcium, Ca*	ppm	50	90	330	460	230	1050
Potassium, K*	ppm	100	120	<100	<100	1130	7180
Magnesium, Mg*	ppm	20	190	210	270	640	2490
Sodium, Na*	ppm	50	<50	400	350	400	570
Phosphorus, P*	ppm	20	450	320	130	830	220
Sulphur, S*	ppm	20	100	350	200	440	670
Rare Earth Metals in soil by ICPMS Method: I	MS12S						
Mercury, Hg*	ppm	0.1	<0.1	0.2	<0.1	<0.1	0.3
Rhenium, Re*	ppm	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS M	ethod:					
Ge*	ppm	0.5	5.6	10.2	6.7	3.3	2.8
ASLP (Australian Standard Leaching Procedure	e) DI Water	Method: A	N007				
Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	-		50	E0.	E0.	50	50

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	50	50	50
Mass of leaching solution used	g	-	1000	1000	1000	1000	1000
Leaching solution used*	No unit	-	DI Water				
pH of solids leachate	pH Units	-	6.3	6.4	6.6	5.8	7.1
Conductivity @25C	µS/cm	1	19	160	73	190	62



	Sampl	e Number	PE068612.006	PE068612.007	PE068612.008	PE068612.009	PE068612.010
	Sam Sai	nple Matrix	5011 11 Jun 2012	500 11 Jun 2012	500 11 Jun 2012	500 11 Jun 2012	50ii 11 Jun 2012
	Sam	ple Name	Eyre Pit #6	Eyre Pit #7	Eyre Pit #8	Eyre Pit #9	Eyre Pit #10
Parameter	Units	LOR					
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Me	thod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	<10	52	20	56	200
Alkalinity in ASLP DI Water Extract Method: A	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	<5	<5	<5	<5	25
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5	21
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	2	19	1	20	2
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	ite Meth	od: AN141		••		
Fluoride by ISE	mg/L	0.1	<0.1	0.2	0.4	0.1	0.6
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	0.6	4.0	0.3	2.6	1.6
Magnesium, Mg	mg/L	0.1	0.4	2.7	0.1	5.4	1.6
Phosphorus, P	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium, K	mg/L	0.1	0.4	0.5	0.3	2.2	1.1
Sodium, Na	mg/L	0.5	0.9	15	10	14	5.7
Trace Metals in ASLP DI Extract by ICPMS M	ethod: AN318						
Aluminium, Al	µg/L	1	<1	<1	43	5	34
Antimony, Sb	µg/L	1	<1	<1	<1	<1	<1
Arsenic, As	µg/L	1	<1	<1	<1	<1	2
Barium, Ba	µg/L	1	51	62	48	95	24
Bismuth, Bi	µg/L	1	<1	<1	<1	<1	<1
Boron, B	µg/L	5	14	56	69	28	39
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	<1	7	11	5	11
Cobalt, Co	µg/L	1	<1	<1	<1	<1	<1
Copper, Cu	µg/L	1	<1	<1	<1	<1	<1
Iron, Fe	µg/L	5	<5	<5	45	<5	39
Lead, Pb	µg/L	1	<1	<1	<1	<1	<1
Manganese, Mn	µg/L	1	700	14	2	11	2
Molybdenum, Mo	µg/L	1	<1	<1	<1	<1	<1
	µg/L	1	2	<1	<1	12	<1
Selenium, Se	µg/L	2	<2	<2	<2	<2	<2
Silver, Ag	µg/L	1	<1	<1	<1	<1	<1
Thallium TI	µg/L	1	U	20	~1	51	GI
	µg/L	1	<1		<1	<1	<1
Tin Sn	µg/L	1	<1	<1	<1	<1	<1
Uranium. U	P9/L	1	<1	<1	<1	<1	<1
Vanadium. V	ua/L	1	<1	<1	<1	<1	<1
Zinc, Zn	μg/L	1	13	18	12	21	<1
L		· · ·					-



	Sample	e Number	PE068612.006	PE068612.007	PE068612.008	PE068612.009	PE068612.010			
	Sam	ple Matrix	Soil	Soil	Soil	Soil	Soil			
	Sar	nple Date	11 Jun 2012							
	Sam	ple Name	Eyre Pit #6	Eyre Pit #7	Eyre Pit #8	Eyre Pit #9	Eyre Pit #10			
Parameter	Units	LOR								
Mercury in ASLP DI Water Extract Method: AN311/AN312										
Mercury	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005			
Sample Subcontracted Method:										
Sample Subcontracted*	No unit	-	-	-	-	-	-			
Fibre ID in bulk materials Method: AN602										
Libidi										
Asbestos Detected	No unit	-	-	-	-	-	_			



PE068612 R0

	Samplı Samj Sar Sam	e Number ble Matrix nple Date ple Name	PE068612.011 Soil 12 Jun 2012 Eyre Pit #10b - Crystalline	PE068612.012 Soil 12 Jun 2012 Eyre Pit #10b - Globular	PE068612.013 Soil 12 Jun 2012 Vasse WRD, #1 Bulk 0.3	PE068612.014 Soil 14 Jun 2012 Vasse WRD, #2 Bulk 0.0-1.5	PE068612.015 Soil 14 Jun 2012 Vasse WRD, #2 Bulk 1.5-3.0			
Parameter	Units	LOR								
Total Sulfur by LECO Furnace Method: AN202										
Total Sulfur*	%w/w	0.005	-	-	<0.005	<0.005	<0.005			
Maximum Potential Acidity*	kg H2SO4/T	0.5	-	-	<0.5	<0.5	<0.5			
HCI Extractable S, Ca and Mg in Soil ICP OES Method: AN014										
Acid Soluble Sulphur (SHCI)	%w/w	0.005	-	-	0.010	<0.005	<0.005			
						·				

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	-	-	NIL	NIL	NIL
Initial Effervescence*	No unit	-	-	-	No	No	No
Effervescence on Warming*	No unit	-	-	-	No	No	No
Titration - Green Colouration?*	No unit	-	-	-	No	No	No
Titration - Precipitate Formed?*	No unit	-	-	-	Yes	Yes	Yes
ANC as % CaCO ₃	% CaCO3	0.1	-	-	0.2	0.2	0.1
ANC as % CaMg(CO ₃)2	%w/w	0.1	-	-	0.2	0.2	0.2
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	-	-	2.2	2.2	1.5
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	-	-	2.2	2.2	1.5

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	-	-	<0.25	<0.25	<0.25
Net Acid Production Potential	kg H2SO4/T	-400	-	-	-2	-2	-2
Total Oxidisable Sulphur	%w/w	0.005	-	-	<0.005	<0.005	<0.005

Metals in soil by Four Acid digest, ICPMS Method: IMS40Q

Silver, Ag*	ppm	0.1	-	-	<0.1	0.1	0.1
Arsenic, As*	ppm	1	-	-	40	48	57
Barium, Ba*	ppm	2	-	-	43	139	155
Beryllium, Be*	ppm	0.1	-	-	0.8	0.6	0.6
Bismuth, Bi*	ppm	0.1	-	-	0.6	0.5	0.5
Cadmium, Cd*	ppm	0.1	-	-	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	-	-	32.3	10.5	10.8
Copper, Cu*	ppm	2	-	-	18	39	36
Manganese, Mn*	ppm	0.5	-	-	12400	1020	1280
Molybdenum, Mo*	ppm	0.1	-	-	0.8	2.5	2.5
Nickel, Ni*	ppm	2	-	-	55	38	36
Lead, Pb*	ppm	1	-	-	30	29	30
Rubidium, Rb*	ppm	0.05	-	-	0.55	30	30.6
Antimony, Sb*	ppm	0.1	-	-	4.3	4	4.6
Selenium, Se*	ppm	2	-	-	<2	2	2
Tin, Sn*	ppm	0.3	-	-	2.8	3	2.9
Tellurium, Te*	ppm	0.1	-	-	0.2	0.3	0.3
Thorium, Th*	ppm	0.05	-	-	9.1	14.8	15.4
Thallium, TI*	ppm	0.1	-	-	0.2	0.3	0.3
Uranium, U*	ppm	0.05	-	-	4.08	2.53	2.38
Tungsten, W*	ppm	0.1	-	-	1.9	1.8	1.9
Zinc, Zn*	ppm	5	-	-	74	59	54
Lithium, Li*	ppm	0.1	-	-	6.4	6.5	7.0
Cerium, Ce*	ppm	0.05	-	-	94	40	42.6
Cesium, Cs*	ppm	0.05	-	-	0.13	2.03	2.04
Gallium, Ga*	ppm	0.2	-	-	15.4	19.8	20.6
Hafnium, Hf*	ppm	0.05	-	-	2.92	3.95	4
Indium, In*	ppm	0.02	-	-	0.09	0.16	0.16
Lanthanum, La*	ppm	0.05	-	-	29.1	17.7	19.7
Niobium, Nb*	ppm	0.1	-	-	8.5	9.8	10.1
Scandium, Sc*	ppm	0.2	-	-	13.6	15	14.3
Tantalum, Ta*	ppm	0.05	-	-	0.86	0.86	0.89


	Sampl Sam Sai Sam	e Number ple Matrix mple Date ple Name	PE068612.011 Soil 12 Jun 2012 Eyre Pit #10b - Crystalline	PE068612.012 Soil 12 Jun 2012 Eyre Pit #10b - Globular	PE068612.013 Soil 12 Jun 2012 Vasse WRD, #1 Bulk 0.3	PE068612.014 Soil 14 Jun 2012 Vasse WRD, #2 Bulk 0.0-1.5	PE068612.015 Soil 14 Jun 2012 Vasse WRD, #2 Bulk 1.5-3.0
Parameter	Units	LOR					
ICPAES after Four Acid Digest Digest Method	I: ICP40Q						
Aluminium, Al*	ppm	100	-	-	44900	49100	47900
Chromium, Cr*	ppm	10	-	-	20	140	150
Iron, Fe*	ppm	100	-	-	487000	364000	373000
Strontium, Sr*	ppm	1	-	-	4	15	17
Titanium, Ti*	ppm	10	-	-	2730	3730	3720
Vanadium, V*	ppm	1	-	-	69	184	202
Zirconium, Zr*	ppm	1	-	-	100	164	141
Calcium, Ca*	ppm	50	-	-	240	990	740
Potassium, K*	ppm	100	-	-	110	4070	4080
Magnesium, Mg*	ppm	20	-	-	630	810	790
Sodium, Na*	ppm	50	-	-	60	480	520
Phosphorus, P*	ppm	20	-	-	220	590	560
Sulphur, S*	ppm	20	-	-	380	280	270
Rare Earth Metals in soil by ICPMS Method: I	MS12S						
Mercury, Hg*	ppm	0.1	-	-	<0.1	<0.1	<0.1
Rhenium, Re*	ppm	0.05	-	-	<0.05	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS M	ethod:					
Ge*	ppm	0.5	-	-	2.5	4.4	4.5
ASLP (Australian Standard Leaching Procedure) DI Water	Method: A	AN007				

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	-	-	50	50	50
Mass of leaching solution used	g	-	-	-	1000	1000	1000
Leaching solution used*	No unit	-	-	-	DI Water	DI Water	DI Water
pH of solids leachate	pH Units	-	-	-	6.2	6.7	6.4
Conductivity @25C	µS/cm	1	-	-	45	93	55



	Sampl Sam Sai Sam	e Number ple Matrix nple Date ple Name	PE068612.011 Soil 12 Jun 2012 Eyre Pit #10b - Crystalline	PE068612.012 Soil 12 Jun 2012 Eyre Pit #10b - Globular	PE068612.013 Soil 12 Jun 2012 Vasse WRD, #1 Bulk 0.3	PE068612.014 Soil 14 Jun 2012 Vasse WRD, #2 Bulk 0.0-1.5	PE068612.015 Soil 14 Jun 2012 Vasse WRD, #2 Bulk 1.5-3.0
Parameter	Units	LOR					
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	thod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	-	-	<10	36	32
Alkalinity in ASLP DI Water Extract Method: A	AN135		1	1	1		
Bicarbonate Alkalinity as HCO3	mg/L	5	-	-	<5	33	14
Carbonate Alkalinity as CO3	mg/L	1	-	-	<1	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	-	-	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	-	-	<5	27	11
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	-	-	6	2	2
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	te Meth	nod: AN141	-	0.4	<0.1	<0.1
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321			10	80	20
	mg/L	0.2	-	-	1.0	8.2	2.6
Magnesium, Mg	mg/L	0.1	-	-	1.3	1.1	0.5
Phosphorus, P	mg/L	0.05	-	-	<0.05	<0.05	<0.05
	mg/L	0.1	-	-	0.5	5.0	5.7
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318	0.0					
Aluminium, Al	µg/L	1	-	-	6	<1	100
Antimony, Sb	µg/L	1	-	-	<1	<1	<1
Arsenic, As	µg/L	1	-	-	<1	<1	<1
Barium, Ba	µg/L	1	-	-	62	98	82
Bismuth, Bi	µg/L	1	-	-	<1	<1	<1
Boron, B	µg/L	5	-	-	47	20	27
Cadmium, Cd	µg/L	0.1	-	-	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	-	-	2	<1	<1
Cobalt, Co	µg/L	1	-	-	<1	2	2
Copper, Cu	µg/L	1	-	-	<1	<1	<1
Iron, Fe	µg/L	5	-	-	12	8	180
Lead, Pb	µg/L	1	-	-	<1	<1	<1
Manganese, Mn	µg/L	1	-	-	2	320	250
Molybdenum, Mo	µg/L	1	-	-	<1	<1	<1
Nickel, Ni	µg/L	1	-	-	<1	<1	<1
Selenium, Se	µg/L	2	-	-	<2	<2	<2
Silver, Ag	µg/L	1	-	-	<1	<1	<1
Strontium, Sr	µg/L	1	-	-	18	43	19
Inallium, II	µg/L	1	-	-	<1	<1	<1
Inorium, Ih	µg/L	1	-	-	<1	<1	<1
lin, Sn	µg/L	1	-	-	<1	<1	<1
Uranium, U	µg/L	1	-	-	<1	<1	<1
	µg/L	1	-	-	<1	<1	<1
2110, 211	µg/L	1 1	-	-	10	12	01



	Sample	e Number	PE068612.011	PE068612.012	PE068612.013	PE068612.014	PE068612.015
	Sample Matrix		Soil	Soil	Soil	Soil	Soil
	Sar	nple Date	12 Jun 2012	12 Jun 2012	12 Jun 2012	14 Jun 2012	14 Jun 2012
	Sam	ple Name	Eyre Pit #10b -	Eyre Pit #10b -	Vasse WRD, #1	Vasse WRD, #2	Vasse WRD, #2
			Crystalline	Globular	Bulk 0.3	Bulk 0.0-1.5	Bulk 1.5-3.0
Parameter	Units	LOR					
Mercury in ASLP DI Water Extract Method: A	N311/AN312						
Mercury	mg/L	0.0005	-	-	<0.0005	<0.0005	<0.0005
Sample Subcontracted Method:							
	1		1		1	1	1
Sample Subcontracted*	No unit	-	-	-	-	-	-
Fibre ID in bulk materials Method: AN602							
FibreID							
Asbestos Detected	No unit	-	-	-	-	-	-



PE068612 R0

0.019

	Sample Number Sample Matrix Sample Date Sample Name		PE068612.016 Soil 13 Jun 2012 Vasse WRD, #3 Bulk 0.0-1.5	PE068612.017 Soil 13 Jun 2012 Vasse WRD, #3 Bulk 1.5-3.0	PE068612.018 Soil 13 Jun 2012 Vasse WRD, #4 Bulk 0.0-1.5	PE068612.019 Soil 13 Jun 2012 Vasse WRD, #4 Bulk 1.5-3.0	PE068612.020 Soil 13 Jun 2012 Vasse WRD, #5 Bulk 0.0-1.5
Parameter	Units	LOR					
Total Sulfur by LECO Furnace Method: AN20	2						
Total Sulfur*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Maximum Potential Acidity*	kg H2SO4/T	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN	014			·	·	·

0.011

0.015

Acid Soluble Sulphur (SHCI) %w/w 0.005 0.019 0.016

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	NIL	NIL	NIL	NIL	NIL
Initial Effervescence*	No unit	-	No	No	No	No	No
Effervescence on Warming*	No unit	-	No	No	No	No	No
Titration - Green Colouration?*	No unit	-	No	No	No	No	No
Titration - Precipitate Formed?*	No unit	-	Yes	Yes	Yes	No	No
ANC as % CaCO ₃	% CaCO3	0.1	0.3	0.2	0.2	0.3	0.8
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.4	0.2	0.2	0.4	0.9
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	3.5	2.2	2.2	3.5	8.2
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	3.4	2.2	2.2	3.4	8.0

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Net Acid Production Potential	kg H2SO4/T	-400	-4	-3	-3	-4	-9
Total Oxidisable Sulphur	%w/w	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Silver, Ag*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic, As*	ppm	1	21	24	14	20	22
Barium, Ba*	ppm	2	76	107	47	59	53
Beryllium, Be*	ppm	0.1	0.5	0.5	0.4	0.4	0.4
Bismuth, Bi*	ppm	0.1	0.2	0.3	0.1	0.2	0.1
Cadmium, Cd*	ppm	0.1	0.1	<0.1	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	12.3	12.5	6	10.2	8.9
Copper, Cu*	ppm	2	35	26	14	21	22
Manganese, Mn*	ppm	0.5	3240	3040	1190	2620	2680
Molybdenum, Mo*	ppm	0.1	1	1	0.5	0.8	0.7
Nickel, Ni*	ppm	2	28	30	14	21	22
Lead, Pb*	ppm	1	20	17	13	15	11
Rubidium, Rb*	ppm	0.05	1.77	1.97	0.86	1.12	0.64
Antimony, Sb*	ppm	0.1	2.6	2.8	1.4	2	1.8
Selenium, Se*	ppm	2	<2	<2	<2	<2	<2
Tin, Sn*	ppm	0.3	1.1	1.2	0.5	0.7	0.6
Tellurium, Te*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Thorium, Th*	ppm	0.05	4.25	5.27	1.88	3.26	2.57
Thallium, TI*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium, U*	ppm	0.05	3.34	1.99	1.27	1.71	1.65
Tungsten, W*	ppm	0.1	2.7	1.6	1.1	1.4	1.2
Zinc, Zn*	ppm	5	75	56	28	38	52
Lithium, Li*	ppm	0.1	1.8	2.4	1.4	1.9	1.0
Cerium, Ce*	ppm	0.05	43.7	36.4	14.8	25	16.2
Cesium, Cs*	ppm	0.05	0.19	0.2	0.1	0.14	0.09
Gallium, Ga*	ppm	0.2	6.5	7.7	2.9	4.7	4.1
Hafnium, Hf*	ppm	0.05	1.24	1.49	0.5	0.89	0.7
Indium, In*	ppm	0.02	0.04	0.05	<0.02	0.03	0.02
Lanthanum, La*	ppm	0.05	9.67	11	5.28	6.67	6.39
Niobium, Nb*	ppm	0.1	3.8	4.4	1.7	2.6	2.3
Scandium, Sc*	ppm	0.2	7	9.6	4.3	8.2	5.7
Tantalum, Ta*	ppm	0.05	0.37	0.39	0.15	0.25	0.22



	Sample Number Sample Matrix Sample Date Sample Name		PE068612.016 Soil 13 Jun 2012 Vasse WRD, #3 Bulk 0.0-1.5	PE068612.017 Soil 13 Jun 2012 Vasse WRD, #3 Bulk 1.5-3.0	PE068612.018 Soil 13 Jun 2012 Vasse WRD, #4 Bulk 0.0-1.5	PE068612.019 Soil 13 Jun 2012 Vasse WRD, #4 Bulk 1.5-3.0	PE068612.020 Soil 13 Jun 2012 Vasse WRD, #5 Bulk 0.0-1.5
Parameter	Units	LOR					
ICPAES after Four Acid Digest Digest Method	I: ICP40Q						
Aluminium, Al*	ppm	100	21700	23100	10300	17900	13800
Chromium, Cr*	ppm	10	20	20	40	40	40
Iron, Fe*	ppm	100	501000	509000	437000	500000	516000
Strontium, Sr*	ppm	1	5	4	1	4	5
Titanium, Ti*	ppm	10	1430	1470	540	840	710
Vanadium, V*	ppm	1	40	50	20	33	32
Zirconium, Zr*	ppm	1	44	56	19	32	26
Calcium, Ca*	ppm	50	840	520	470	810	2160
Potassium, K*	ppm	100	310	340	140	200	150
Magnesium, Mg*	ppm	20	1040	790	460	950	1320
Sodium, Na*	ppm	50	420	290	260	310	490
Phosphorus, P*	ppm	20	490	520	450	370	360
Sulphur, S*	ppm	20	410	450	300	430	450
Rare Earth Metals in soil by ICPMS Method: II	NS12S						
Mercury, Hg*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Rhenium, Re*	ppm	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS Me	ethod:					
Ge*	ppm	0.5	4.3	4.7	6.7	5.7	4.8
ASLP (Australian Standard Leaching Procedure) DI Water	Method: /	AN007				

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	50	50	50
Mass of leaching solution used	g	-	1000	1000	1000	1000	1000
Leaching solution used*	No unit	-	DI Water				
pH of solids leachate	pH Units	-	7.3	7.1	7.6	7.5	8.4
Conductivity @25C	µS/cm	1	280	150	130	210	270



	Sampl Sam	e Number ple Matrix	PE068612.016 Soil	PE068612.017 Soil	PE068612.018 Soil	PE068612.019 Soil	PE068612.020 Soil
	Sai	mple Date	13 Jun 2012				
	Sam	ple Name	Vasse WRD, #3	Vasse WRD, #3	Vasse WRD, #4	Vasse WRD, #4	Vasse WRD, #5
Deremeter	Unito		Bulk 0.0-1.5	Bulk 1.5-5.0	Bulk 0.0-1.5	Duik 1.5-5.0	Buik 0.0-1.5
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	thod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	108	64	32	84	108
	0						
Alkalinity in ASLP DI Water Extract Method: A	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	47	20	30	46	55
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	38	17	25	38	45
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	23	16	11	18	24
L	-	1		1			
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	ite Meth	od: AN141				
Fluoride by ISE	mg/L	0.1	1.2	0.6	0.6	1.0	1.2
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	18	7.1	9.8	15	21
Magnesium, Mg	mg/L	0.1	5.1	2.9	2.1	4.0	3.4
Phosphorus, P	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium, K	mg/L	0.1	1.2	1.2	0.8	1.1	1.2
Sodium, Na	mg/L	0.5	16	10	7.0	10	16
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318						
Aluminium, Al	µg/L	1	11	4	3	1	1
Antimony, Sb	µg/L	1	<1	<1	<1	<1	<1
Arsenic, As	µg/L	1	<1	<1	<1	<1	<1
Barium, Ba	µg/L	1	160	200	190	160	140
Bismuth, Bi	µg/L	1	<1	<1	<1	<1	<1
Boron, B	µg/L	5	38	42	19	37	38
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	<1	<1	<1	<1	<1
Cobalt, Co	µg/L	1	<1	<1	<1	<1	<1
Copper, Cu	µg/L	1	<1	<1	<1	<1	<1
Iron, Fe	µg/L	5	16	<5	8	<5	5
Lead, Pb	µg/L	1	<1	<1	<1	<1	<1
Manganese, Mn	µg/L	1	6	6	<1	2	<1
Molybdenum, Mo	µg/L	1	<1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	<1	<1	<1	<1	<1
Selenium, Se	μg/L	2	<2	<2	<2	<2	<2
Silver, Ag	μg/L	1	<1	<1	<1	<1	<1
Strontium, Sr	µg/L	1	110	63	51	77	97
Thallium, Tl	μg/L	1	<1	<1	<1	<1	<1
Thorium, Th	µg/L	1	<1	<1	<1	<1	<1
Tin, Sn	µg/L	1	<1	<1	<1	<1	<1
Uranium, U	µg/L	1	<1	<1	<1	<1	<1
Vanadium, V	μg/L	1	<1	<1	<1	<1	<1
Zinc, Zn	µg/L	1	14	19	10	18	7



	Sample	e Number	PE068612.016	PE068612.017	PE068612.018	PE068612.019	PE068612.020
	Sam	ple Matrix	Soil	Soil	Soil	Soil	Soil
	Sar	nple Date	13 Jun 2012				
	Sam	ple Name	Vasse WRD, #3	Vasse WRD, #3	Vasse WRD, #4	Vasse WRD, #4	Vasse WRD, #5
			Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-1.5
Parameter	Units	LOR					
Mercury in ASLP DI Water Extract Method: Al	N311/AN312						
Mercury	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sample Subcontracted Method:							
Sample Subcontracted*	No unit	-	-	-	-	-	-
Fibre ID in bulk materials Method: AN602							
FibreID							
Asbestos Detected	No unit	-	-	-	-	-	-



PE068612 R0

Paramator	Sample Samj Sar Sam	e Number ble Matrix nple Date ple Name	PE068612.021 Soil 13 Jun 2012 Vasse WRD, #5 Bulk 1.5-3.0	PE068612.022 Soil 13 Jun 2012 Vasse WRD, #5 Bulk 0.0-3.0 Asbestos	PE068612.023 Soil 13 Jun 2012 Vasse WRD, #6 Bulk 0.0-1.5	PE068612.024 Soil 13 Jun 2012 Vasse WRD, #6 Bulk 1.5-3.0	PE068612.025 Soil 14 Jun 2012 Vasse WRD, #7 Bulk 0.0-1.5
	Office	LOIN					
Total Sulfur by LECO Furnace Method: AN202	2						
Total Sulfur*	%w/w	0.005	<0.005		<0.005	<0.005	<0.005
	1	0.000	-0.5		-0.5	-0.5	-0.5
Maximum Potential Acidity"	kg H2SO4/1	0.5	<0.5	-	<0.5	<0.5	<0.5
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN	014					

Acid Soluble Sulphur (SHCI)	%w/w	0.005	0.007	-	<0.005	<0.005	0.008

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	NIL	-	NIL	NIL	NIL
Initial Effervescence*	No unit	-	No	-	No	NO	NO
Effervescence on Warming*	No unit	-	No	-	No	NO	NO
Titration - Green Colouration?*	No unit	-	No	-	No	NO	NO
Titration - Precipitate Formed?*	No unit	-	No	-	No	YES	YES
ANC as % CaCO ₃	% CaCO3	0.1	0.4	-	0.5	0.3	0.5
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.5	-	0.6	0.4	0.5
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	4.5	-	5.2	3.4	4.7
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	4.4	-	5.1	3.4	4.6

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	-	<0.25	<0.25	<0.25
Net Acid Production Potential	kg H2SO4/T	-400	-5	-	-5	-3	-5
Total Oxidisable Sulphur	%w/w	0.005	<0.005	-	<0.005	<0.005	<0.005

Silver, Ag*	ppm	0.1	<0.1	-	<0.1	<0.1	0.1
Arsenic, As*	ppm	1	34	-	31	30	45
Barium, Ba*	ppm	2	60	-	102	95	446
Beryllium, Be*	ppm	0.1	0.6	-	0.5	0.5	1
Bismuth, Bi*	ppm	0.1	0.3	-	0.2	0.3	0.6
Cadmium, Cd*	ppm	0.1	<0.1	-	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	11.7	-	16.4	10	10.5
Copper, Cu*	ppm	2	33	-	31	25	53
Manganese, Mn*	ppm	0.5	2840	-	2580	2210	706
Molybdenum, Mo*	ppm	0.1	0.8	-	0.8	1	1.8
Nickel, Ni*	ppm	2	27	-	20	31	43
Lead, Pb*	ppm	1	17	-	17	22	31
Rubidium, Rb*	ppm	0.05	2.25	-	1.01	0.86	10.1
Antimony, Sb*	ppm	0.1	3.1	-	1.9	2.4	4.2
Selenium, Se*	ppm	2	<2	-	<2	<2	3
Tin, Sn*	ppm	0.3	1.1	-	0.9	1.2	2.7
Tellurium, Te*	ppm	0.1	<0.1	-	<0.1	0.1	0.3
Thorium, Th*	ppm	0.05	4.72	-	4.18	6.19	17.2
Thallium, TI*	ppm	0.1	<0.1	-	0.3	<0.1	0.1
Uranium, U*	ppm	0.05	2.37	-	2.15	1.96	2.92
Tungsten, W*	ppm	0.1	1.8	-	1.1	1.6	2
Zinc, Zn*	ppm	5	55	-	52	47	51
Lithium, Li*	ppm	0.1	5.0	-	2.8	3.0	20
Cerium, Ce*	ppm	0.05	33.1	-	47.8	32.5	59.1
Cesium, Cs*	ppm	0.05	0.29	-	0.11	0.1	0.69
Gallium, Ga*	ppm	0.2	7.5	-	6.2	7.9	20.4
Hafnium, Hf*	ppm	0.05	1.33	-	1.15	1.71	4.74
Indium, In*	ppm	0.02	0.04	-	0.04	0.06	0.17
Lanthanum, La*	ppm	0.05	7.59	-	7.32	7.44	15.9
Niobium, Nb*	ppm	0.1	4	-	3.2	4.5	9.4
Scandium, Sc*	ppm	0.2	9.4	-	10.2	11	20
Tantalum, Ta*	ppm	0.05	0.43	-	0.3	0.45	0.92



PE068612 R0

	Sample Number Sample Matrix Sample Date Sample Name		PE068612.021 Soil 13 Jun 2012 Vasse WRD, #5	PE068612.022 Soil 13 Jun 2012 Vasse WRD, #5	PE068612.023 Soil 13 Jun 2012 Vasse WRD, #6	PE068612.024 Soil 13 Jun 2012 Vasse WRD, #6	PE068612.025 Soil 14 Jun 2012 Vasse WRD, #7
Parameter	Units	LOR	Bulk 1.5-3.0	Bulk 0.0-3.0 Asbestos	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-1.5
ICPAES after Four Acid Digest Digest Method	i: ICP40Q						
Aluminium, Al*	ppm	100	30200	-	23600	27600	64800
Chromium, Cr*	ppm	10	<10	-	20	10	130
Iron, Fe*	ppm	100	477000	-	493000	499000	373000
Strontium, Sr*	ppm	1	7	-	9	6	22
Titanium, Ti*	ppm	10	1450	-	1070	1550	3260
Vanadium, V*	ppm	1	50	-	47	57	141
Zirconium, Zr*	ppm	1	45 -		37	60	157
Calcium, Ca*	ppm	50	1420	-	1710	950	1640
Potassium, K*	ppm	100	410	-	240	160	1370
Magnesium, Mg*	ppm	20	990	-	820	710	1000
Sodium, Na*	ppm	50	470	-	200	240	380
Phosphorus, P*	ppm	20	480	-	250	280	260
Sulphur, S*	ppm	20	560	-	450	470	590
Rare Earth Metals in soil by ICPMS Method: II	MS12S						
Mercury, Hg*	ppm	0.1	<0.1	-	<0.1	<0.1	<0.1
Rhenium, Re*	ppm	0.05	<0.05	-	<0.05	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS M	lethod:	82		5.8	59	52
	ppin	0.0	0.2	-	0.0	0.8	0.2

ASLP (Australian Standard Leaching Procedure) DI Water Method: AN007

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	-	50	50	50
Mass of leaching solution used	g	-	1000	-	1000	1000	1000
Leaching solution used*	No unit	-	DI Water	-	DI Water	DI Water	DI Water
pH of solids leachate	pH Units	-	8.4	-	7.7	7.7	7.8
Conductivity @25C	µS/cm	1	130	-	120	120	180



	Sample Samj	e Number ple Matrix	PE068612.021 Soil	PE068612.022 Soil	PE068612.023 Soil	PE068612.024 Soil	PE068612.025 Soil
	Sar	nple Date	13 Jun 2012	13 Jun 2012	13 Jun 2012	13 Jun 2012	14 Jun 2012
	Sam	ple Name	Vasse WRD, #5	Vasse WRD, #5	Vasse WRD, #6	Vasse WRD, #6	Vasse WRD, #7
Parameter	Unite	LOR	Buik 1.5-5.0	Asbestos	Buik 0.0-1.5	Buik 1.5-5.0	Buik 0.0-1.0
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	hod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	84	-	56	36	52
	0						
Alkalinity in ASLP DI Water Extract Method: A	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	54	-	56	46	54
Carbonate Alkalinity as CO3	mg/L	1	<1	-	<1	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	-	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	44	-	46	38	45
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	23	-	6	8	9
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	te Meth	nod: AN141				
Fluoride by ISE	mg/L	0.1	1.0	-	1.0	1.0	0.4
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	19	-	17	13	17
Magnesium, Mg	mg/L	0.1	2.1	-	1.2	1.6	3.0
Phosphorus, P	mg/L	0.05	<0.05	-	<0.05	<0.05	<0.05
Potassium, K	mg/L	0.1	0.9	-	0.5	0.6	4.1
Sodium, Na	mg/L	0.5	11	-	2.8	5.2	5.4
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318						
Aluminium, Al	µg/L	1	14	-	21	35	23
Antimony, Sb	µg/L	1	<1	-	<1	<1	<1
Arsenic, As	µg/L	1	<1	-	<1	<1	<1
Barium, Ba	µg/L	1	96	-	180	210	290
Bismuth, Bi	µg/L	1	<1	-	<1	<1	<1
Boron, B	µg/L	5	41	-	30	53	58
Cadmium, Cd	µg/L	0.1	51	-	25	14	13
Chromium, Cr	µg/L	1	2	-	1	2	1
Cobalt, Co	µg/L	1	<1	-	<1	<1	<1
Copper, Cu	µg/L	1	2	-	<1	<1	<1
Iron, Fe	µg/L	5	14	-	20	48	7
Lead, Pb	µg/L	1	36	-	23	18	19
Manganese, Mn	µg/L	1	<1	-	<1	1	<1
Molybdenum, Mo	µg/L	1	<1	-	<1	<1	<1
Nickel, Ni	µg/L	1	1	-	1	1	<1
Selenium, Se	µg/L	2	<2	-	<2	<2	<2
Silver, Ag	µg/L	1	<1	-	<1	<1	<1
Strontium, Sr	µg/L	1	58	-	54	41	75
Thallium, TI	µg/L	1	<1	-	<1	<1	<1
Thorium, Th	µg/L	1	<1	-	<1	<1	<1
Tin, Sn	µg/L	1	<1	-	<1	<1	<1
Uranium, U	µg/L	1	<1	-	<1	<1	<1
Vanadium, V	µg/L	1	<1	-	<1	<1	<1
Zinc, Zn	µg/L	1	76	-	50	58	42



	Sample	e Number	PE068612.021	PE068612.022	PE068612.023	PE068612.024	PE068612.025
	Sam	pie Matrix	5011	5011	5011	5011	5011
	Sar	nple Date	13 Jun 2012	13 Jun 2012	13 Jun 2012	13 Jun 2012	14 Jun 2012
	Sam	ple Name	Vasse WRD, #5	Vasse WRD, #5	Vasse WRD, #6	Vasse WRD, #6	Vasse WRD, #7
			Bulk 1.5-3.0	Bulk 0.0-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-1.5
Parameter	Units	LOR		Asbestos			
Mercury in ASLP DI Water Extract Method: Al	N311/AN312						
Mercury	mg/L	0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005
Sample Subcontracted Method:							
Sample Subcontracted*	No unit	-	-	-	-	-	-
Fibre ID in bulk materials Method: AN602 FibreID							
Asbestos Detected	No unit	-	-	No	-	-	_



PE068612 R0

	Sample Samj Sar Sam	e Number ple Matrix nple Date ple Name	PE068612.026 Soil 14 Jun 2012 Vasse WRD, #7 Bulk 1.5-3.0	PE068612.027 Soil 13 Jun 2012 Vasse WRD, #8 Bulk 0.0-1.5	PE068612.028 Soil 13 Jun 2012 Vasse WRD, #8 Bulk 1.5-3.0	PE068612.030 Soil 13 Jun 2012 Vasse WRD, #9 Bulk 1.5-3.0					
Parameter	Units	LOR									
Total Sulfur by LECO Furnace Method: AN202											
Total Sulfur*	%w/w	0.005	0.046	0.005	<0.005	0.059					
Maximum Potential Acidity*	kg H2SO4/T	0.5	1.4	<0.5	<0.5	1.8					
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN	014									

Acid Soluble Sulphur (SHCI)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	NIL	NIL	NIL	NIL
Initial Effervescence*	No unit	-	NO	NO	NO	NO
Effervescence on Warming*	No unit	-	NO	NO	NO	NO
Titration - Green Colouration?*	No unit	-	NO	NO	NO	NO
Titration - Precipitate Formed?*	No unit	-	YES	YES	YES	YES
ANC as % CaCO ₃	% CaCO3	0.1	0.3	0.2	0.3	0.2
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.4	0.2	0.4	0.3
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	3.4	1.7	3.4	2.5
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	3.4	1.7	3.4	2.4

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	1.3	0.27	<0.25	1.7
Net Acid Production Potential	kg H2SO4/T	-400	-2	-1	-3	-1
Total Oxidisable Sulphur	%w/w	0.005	0.041	0.009	<0.005	0.055

Silver, Ag*	ppm	0.1	<0.1	<0.1	<0.1	<0.1
Arsenic, As*	ppm	1	52	17	22	32
Barium, Ba*	ppm	2	300	49	138	168
Beryllium, Be*	ppm	0.1	0.5	0.4	0.3	0.4
Bismuth, Bi*	ppm	0.1	0.5	0.2	0.2	0.4
Cadmium, Cd*	ppm	0.1	<0.1	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	5.9	10.4	5.9	8.2
Copper, Cu*	ppm	2	39	16	17	28
Manganese, Mn*	ppm	0.5	498	2770	1730	1270
Molybdenum, Mo*	ppm	0.1	1.7	0.8	0.8	1.4
Nickel, Ni*	ppm	2	21	60	13	15
Lead, Pb*	ppm	1	26	19	21	24
Rubidium, Rb*	ppm	0.05	5.49	1.24	1.25	2.82
Antimony, Sb*	ppm	0.1	3.8	1.6	2.2	3.5
Selenium, Se*	ppm	2	2	<2	<2	<2
Tin, Sn*	ppm	0.3	2.5	0.9	0.8	1.6
Tellurium, Te*	ppm	0.1	0.3	<0.1	<0.1	0.2
Thorium, Th*	ppm	0.05	11.8	3.75	4.55	9.95
Thallium, TI*	ppm	0.1	<0.1	<0.1	<0.1	<0.1
Uranium, U*	ppm	0.05	2.08	1.44	1.54	2.04
Tungsten, W*	ppm	0.1	1.7	8.2	2.3	1.7
Zinc, Zn*	ppm	5	49	28	24	33
Lithium, Li*	ppm	0.1	8.6	2.7	2.1	5.7
Cerium, Ce*	ppm	0.05	22.4	23	17.7	50.4
Cesium, Cs*	ppm	0.05	0.44	0.1	0.13	0.24
Gallium, Ga*	ppm	0.2	16.1	6.1	5.6	11.1
Hafnium, Hf*	ppm	0.05	3.64	1.11	1.25	2.73
Indium, In*	ppm	0.02	0.13	0.03	0.03	0.08
Lanthanum, La*	ppm	0.05	7.95	8.26	3.71	6.83
Niobium, Nb*	ppm	0.1	7.9	3.3	3.3	6.4
Scandium, Sc*	ppm	0.2	13.7	7.2	8.5	15.2
Tantalum, Ta*	ppm	0.05	0.73	0.3	0.29	0.59



PE068612 R0

	Sampi Sam Sar Sam	e Number ple Matrix mple Date ple Name	PE068612.026 Soil 14 Jun 2012 Vasse WRD, #7 Bulk 1.5-3.0	PE068612.027 Soil 13 Jun 2012 Vasse WRD, #8 Bulk 0.0-1.5	Soil 13 Jun 2012 Vasse WRD, #8 Bulk 1.5-3.0	Soil 13 Jun 2012 Vasse WRD, #9 Bulk 1.5-3.0
Parameter	Units	LOR				
ICPAES after Four Acid Digest Digest Method	I: ICP40Q					
Aluminium, Al*	ppm	100	50200	17200	17000	37000
Chromium, Cr*	ppm	10	110	10	90	100
Iron, Fe*	ppm	100	425000	409000	478000	455000
Strontium, Sr*	ppm	1	14	2	7	14
Titanium, Ti*	ppm	10	2710	1120	1110	2140
Vanadium, V*	ppm	1	124	36	41	91
Zirconium, Zr*	ppm	1	121	41	45	94
Calcium, Ca*	ppm	50	1070	360	930	690
Potassium, K*	ppm	100	850	170	220	430
Magnesium, Mg*	ppm	20	590	430	450	440
Sodium, Na*	ppm	50	380	140	160	180
Phosphorus, P*	ppm	20	240	430	280	310
Sulphur, S*	ppm	20	680	240	390	640
Rare Earth Metals in soil by ICPMS Method: I	MS12S					
Mercury, Hg*	ppm	0.1	<0.1	<0.1	<0.1	<0.1
Rhenium, Re*	ppm	0.05	<0.05	<0.05	<0.05	<0.05

Metals in soil by Nitric/Hydrofluoric Acid Digest, ICPMS Method:

Ge*	ppm	0.5	5.4	5.7	6.2	6.4

ASLP (Australian Standard Leaching Procedure) DI Water Method: AN007

Percentage Solids*	%	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	50	50
Mass of leaching solution used	g	-	1000	1000	1000	1000
Leaching solution used*	No unit	-	DI Water	DI Water	DI Water	DI Water
pH of solids leachate	pH Units	-	7.4	7.0	8.2	7.3
Conductivity @25C	µS/cm	1	150	72	130	75



	Samp San	ole Number nple Matrix	PE068612.026 Soil	PE068612.027 Soil	PE068612.028 Soil	PE068612.030 Soil
	Sa	ampie Date nole Name	14 Jun 2012 Vasse WRD, #7	13 Jun 2012 Vasse WRD, #8	13 Jun 2012 Vasse WRD, #8	13 Jun 2012 Vasse WRD, #9
			Bulk 1.5-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 1.5-3.0
Parameter	Units	LOR				
Total Dissolved Solids (TDS) in ASLP DI Wate	er Extract Me	ethod: AN1	13			
Total Dissolved Solids Dried at 180°C	mg/L	10	44	16	44	12
Alkalinity in ASLP DI Water Extract Method	: AN135					
Bicarbonate Alkalinity as HCO3	mg/L	5	32	9	49	17
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	26	8	40	14
Sulphate in ASLP DI Water Extract Method:	: AN275					
Sulphate	mg/L	1	12	8	9	10
Fluoride by Ion Selective Electrode in ASLP E	DI Water Leach	ate Meth 0.1	od: AN141 0.4	0.4	0.6	0.4
Metals in Water (ASLP DI) by ICPOES Meth	od: AN320/AN	1321				
Calcium, Ca	mg/L	0.2	11	3.9	17	5.3
Magnesium, Mg	mg/L	0.1	2.2	1.4	1.6	1.2
Phosphorus, P	mg/L	0.05	<0.05	<0.05	<0.05	<0.05
Potassium, K	mg/L	0.1	2.2	0.7	0.7	0.9
Sodium, Na	mg/L	0.5	7.8	4.5	3.8	4.1
Trace Metals in ASLP DI Extract by ICPMS	Method: AN31	8				
Aluminium, Al	µg/L	1	18	4	19	13
Antimony, Sb	µg/L	1	<1	<1	<1	<1
Arsenic, As	µg/L	1	<1	<1	<1	<1
Barium, Ba	µg/L	1	240	200	280	260
Bismuth, Bi	µg/L	1	<1	<1	<1	<1
Boron, B	µg/L	5	53	30	27	56
Cadmium, Cd	µg/L	0.1	13	10	11	6.7
Chromium, Cr	µg/L	1	<1	<1	<1	<1
Cobalt, Co	µg/L	1	<1	<1	<1	<1
Copper, Cu	µg/L	1	<1	<1	<1	<1
Iron, Fe	µg/L	5	8	<5	17	13
Lead, Pb	µg/L	1	23	15	31	16
Manganese, Mn	µg/L	1	<1	2	<1	1
Molybdenum, Mo	µg/L	1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	<1	<1	<1	<1
Selenium, Se	µg/L	2	<2	<2	<2	<2
Silver, Ag	µg/L	1	<1	<1	<1	<1
Strontium, Sr	µg/L	1	59	25	60	35
Thallium, TI	µg/L	1	<1	<1	<1	<1
Thorium, Th	µg/L	1	<1	<1	<1	<1
Tin, Sn	µg/L	1	<1	<1	<1	<1
Uranium, U	µg/L	1	<1	<1	<1	<1
Vanadium, V	µg/L	1	<1	<1	<1	<1
Zinc, Zn	µg/L	1	57	66	50	69



	Sample Number Sample Matrix Sample Date Sample Name		PE068612.026 Soil 14 Jun 2012 Vasse WRD, #7 Bulk 1.5-3.0	PE068612.027 Soil 13 Jun 2012 Vasse WRD, #8 Bulk 0.0-1.5	PE068612.028 Soil 13 Jun 2012 Vasse WRD, #8 Bulk 1.5-3.0	PE068612.030 Soil 13 Jun 2012 Vasse WRD, #9 Bulk 1.5-3.0					
Parameter	Units	LOR									
Mercury in ASLP DI Water Extract Method: AN311/AN312											
Mercury	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005					
Sample Subcontracted Method:	Sample Subcontracted Method:										
Sample Subcontracted*	No unit	-	-	-	-	-					
Fibre ID in bulk materials Method: AN602 FibreID				1							
Asbestos Detected	No unit	-	-	-	-	-					



PE068612 R0

0.006

<0.005

	Sample Number Sample Matrix Sample Date Sample Name		PE068612.031 Soil 13 Jun 2012 Vasse WRD, #10	PE068612.032 Soil 13 Jun 2012 Vasse WRD, #10	PE068612.033 Soil 13 Jun 2012 Vasse WRD, #10	PE068612.034 Soil 12 Jun 2012 Vasse WRD, #11	PE068612.035 Soil 13 Jun 2012 Vasse WRD, #12
Parameter	Units	LOR	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-3.0 Asbestos	Bulk 0.3	Bulk 0.0-1.5
Total Sulfur by LECO Furnace Method: AN20	2						
Total Sulfur*	%w/w	0.005	<0.005	0.015	-	<0.005	<0.005
Maximum Potential Acidity*	kg H2SO4/T	0.5	<0.5	<0.5	-	<0.5	<0.5
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN	014					

<0.005

<0.005

Acid Soluble Sulphur (SHCI) %w/w 0.005

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	NIL	NIL	-	NIL	NIL
Initial Effervescence*	No unit	-	NO	NO	-	NO	NO
Effervescence on Warming*	No unit	-	NO	NO	-	NO	NO
Titration - Green Colouration?*	No unit	-	NO	NO	-	NO	NO
Titration - Precipitate Formed?*	No unit	-	YES	YES	-	YES	YES
ANC as % CaCO ₃	% CaCO3	0.1	0.2	0.2	-	0.3	0.5
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.3	0.2	-	0.3	0.5
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	2.5	2.0	-	2.9	4.9
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	2.4	1.9	-	2.9	4.8

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	0.41	-	<0.25	<0.25
Net Acid Production Potential	kg H2SO4/T	-400	-2	-2	-	-3	-5
Total Oxidisable Sulphur	%w/w	0.005	<0.005	0.013	-	<0.005	<0.005

Silver, Ag*	ppm	0.1	<0.1	<0.1	-	<0.1	<0.1
Arsenic, As*	ppm	1	19	31	-	34	17
Barium, Ba*	ppm	2	124	122	-	130	280
Beryllium, Be*	ppm	0.1	0.4	0.6	-	0.4	0.5
Bismuth, Bi*	ppm	0.1	0.3	0.7	-	0.5	0.2
Cadmium, Cd*	ppm	0.1	<0.1	<0.1	-	<0.1	<0.1
Cobalt, Co*	ppm	0.1	7.3	21.9	-	9.8	7.9
Copper, Cu*	ppm	2	20	25	-	30	26
Manganese, Mn*	ppm	0.5	2210	2880	-	1290	1610
Molybdenum, Mo*	ppm	0.1	0.7	0.9	-	1.2	0.9
Nickel, Ni*	ppm	2	21	28	-	23	25
Lead, Pb*	ppm	1	27	37	-	26	18
Rubidium, Rb*	ppm	0.05	0.82	0.66	-	1.11	2.99
Antimony, Sb*	ppm	0.1	2.1	2.9	-	3.2	2.4
Selenium, Se*	ppm	2	<2	<2	-	<2	<2
Tin, Sn*	ppm	0.3	1.2	3	-	1.7	0.9
Tellurium, Te*	ppm	0.1	0.1	0.3	-	0.3	<0.1
Thorium, Th*	ppm	0.05	7.08	16.5	-	11.4	4.96
Thallium, TI*	ppm	0.1	<0.1	<0.1	-	<0.1	<0.1
Uranium, U*	ppm	0.05	1.97	2.89	-	1.82	2.03
Tungsten, W*	ppm	0.1	1.6	1.7	-	1.5	2.1
Zinc, Zn*	ppm	5	36	76	-	43	43
Lithium, Li*	ppm	0.1	2.1	3.4	-	4.9	3.9
Cerium, Ce*	ppm	0.05	40.8	47.1	-	34.6	18.7
Cesium, Cs*	ppm	0.05	0.07	0.07	-	0.09	0.27
Gallium, Ga*	ppm	0.2	8.5	21.5	-	13.1	6.6
Hafnium, Hf*	ppm	0.05	1.93	5.31	-	3.26	1.36
Indium, In*	ppm	0.02	0.05	0.15	-	0.08	0.03
Lanthanum, La*	ppm	0.05	9.73	15.9	-	7.17	5.25
Niobium, Nb*	ppm	0.1	4.8	13.1	-	7.1	3.6
Scandium, Sc*	ppm	0.2	12.5	19.7	-	15.2	9.6
Tantalum, Ta*	ppm	0.05	0.43	1.12	-	0.7	0.36



PE068612 R0

	Sample Number			PE068612.032	PE068612.033	PE068612.034	PE068612.035	
	Samı	ple Matrix	Soil	Soil	Soil	Soil	Soil	
	Sar	nple Date	13 Jun 2012	13 Jun 2012	13 Jun 2012	12 Jun 2012	13 Jun 2012	
	Sam	pie Name	Vasse WRD, #10	Vasse WRD, #10	Vasse WRD, #10	Vasse WRD, #11	Vasse WRD, #12	
- · · ·			BUIK 0.0-1.5	DUIK 1.3-3.0	Ashestos	BUIK 0.5	DUIK 0.0-1.5	
Parameter	Units	LOR			A000000			
ICPAES after Four Acid Digest Digest Method: ICP40Q								
Aluminium, Al*	ppm	100	28300	45200	-	45900	25200	
Chromium, Cr*	ppm	10	50	70	-	70	<10	
Iron, Fe*	ppm	100	493000	456000	-	441000	458000	
Strontium, Sr*	ppm	1	10	4	-	8	10	
Titanium, Ti*	ppm	10	1560	4000	-	2550	1300	
Vanadium, V*	ppm	1	54	131	-	93	44	
Zirconium, Zr*	ppm	1	64	176	-	102	45	
Calcium, Ca*	ppm	50	690	380	-	550	1260	
Potassium, K*	ppm	100	200	130	-	190	470	
Magnesium, Mg*	ppm	20	500	410	-	430	800	
Sodium, Na*	ppm	50	230	160	-	220	410	
Phosphorus, P*	ppm	20	280	260	-	240	360	
Sulphur, S*	ppm	20	580	520	-	490	600	
Rare Earth Metals in soil by ICPMS Method: II	NS12S							
Mercury, Hg*	ppm	0.1	<0.1	<0.1	-	<0.1	<0.1	
Rhenium, Re*	ppm	0.05	<0.05	<0.05	-	<0.05	<0.05	
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS Me	ethod:						
Ge*	ppm	0.5	5.6	4.0	-	5.1	5.4	

ASLP (Australian Standard Leaching Procedure) DI Water Method: AN007

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	-	50	50
Mass of leaching solution used	g	-	1000	1000	-	1000	1000
Leaching solution used*	No unit	-	DI Water	DI Water	-	DI Water	DI Water
pH of solids leachate	pH Units	-	7.4	6.5	-	7.0	8.4
Conductivity @25C	µS/cm	1	97	61	-	25	4



	Sampl	e Number	PE068612.031	PE068612.032	PE068612.033	PE068612.034	PE068612.035
	Sam	mple Date	13 Jun 2012	13 Jun 2012	13 Jun 2012	12 Jun 2012	13 Jun 2012
	Sam	Iple Name	Vasse WRD, #10	Vasse WRD, #10	Vasse WRD, #10	Vasse WRD, #11	Vasse WRD, #12
			Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-3.0	Bulk 0.3	Bulk 0.0-1.5
Parameter	Units	LOR			Aspestos		
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	thod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	40	16	-	20	44
Alkalinity in ASLP DI Water Extract Method: A	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	21	8	-	<5	57
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	-	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	-	<5	<5
Total Alkalinity as CaCO3	mg/L	5	17	6	-	<5	46
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	10	7	-	3	16
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	ite Meth	nod: AN141				
Fluoride by ISE	mg/L	0.1	0.7	0.3	-	0.2	0.7
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	7.6	2.2	-	0.7	18
Magnesium, Mg	mg/L	0.1	1.5	1.2	-	0.3	2.0
Phosphorus, P	mg/L	0.05	<0.05	<0.05	-	<0.05	<0.05
Potassium, K	mg/L	0.1	0.8	0.5	-	0.2	0.8
Sodium, Na	mg/L	0.5	5.5	5.2	-	2.5	8.2
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318						
Aluminium, Al	µg/L	1	19	9	-	130	19
Antimony, Sb	μg/L	1	<1	<1	-	<1	<1
Arsenic, As	µg/L	1	<1	<1	-	<1	<1
Barium, Ba	µg/L	1	250	270	-	98	210
Bismuth, Bi	µg/L	1	<1	<1	-	<1	<1
Boron, B	µg/L	5	50	29	-	41	30
Cadmium, Cd	µg/L	0.1	7.1	<0.1	-	3.4	6.7
Chromium, Cr	µg/L	1	<1	<1	-	<1	<1
Cobalt, Co	µg/L	1	<1	<1	-	<1	<1
Copper, Cu	µg/L	1	<1	<1	-	<1	<1
Iron, Fe	µg/L	5	19	11	-	67	19
Lead, Pb	µg/L	1	27	<1	-	34	2
Manganese, Mn	µg/L	1	<1	2	-	1	<1
Molybdenum, Mo	µg/L	1	<1	<1	-	<1	<1
Nickel, Ni	µg/L	1	<1	<1	-	<1	<1
Selenium, Se	µg/L	2	<2	<2	-	<2	<2
Silver, Ag	µg/L	1	<1	<1	-	<1	<1
Strontium, Sr	µg/L	1	47	19	-	6	62
Thallium, TI	µg/L	1	<1	<1	-	<1	<1
Thorium, Th	µg/L	1	<1	<1	-	<1	<1
Tin, Sn	µg/L	1	<1	<1	-	<1	<1
Uranium, U	µg/L	1	<1	<1	-	<1	<1
Vanadium, V	µg/L	1	<1	<1	-	<1	<1
Zinc, Zn	µg/L	1	57	63	-	61	50



	Sampl	e Number	PE068612.031	PE068612.032	PE068612.033	PE068612.034	PE068612.035
	Sam	ple Matrix	Soil	Soil	Soil	Soil	Soil
	Sar	nple Date	13 Jun 2012	13 Jun 2012	13 Jun 2012	12 Jun 2012	13 Jun 2012
	Sam	ple Name	Vasse WRD, #10	Vasse WRD, #10	Vasse WRD, #10	Vasse WRD, #11	Vasse WRD, #12
			Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-3.0	Bulk 0.3	Bulk 0.0-1.5
					Ashestos		
Parameter	Units	LOR			Aspesios		
Mercurv in ASLP DI Water Extract Method: A	N311/AN312						
· · · · · · · · · · · · · · · · · · ·							
Mercury	mg/L	0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005
Sample Subcontracted Method:							
r							
Sample Subcontracted*	No unit	-	-	-	-	-	-
Fibre ID in bulk materials Method: AN602							
EibreID							
Asbestos Detected	No unit	-	-	-	No	-	-



PE068612 R0

	Sampl Sam Sai Sam	e Number ple Matrix nple Date ple Name	PE068612.036 Soil 13 Jun 2012 Vasse WRD, #12 Bulk 1.5-3.0	PE068612.037 Soil 13 Jun 2012 Vasse WRD, #13 Bulk 0.0-1.5	PE068612.038 Soil 13 Jun 2012 Vasse WRD, #13 Bulk 1.5-3.0	PE068612.039 Soil 12 Jun 2012 Vasse WRD, #14 Bulk 0.3	PE068612.040 Soil 13 Jun 2012 Vasse WRD, #15 Bulk 0.0-1.5
Parameter	Units	LOR					
Total Sulfur by LECO Furnace Method: AN20	2						
Total Sulfur*	%w/w	0.005	<0.005	0.041	0.017	0.034	0.036
Maximum Potential Acidity*	kg H2SO4/T	0.5	<0.5	1.3	0.5	1.0	1.1
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN	014					
Acid Soluble Sulphur (SHCI)	%w/w	0.005	0.007	<0.005	<0.005	<0.005	<0.005
Acid Neutralising Capacity or Neutralisation Po	otential(ANC/I	NP) Met	hod: AN212				

Fizz Rating Reaction*	No unit	-	NIL	NIL	NIL	NIL	NIL
Initial Effervescence*	No unit	-	NO	NO	NO	NO	NO
Effervescence on Warming*	No unit	-	NO	NO	NO	NO	NO
Titration - Green Colouration?*	No unit	-	NO	NO	NO	NO	NO
Titration - Precipitate Formed?*	No unit	-	No	No	No	No	YES
ANC as % CaCO ₃	% CaCO3	0.1	0.2	0.3	0.1	0.2	0.3
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.3	0.3	0.2	0.2	0.4
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	2.5	3.2	1.5	2.0	3.4
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	2.4	3.1	1.4	1.9	3.4

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	1.1	0.43	1.1	1.0
Net Acid Production Potential	kg H2SO4/T	-400	-3	-2	-1	-1	-2
Total Oxidisable Sulphur	%w/w	0.005	<0.005	0.036	0.014	0.036	0.033

Silver, Ag*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic, As*	ppm	1	11	31	43	24	29
Barium, Ba*	ppm	2	102	157	74	96	41
Beryllium, Be*	ppm	0.1	0.4	0.7	0.6	0.5	0.8
Bismuth, Bi*	ppm	0.1	0.1	0.4	0.4	0.4	0.5
Cadmium, Cd*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	7.7	12.8	26.8	6.7	20.3
Copper, Cu*	ppm	2	17	30	38	28	21
Manganese, Mn*	ppm	0.5	1310	2340	1610	1990	5630
Molybdenum, Mo*	ppm	0.1	0.6	1	1	1.2	0.8
Nickel, Ni*	ppm	2	17	25	26	20	26
Lead, Pb*	ppm	1	12	28	27	24	42
Rubidium, Rb*	ppm	0.05	1.31	2.31	1.01	1.27	0.6
Antimony, Sb*	ppm	0.1	1.1	2.5	3.2	2.4	2.9
Selenium, Se*	ppm	2	<2	<2	<2	<2	<2
Tin, Sn*	ppm	0.3	0.4	1.7	1.6	1.2	1.6
Tellurium, Te*	ppm	0.1	<0.1	0.2	0.2	0.1	0.1
Thorium, Th*	ppm	0.05	2.39	10.2	7.97	7.61	9.13
Thallium, TI*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium, U*	ppm	0.05	1.74	2.68	2.31	1.78	3.07
Tungsten, W*	ppm	0.1	3.6	1.5	1.2	1.7	1.5
Zinc, Zn*	ppm	5	35	60	166	39	61
Lithium, Li*	ppm	0.1	1.6	5.3	3.4	6.7	1.4
Cerium, Ce*	ppm	0.05	13.6	34.1	32.7	28.7	41.3
Cesium, Cs*	ppm	0.05	0.12	0.17	0.08	0.1	0.05
Gallium, Ga*	ppm	0.2	3.3	13.6	11.2	9	12.4
Hafnium, Hf*	ppm	0.05	0.65	3.1	2.56	2.15	2.65
Indium, In*	ppm	0.02	<0.02	0.09	0.08	0.06	0.07
Lanthanum, La*	ppm	0.05	4.78	12.2	10.5	5.45	9.95
Niobium, Nb*	ppm	0.1	2	7.7	6.2	4.8	7.1
Scandium, Sc*	ppm	0.2	5.1	16.2	15.2	11.1	18.4
Tantalum, Ta*	ppm	0.05	0.19	0.7	0.55	0.47	0.64



	Sample Number Sample Matrix Sample Date Sample Name		PE068612.036 Soil 13 Jun 2012 Vasse WRD, #12 Bulk 1.5-3.0	PE068612.037 Soil 13 Jun 2012 Vasse WRD, #13 Bulk 0.0-1.5	PE068612.038 Soil 13 Jun 2012 Vasse WRD, #13 Bulk 1.5-3.0	PE068612.039 Soil 12 Jun 2012 Vasse WRD, #14 Bulk 0.3	PE068612.040 Soil 13 Jun 2012 Vasse WRD, #15 Bulk 0.0-1.5
Parameter	Units	LOR					
ICPAES after Four Acid Digest Digest Method	: ICP40Q						
Aluminium, Al*	ppm	100	14300	40900	30300	27800	34600
Chromium, Cr*	ppm	10	<10	60	70	70	50
Iron, Fe*	ppm	100	501000	454000	490000	480000	482000
Strontium, Sr*	ppm	1	4	5	2	6	5
Titanium, Ti*	ppm	10	640	2510	1850	1640	2170
Vanadium, V*	ppm	1	19	86	83	61	70
Zirconium, Zr*	ppm	1	22	100	84	72	85
Calcium, Ca*	ppm	50	550	700	420	430	510
Potassium, K*	ppm	100	230	350	180	280	100
Magnesium, Mg*	ppm	20	720	650	400	380	610
Sodium, Na*	ppm	50	400	410	330	150	240
Phosphorus, P*	ppm	20	310	280	270	310	340
Sulphur, S*	ppm	20	420	510	510	500	510
Rare Earth Metals in soil by ICPMS Method: II	MS12S						
Mercury, Hg*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Rhenium, Re*	ppm	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS M	ethod:					
Ge*	ppm	0.5	4.7	4.7	4.6	5.8	4.7
ASLP (Australian Standard Leaching Procedure) DI Water	Method: /	AN007				

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	50	50	50
Mass of leaching solution used	g	-	1000	1000	1000	1000	1000
Leaching solution used*	No unit	-	DI Water				
pH of solids leachate	pH Units	-	7.6	7.3	6.7	6.8	7.1
Conductivity @25C	µS/cm	1	160	140	130	42	130



	Sample Samj Sar Sam	e Number ple Matrix nple Date ple Name	PE068612.036 Soil 13 Jun 2012 Vasse WRD, #12	PE068612.037 Soil 13 Jun 2012 Vasse WRD, #13	PE068612.038 Soil 13 Jun 2012 Vasse WRD, #13	PE068612.039 Soil 12 Jun 2012 Vasse WRD, #14	PE068612.040 Soil 13 Jun 2012 Vasse WRD, #15
			Bulk 1.5-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.3	Bulk 0.0-1.5
Parameter	Units	LOR					
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	hod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	56	40	16	<10	56
Alkalinity in ASLP DI Water Extract Method: A	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	22	25	8	8	11
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	18	21	7	6	9
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	22	16	17	7	20
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	te Metł	nod: AN141				
Fluoride by ISE	mg/L	0.1	0.5	0.6	0.3	0.2	1.0
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	8.4	8.0	4.9	2.4	7.8
Magnesium, Mg	mg/L	0.1	3.7	2.1	2.2	0.8	2.8
Phosphorus, P	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium, K	mg/L	0.1	1.0	1.0	0.9	0.5	0.5
Sodium, Na	mg/L	0.5	12	10	10	2.7	8.1
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318						
Aluminium, Al	µg/L	1	7	16	4	6	4
Antimony, Sb	µg/L	1	<1	<1	<1	<1	<1
Arsenic, As	µg/L	1	<1	<1	<1	<1	<1
Barium, Ba	µg/L	1	160	200	210	220	160
Bismuth, Bi	µg/L	1	<1	<1	<1	<1	<1
Boron, B	µg/L	5	34	35	28	22	40
Cadmium, Cd	µg/L	0.1	3.7	3.6	2.2	1.4	2.8
Chromium, Cr	µg/L	1	<1	3	<1	<1	5
Cobalt, Co	µg/L	1	<1	<1	<1	<1	<1
Copper, Cu	µg/L	1	<1	<1	<1	<1	<1
Iron, Fe	µg/L	5	11	14	<5	10	<5
Lead, Pb	µg/L	1	<1	35	<1	17	<1
Manganese, Mn	µg/L	1	<1	<1	2	2	<1
Molybdenum, Mo	µg/L	1	<1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	<1	<1	<1	<1	<1
Selenium, Se	µg/L	2	<2	<2	<2	<2	<2
Silver, Ag	µg/L	1	<1	<1	<1	<1	<1
Strontium, Sr	µg/L	1	46	33	30	20	44
I hallium, TI	µg/L	1	<1	<1	<1	<1	<1
Inorium, Ih	µg/L	1	<1	<1	<1	<1	<1
	µg/L	1	<1	<1	<1	<1	<1
Uranium, U	µg/L	1	<1	<1	<1	<1	<1
Zine Ze	µg/L	1	<1	<1	<1	<1	<1
200, 20	hĝ/r	1	56	00	09	00	53



	Sample	e Number	PE068612.036	PE068612.037	PE068612.038	PE068612.039	PE068612.040			
	Sam	Sample Matrix		Soil	Soil	Soil	Soil			
	Sar	nple Date	13 Jun 2012	13 Jun 2012	13 Jun 2012	12 Jun 2012	13 Jun 2012			
	Sam	ple Name	Vasse WRD, #12	Vasse WRD, #13	Vasse WRD, #13	Vasse WRD, #14	Vasse WRD, #15			
			Bulk 1.5-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.3	Bulk 0.0-1.5			
Parameter	Units	LOR								
Mercury in ASLP DI Water Extract Method: Al	N311/AN312									
Mercury	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005			
Sample Subcontracted Method:										
Sample Subcontracted*	No unit	-	-	-	-	-	-			
Fibre ID in bulk materials Method: AN602 FibreID										
Asbestos Detected	No unit	-	-	-	-	-	-			



PE068612 R0

	Sampl Sam Sam Sam	e Number ple Matrix mple Date pple Name	PE068612.041 Soil 13 Jun 2012 Vasse WRD, #15 Bulk 1.5-3.0	PE068612.042 Soil 13 Jun 2012 Vasse WRD, #15 Bulk 0.0-3.0 Asbastos	PE068612.043 Soil 14 Jun 2012 Vasse WRD, #16 Bulk 0.0-1.5	PE068612.044 Soil 14 Jun 2012 Vasse WRD, #16 Bulk 1.5-3.0	PE068612.045 Soil 13 Jun 2012 Vasse WRD, #18 Bulk 0.0-1.5
Parameter	Units	LOR		Aspesios			
Total Sulfur by LECO Furnace Method: AN20	2						
Total Sulfur*	%w/w	0.005	<0.005	-	0.021	0.037	0.017
Maximum Potential Acidity*	kg H2SO4/T	0.5	<0.5	-	0.6	1.1	0.5
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN	014					1
Acid Soluble Sulphur (SHCI)	%w/w	0.005	<0.005	-	<0.005	<0.005	0.012

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fire Deline Departient	Na unit		NII		NIII	NII	NII
Fizz Rating Reaction"	NO UNIT	-	NIL	-	NIL	NIL	NIL
Initial Effervescence*	No unit	-	NO	-	NO	NO	NO
Effervescence on Warming*	No unit	-	NO	-	NO	NO	NO
Titration - Green Colouration?*	No unit	-	NO	-	NO	NO	NO
Titration - Precipitate Formed?*	No unit	-	YES	-	YES	YES	YES
ANC as % CaCO ₃	% CaCO3	0.1	0.2	-	0.3	0.2	0.2
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.2	-	0.3	0.2	0.2
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	2.2	-	2.7	2.2	2.0
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	2.2	-	2.6	2.2	1.9

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	-	0.65	1.2	<0.25
Net Acid Production Potential	kg H2SO4/T	-400	-2	-	-2	-1	-2
Total Oxidisable Sulphur	%w/w	0.005	<0.005	-	0.021	0.040	<0.005

Silver, Ag*	ppm	0.1	<0.1	-	0.1	<0.1	<0.1
Arsenic, As*	ppm	1	14	-	44	45	43
Barium, Ba*	ppm	2	49	-	292	178	181
Beryllium, Be*	ppm	0.1	0.5	-	1	0.9	0.4
Bismuth, Bi*	ppm	0.1	0.2	-	0.4	0.4	0.4
Cadmium, Cd*	ppm	0.1	<0.1	-	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	7.5	-	9.4	8.6	6.8
Copper, Cu*	ppm	2	13	-	42	36	37
Manganese, Mn*	ppm	0.5	1760	-	1110	1100	1090
Molybdenum, Mo*	ppm	0.1	0.8	-	2.4	2.5	1.1
Nickel, Ni*	ppm	2	14	-	42	34	14
Lead, Pb*	ppm	1	18	-	29	29	25
Rubidium, Rb*	ppm	0.05	0.69	-	8.62	8.85	2.22
Antimony, Sb*	ppm	0.1	1.5	-	4.2	4	2.5
Selenium, Se*	ppm	2	<2	-	2	2	2
Tin, Sn*	ppm	0.3	0.6	-	2.3	2.5	1.5
Tellurium, Te*	ppm	0.1	<0.1	-	0.2	0.2	0.3
Thorium, Th*	ppm	0.05	3.44	-	11.9	12.8	8.06
Thallium, TI*	ppm	0.1	<0.1	-	0.2	0.1	<0.1
Uranium, U*	ppm	0.05	1.47	-	2.73	2.75	1.6
Tungsten, W*	ppm	0.1	1	-	2.2	2.3	1.2
Zinc, Zn*	ppm	5	31	-	36	33	63
Lithium, Li*	ppm	0.1	0.9	-	14	11	7.1
Cerium, Ce*	ppm	0.05	19.8	-	32.3	27.4	21.5
Cesium, Cs*	ppm	0.05	0.07	-	0.55	0.53	0.18
Gallium, Ga*	ppm	0.2	4.6	-	19	19.3	10.9
Hafnium, Hf*	ppm	0.05	0.99	-	3.61	3.89	2.49
Indium, In*	ppm	0.02	0.03	-	0.1	0.11	0.08
Lanthanum, La*	ppm	0.05	6.04	-	11.5	9.44	5.69
Niobium, Nb*	ppm	0.1	2.5	-	10.6	11.7	5.7
Scandium, Sc*	ppm	0.2	7.6	-	15.4	14.7	14.5
Tantalum, Ta*	ppm	0.05	0.23	-	1.04	1.14	0.54



	Sampl Sam Sar Sam	e Number ple Matrix nple Date ple Name	PE068612.041 Soil 13 Jun 2012 Vasse WRD, #15 Bulk 1.5-3.0	PE068612.042 Soil 13 Jun 2012 Vasse WRD, #15 Bulk 0.0-3.0	PE068612.043 Soil 14 Jun 2012 Vasse WRD, #16 Bulk 0.0-1.5	PE068612.044 Soil 14 Jun 2012 Vasse WRD, #16 Bulk 1.5-3.0	PE068612.045 Soil 13 Jun 2012 Vasse WRD, #18 Bulk 0.0-1.5				
Parameter	Units	LOR		Asbestos							
ICPAES after Four Acid Digest Digest Method: ICP40Q											
Aluminium, Al*	ppm	100	13500	-	48500	43900	34100				
Chromium, Cr*	ppm	10	<10	-	130	130	90				
Iron, Fe*	ppm	100	523000	-	430000	430000	432000				
Strontium, Sr*	ppm	1	1	-	6	5	6				
Titanium, Ti*	ppm	10	800	-	3550	3770	1840				
Vanadium, V*	ppm	1	29	-	144	149	81				
Zirconium, Zr*	ppm	1	31	-	127	137	84				
Calcium, Ca*	ppm	50	520	-	370	430	480				
Potassium, K*	ppm	100	110	-	1200	1320	320				
Magnesium, Mg*	ppm	20	390	-	490	460	330				
Sodium, Na*	ppm	50	180	-	240	250	230				
Phosphorus, P*	ppm	20	460	-	310	300	220				
Sulphur, S*	ppm	20	410	-	450	450	570				
Rare Earth Metals in soil by ICPMS Method: I	MS12S										
Mercury, Hg*	ppm	0.1	<0.1	-	<0.1	<0.1	<0.1				
Rhenium, Re*	ppm	0.05	<0.05	-	<0.05	<0.05	<0.05				
Metals in soil by Nitric/Hydrofluoric Acid Digest	Metals in soil by Nitric/Hydrofluoric Acid Digest, ICPMS Method:										
Ge*	ppm	0.5	5.0	-	4.7	5.0	6.3				
ASLP (Australian Standard Leaching Procedure	e) DI Water	Method: /	AN007								

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	-	50	50	50
Mass of leaching solution used	g	-	1000	-	1000	1000	1000
Leaching solution used*	No unit	-	DI Water	-	DI Water	DI Water	DI Water
pH of solids leachate	pH Units	-	7.1	-	6.3	6.5	6.4
Conductivity @25C	µS/cm	1	98	-	56	63	51



	Sampl Sam Sai Sam	e Number ple Matrix nple Date ple Name	PE068612.041 Soil 13 Jun 2012 Vasse WRD, #15 Bulk 1.5-3.0	PE068612.042 Soil 13 Jun 2012 Vasse WRD, #15 Bulk 0.0-3.0	PE068612.043 Soil 14 Jun 2012 Vasse WRD, #16 Bulk 0.0-1.5	PE068612.044 Soil 14 Jun 2012 Vasse WRD, #16 Bulk 1.5-3.0	PE068612.045 Soil 13 Jun 2012 Vasse WRD, #18 Bulk 0.0-1.5
Parameter	Units	LOR		Asbestos			
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	thod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	36	-	12	20	20
Alkalinity in ASLP DI Water Extract Method: A	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	21	-	<5	8	6
Carbonate Alkalinity as CO3	mg/L	1	<1	-	<1	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	-	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	18	-	<5	7	<5
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	11	-	6	9	8
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	te Meth	nod: AN141 0.7	-	<0.1	<0.1	0.2
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	8.7	-	2.1	3.2	2.3
Magnesium, Mg	mg/L	0.1	1.5	-	0.7	1.0	1.0
Phosphorus, P	mg/L	0.05	<0.05	-	<0.05	<0.05	<0.05
Potassium, K	mg/L	0.1	0.3	-	1.9	2.3	0.7
Sodium, Na	mg/L	0.5	4.2	-	4.3	4.0	4.0
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318						
Aluminium, Al	µg/L	1	6	-	6	7	8
Antimony, Sb	µg/L	1	<1	-	<1	<1	<1
Arsenic, As	µg/L	1	<1	-	<1	<1	<1
Barium, Ba	µg/L	1	200	-	370	250	240
Bismuth, Bi	µg/L	1	<1	-	<1	<1	<1
Boron, B	µg/L	5	37	-	20	23	28
Cadmium, Cd	µg/L	0.1	2.6	-	1.8	1.6	1.6
Chromium, Cr	µg/L	1	<1	-	<1	<1	<1
Cobalt, Co	µg/L	1	<1	-	<1	<1	<1
Copper, Cu	µg/L	1	<1	-	<1	<1	<1
Iron, Fe	µg/L	5	5	-	6	11	21
Lead, Pb	µg/L	1	<1	-	46	<1	<1
Manganese, Mn	µg/L	1	<1	-	41	30	2
Molybdenum, Mo	µg/L	1	<1	-	<1	<1	<1
	µg/L	1	<1	-	<1	<1	<1
Selenium, Se	µg/L	2	<2	-	<2	<2	<2
Silver, Ag	µg/L	1	<1	-	<1	<1	<1
Strontium, Sr	µg/L	1	33	-	14	19	19
Inailium, II	µg/L	1	<1	-	<1	<1	<1
	µg/L	1	<1	-	<1	<1	<1
	µg/L	1	<1	-	<1	<1	<1
	µg/L	1	~1	-	<1	~1	<1
Zinc. Zn	µg/L ua/l	1	60		77	48	50
1					••		



	Sample	e Number	PE068612.041	PE068612.042	PE068612.043	PE068612.044	PE068612.045
	Sam	ple Matrix	Soil	Soil	Soil	Soil	Soil
	Sar	nple Date	13 Jun 2012	13 Jun 2012	14 Jun 2012	14 Jun 2012	13 Jun 2012
	Sam	ple Name	Vasse WRD, #15	Vasse WRD, #15	Vasse WRD, #16	Vasse WRD, #16	Vasse WRD, #18
			Bulk 1.5-3.0	Bulk 0.0-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-1.5
Parameter	Units	LOR		Asbestos			
Mercury in ASLP DI Water Extract Method: AN	N311/AN312						
Mercury	mg/L	0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005
Sample Subcontracted Method:							
Sample Subcontracted*	No unit	-	-	-	-	-	-
Fibre ID in bulk materials Method: AN602 FibreID							
Ashestos Detected	No unit	_	_	No	_	_	_



ANALYTICAL REPORT

PE068612 R0

		Sampl Sam Sai Sam	e Number ple Matrix nple Date ple Name	PE068612.046 Soil 13 Jun 2012 Vasse WRD, #18 Bulk 1.5-3.0	PE068612.047 Soil 13 Jun 2012 Vasse WRD, #19 Bulk 0.0-1.5	PE068612.048 Soil 13 Jun 2012 Vasse WRD, #19 Bulk 1.5-3.0	PE068612.049 Soil 13 Jun 2012 Vasse WRD, #20 Bulk 0.0-1.5	PE068612.050 Soil 13 Jun 2012 Vasse WRD, #20 Bulk 1.5-3.0			
I	Parameter	Units	LOR								
	Total Sulfur by LECO Furnace Method: AN20	2									
1	Total Sulfur*	%w/w	0.005	0.024	0.006	<0.005	0.24	<0.005			
Ν	Maximum Potential Acidity*	kg H2SO4/T	0.5	0.7	<0.5	<0.5	7.4	<0.5			
	HCI Extractable S, Ca and Mg in Soil ICP OES Method: AN014										
4	Acid Soluble Sulphur (SHCI)	%w/w	0.005	0.013	0.015	0.009	0.023	0.025			

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

No unit	-	NIL	Slight	Slight	NIL	NIL
No unit	-	NO	NO	NO	NO	NO
No unit	-	NO	NO	NO	NO	NO
No unit	-	NO	NO	NO	NO	NO
No unit	-	YES	YES	YES	YES	YES
% CaCO3	0.1	0.3	2.0	1.4	0.4	0.6
%w/w	0.1	0.3	2.2	1.5	0.4	0.7
kg CaCO3/T	1	2.7	20	14	4.0	6.2
kg H2SO4/T	1	2.6	19	14	3.9	6.1
	No unit No unit No unit No unit No unit % CaCO3 %w/w kg CaCO3/T kg H2SO4/T	No unit - % CaCO3 0.1 %w/w 0.1 kg CaCO3/T 1 kg H2SO4/T 1	No unit - NIL No unit - NO No unit - YES % CaCO3 0.1 0.3 %w/w 0.1 0.3 kg CaCO3/T 1 2.7 kg H2SO4/T 1 2.6	No unit - NIL Slight No unit - NO NO No unit - YES YES % CaCO3 0.1 0.3 2.0 %w/w 0.1 0.3 2.2 kg CaCO3/T 1 2.7 20 kg H2SO4/T 1 2.6 19	No unit - NIL Slight Slight No unit - NO NO NO No unit - YES YES YES % CaCO3 0.1 0.3 2.0 1.4 %w/w 0.1 0.3 2.2 1.5 kg CaCO3/T 1 2.7 20 14 kg H2SO4/T 1 2.8 19 14	No unit - NIL Slight Slight NIL No unit - NO NO NO NO No unit - YES YES YES YES % CaCO3 0.1 0.3 2.0 1.4 0.4 %w/w 0.1 0.3 2.2 1.5 0.4 kg CaCO3/T 1 2.7 20 14 4.0 kg H2SO4/T 1 2.6 19 14 3.9

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	0.32	<0.25	<0.25	6.6	<0.25
Net Acid Production Potential	kg H2SO4/T	-400	-2	-20	-14	3	-7
Total Oxidisable Sulphur	%w/w	0.005	0.010	<0.005	<0.005	0.22	<0.005

Silver, Ag*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic, As*	ppm	1	43	18	18	19	30
Barium, Ba*	ppm	2	180	318	118	683	975
Beryllium, Be*	ppm	0.1	0.5	0.4	0.4	0.6	0.8
Bismuth, Bi*	ppm	0.1	0.4	0.3	0.3	0.2	0.3
Cadmium, Cd*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	10.3	10.3	6.5	12.3	13.3
Copper, Cu*	ppm	2	34	28	30	32	35
Manganese, Mn*	ppm	0.5	1390	1070	1210	4840	3110
Molybdenum, Mo*	ppm	0.1	1.1	0.7	0.7	0.7	1.4
Nickel, Ni*	ppm	2	17	29	29	12	33
Lead, Pb*	ppm	1	28	18	15	23	25
Rubidium, Rb*	ppm	0.05	2.21	3.28	2.89	3.2	5.88
Antimony, Sb*	ppm	0.1	2.6	1.7	1.5	1	2.1
Selenium, Se*	ppm	2	2	<2	<2	3	<2
Tin, Sn*	ppm	0.3	1.4	1.2	1.1	0.6	1
Tellurium, Te*	ppm	0.1	0.3	0.1	<0.1	0.1	0.1
Thorium, Th*	ppm	0.05	8.67	6.99	6.14	5.07	7.07
Thallium, TI*	ppm	0.1	<0.1	0.1	0.1	0.5	0.3
Uranium, U*	ppm	0.05	1.66	1.57	1.44	1.7	2.14
Tungsten, W*	ppm	0.1	1.1	1.4	1.3	0.5	1.1
Zinc, Zn*	ppm	5	62	31	26	108	80
Lithium, Li*	ppm	0.1	5.7	6.6	4.7	1.8	7.0
Cerium, Ce*	ppm	0.05	28.6	26.6	20.4	34.9	40.9
Cesium, Cs*	ppm	0.05	0.17	0.23	0.2	0.19	0.35
Gallium, Ga*	ppm	0.2	10.3	9.6	8.5	5.4	7.8
Hafnium, Hf*	ppm	0.05	2.5	1.9	1.66	1.25	1.84
Indium, In*	ppm	0.02	0.08	0.05	0.05	0.04	0.05
Lanthanum, La*	ppm	0.05	8.14	8.7	6.89	3.55	10.3
Niobium, Nb*	ppm	0.1	5.2	5.1	4.5	2.2	4.2
Scandium, Sc*	ppm	0.2	15.8	11	9.9	13.1	14.7
Tantalum, Ta*	ppm	0.05	0.5	0.5	0.48	0.2	0.4



	Sampl Sam Sar Sam	e Number ple Matrix nple Date ple Name	PE068612.046 Soil 13 Jun 2012 Vasse WRD, #18 Bulk 1.5-3.0	PE068612.047 Soil 13 Jun 2012 Vasse WRD, #19 Bulk 0.0-1.5	PE068612.048 Soil 13 Jun 2012 Vasse WRD, #19 Bulk 1.5-3.0	PE068612.049 Soil 13 Jun 2012 Vasse WRD, #20 Bulk 0.0-1.5	PE068612.050 Soil 13 Jun 2012 Vasse WRD, #20 Bulk 1.5-3.0
Parameter	Units	LOR					
ICPAES after Four Acid Digest Digest Method	I: ICP40Q						
Aluminium, Al*	ppm	100	35900	32400	27700	23000	38400
Chromium, Cr*	ppm	10	70	40	<10	20	30
Iron, Fe*	ppm	100	446000	460000	472000	453000	433000
Strontium, Sr*	ppm	1	8	19	15	17	16
Titanium, Ti*	ppm	10	1750	1760	1560	700	1510
Vanadium, V*	ppm	1	83	65	49	35	66
Zirconium, Zr*	ppm	1	80	65	57	41	62
Calcium, Ca*	ppm	50	560	6960	4450	1160	1890
Potassium, K*	ppm	100	340	540	450	620	850
Magnesium, Mg*	ppm	20	380	1250	1180	540	640
Sodium, Na*	ppm	50	190	320	280	350	300
Phosphorus, P*	ppm	20	200	270	290	140	250
Sulphur, S*	ppm	20	590	430	370	920	880
Rare Earth Metals in soil by ICPMS Method: II	NS12S						
Mercury, Hg*	ppm	0.1	<0.1	<0.1	<0.1	0.1	<0.1
Rhenium, Re*	ppm	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS M	ethod:					
Ge*	ppm	0.5	6.1	5.1	4.8	3.9	4.2
ASLP (Australian Standard Leaching Procedure) DI Water	Method: /	AN007				

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	50	50	50
Mass of leaching solution used	g	-	1000	1000	1000	1000	1000
Leaching solution used*	No unit	-	DI Water				
pH of solids leachate	pH Units	-	6.2	8.1	8.0	7.6	7.7
Conductivity @25C	µS/cm	1	56	130	130	120	150



	Sample Samj	e Number ple Matrix	PE068612.046 Soil	PE068612.047 Soil	PE068612.048 Soil	PE068612.049 Soil	PE068612.050 Soil				
	Sar	nple Date	13 Jun 2012								
	Sam	ple Name	Vasse WRD, #18 Bulk 1.5-3.0	Vasse WRD, #19 Bulk 0.0-1.5	Vasse WRD, #19 Bulk 1.5-3.0	Vasse WRD, #20 Bulk 0.0-1.5	Vasse WRD, #20 Bulk 1.5-3.0				
Parameter	Units	LOR									
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	hod: AN1	13								
Total Dissolved Solids Dried at 180°C	mg/L	10	72	104	104	92	140				
Alkalinity in ASLP DI Water Extract Method: A	AN135										
Bicarbonate Alkalinity as HCO3	mg/L	5	6	52	58	40	73				
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1				
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	<5	<5	<5				
Total Alkalinity as CaCO3	mg/L	5	5	43	47	33	60				
Sulphate in ASLP DI Water Extract Method: AN275											
Sulphate	mg/L	1	10	11	8	14	12				
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	te Meth	nod: AN141								
Fluoride by ISE	mg/L	0.1	0.2	1.2	1.2	0.7	0.6				
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321									
Calcium, Ca	mg/L	0.2	2.7	17	18	15	24				
Magnesium, Mg	mg/L	0.1	1.1	2.2	2.1	1.5	1.7				
Phosphorus, P	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Potassium, K	mg/L	0.1	0.8	1.7	1.3	0.6	0.9				
Sodium, Na	mg/L	0.5	3.8	4.5	4.0	3.6	3.0				
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318										
Aluminium, Al	µg/L	1	11	28	54	25	28				
Antimony, Sb	µg/L	1	<1	<1	<1	<1	<1				
Arsenic, As	μg/L	1	<1	<1	<1	<1	<1				
Barium, Ba	μg/L	1	210	230	240	240	280				
Bismuth, Bi	μg/L	1	<1	<1	<1	<1	<1				
Boron, B	µg/L	5	48	49	62	33	37				
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Chromium, Cr	µg/L	1	<1	<1	1	<1	2				
Cobalt, Co	µg/L	1	<1	<1	<1	<1	<1				
Copper, Cu	µg/L	1	<1	<1	<1	<1	<1				
Iron, Fe	µg/L	5	38	<5	61	75	56				
Lead, Pb	µg/L	1	<1	<1	<1	<1	<1				
Manganese, Mn	µg/L	1	3	<1	<1	3	<1				
Molybdenum, Mo	µg/L	1	<1	<1	<1	<1	<1				
Nickel, Ni	µg/L	1	<1	<1	<1	<1	<1				
Selenium, Se	µg/L	2	<2	<2	<2	<2	<2				
Silver, Ag	µg/L	1	<1	<1	<1	<1	<1				
Strontium, Sr	µg/L	1	31	91	100	86	78				
Thereing Th	µg/L	1	<1	<1	<1	<1	<1				
The Or	µg/L	1	<1	<1	<1	<1	<1				
	µg/L	1	<1	<1	<1	<1	<1				
	µg/L	1	<1	<1	<1	<1	<1				
	µg/L	1	~1	<u>~1</u>		~1	20				
2110, 211	µg/L	1	33	4	30	21	28				



	Sample	e Number	PE068612.046	PE068612.047	PE068612.048	PE068612.049	PE068612.050				
	Sam	ple Matrix	Soil	Soil	Soil	Soil	Soil				
	Sar	nple Date	13 Jun 2012								
	Sam	ple Name	Vasse WRD, #18	Vasse WRD, #19	Vasse WRD, #19	Vasse WRD, #20	Vasse WRD, #20				
			Bulk 1.5-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0				
Parameter	Units	LOR									
Mercury in ASLP DI Water Extract Method: AN311/AN312											
Mercury	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005				
Sample Subcontracted Method:	Sample Subcontracted Method:										
Sample Subcontracted*	No unit	-	-	-	-	-	-				
Fibre ID in bulk materials Method: AN602											
FibreID											
Asbestos Detected	No unit	-	-	-	-	-	-				



PE068612 R0

	Sampl	e Number	PE068612.051	PE068612.052	PE068612.053	PE068612.054			
	Sam	ple Matrix	Soil	Soil	Soil	Soil			
	Sample Date		13 Jun 2012	14 Jun 2012	14 Jun 2012	14 Jun 2012			
	Sam	ple Name	Vasse WRD, #20	Vasse WRD, #21	Vasse WRD, #21	Vasse WRD, #22			
			Bulk 0.0-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-1.5			
Parameter	Units	LOR	Asbestos						
Total Sulfur by LECO Furnace Method: AN202									
Total Sulfur*	%w/w	0.005	-	0.019	0.059	0.012			
Maximum Potential Acidity*	kg H2SO4/T	0.5	-	0.6	1.8	<0.5			
HCI Extractable S, Ca and Mg in Soil ICP OES Method: AN014									
Acid Soluble Sulphur (SHCI)	%w/w	0.005	-	0.015	0.017	<0.005			

Acid Soluble Sulphur (SHCI) %w/w 0.005

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	-	NIL	NIL	NIL
Initial Effervescence*	No unit	-	-	NO	NO	NO
Effervescence on Warming*	No unit	-	-	NO	NO	NO
Titration - Green Colouration?*	No unit	-	-	NO	NO	NO
Titration - Precipitate Formed?*	No unit	-	-	YES	YES	NO
ANC as % CaCO ₃	% CaCO3	0.1	-	0.2	0.2	0.2
ANC as % CaMg(CO ₃)2	%w/w	0.1	-	0.3	0.3	0.2
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	-	2.5	2.5	1.7
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	-	2.4	2.4	1.7

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	-	<0.25	1.3	0.26
Net Acid Production Potential	kg H2SO4/T	-400	-	-2	-1	-1
Total Oxidisable Sulphur	%w/w	0.005	-	<0.005	0.042	0.008

Silver, Ag*	ppm	0.1	-	<0.1	<0.1	<0.1
Arsenic, As*	ppm	1	-	28	24	69
Barium, Ba*	ppm	2	-	109	94	101
Beryllium, Be*	ppm	0.1	-	0.6	0.6	1.1
Bismuth, Bi*	ppm	0.1	-	0.3	0.2	0.4
Cadmium, Cd*	ppm	0.1	-	<0.1	<0.1	<0.1
Cobalt, Co*	ppm	0.1	-	9.2	9	7.5
Copper, Cu*	ppm	2	-	24	25	52
Manganese, Mn*	ppm	0.5	-	2810	2210	566
Molybdenum, Mo*	ppm	0.1	-	1.1	2.5	2.8
Nickel, Ni*	ppm	2	-	25	20	45
Lead, Pb*	ppm	1	-	20	50	28
Rubidium, Rb*	ppm	0.05	-	1.18	0.86	11
Antimony, Sb*	ppm	0.1	-	1.9	1.8	4.2
Selenium, Se*	ppm	2	-	<2	<2	2
Tin, Sn*	ppm	0.3	-	0.8	0.5	2.2
Tellurium, Te*	ppm	0.1	-	0.1	0.1	0.3
Thorium, Th*	ppm	0.05	-	5.01	3.19	11.7
Thallium, TI*	ppm	0.1	-	<0.1	<0.1	0.2
Uranium, U*	ppm	0.05	-	2.71	2.5	3.27
Tungsten, W*	ppm	0.1	-	1.7	1.7	1.6
Zinc, Zn*	ppm	5	-	64	76	156
Lithium, Li*	ppm	0.1	-	2.4	1.2	16
Cerium, Ce*	ppm	0.05	-	32.1	22.3	22.6
Cesium, Cs*	ppm	0.05	-	0.1	0.07	0.78
Gallium, Ga*	ppm	0.2	-	6.7	4.7	17.3
Hafnium, Hf*	ppm	0.05	-	1.5	0.85	4.28
Indium, In*	ppm	0.02	-	0.04	0.02	0.13
Lanthanum, La*	ppm	0.05	-	6.93	4.64	8.14
Niobium, Nb*	ppm	0.1	-	3.9	2.4	9.5
Scandium, Sc*	ppm	0.2	-	1.9	1.8	4.2
Tantalum, Ta*	ppm	0.05	-	0.38	0.25	1.03



PE068612 R0

	Sample Number Sample Matrix Sample Date Sample Name		PE068612.051 Soil 13 Jun 2012 Vasse WRD, #20 Bulk 0.0-3.0	PE068612.052 Soil 14 Jun 2012 Vasse WRD, #21 Bulk 0.0-1.5	PE068612.053 Soil 14 Jun 2012 Vasse WRD, #21 Bulk 1.5-3.0	PE068612.054 Soil 14 Jun 2012 Vasse WRD, #22 Bulk 0.0-1.5			
Parameter	Units	LOR	Asbestos						
ICPAES after Four Acid Digest Digest Method: ICP40Q									
Aluminium, Al*	ppm	100	-	25700	16600	55200			
Chromium, Cr*	ppm	10	-	30	20	120			
Iron, Fe*	ppm	100	-	484000	531000	421000			
Strontium, Sr*	ppm	1	-	6	4	5			
Titanium, Ti*	ppm	10	-	1320	820	3170			
Vanadium, V*	ppm	1	-	47	38	170			
Zirconium, Zr*	ppm	1	-	53	30	122			
Calcium, Ca*	ppm	50	-	550	580	300			
Potassium, K*	ppm	100	-	210	160	1580			
Magnesium, Mg*	ppm	20	-	670	740	390			
Sodium, Na*	ppm	50	-	380	460	270			
Phosphorus, P*	ppm	20	-	370	420	250			
Sulphur, S*	ppm	20	-	580	610	350			
Rare Earth Metals in soil by ICPMS Method: II	MS12S								

Mercury, Hg*	ppm	0.1	-	<0.1	<0.1	<0.1
Rhenium, Re*	ppm	0.05	-	<0.05	<0.05	<0.05

Metals in soil by Nitric/Hydrofluoric Acid Digest, ICPMS Method:

Ge*	ppm	0.5	-	4.2	3.8	3.5

ASLP (Australian Standard Leaching Procedure) DI Water Method: AN007

Percentage Solids*	%	-	-	-	-	-
Mass of test sample for extraction	g	-	-	50	50	50
Mass of leaching solution used	g	-	-	1000	1000	1000
Leaching solution used*	No unit	-	-	DI Water	DI Water	DI Water
pH of solids leachate	pH Units	-	-	7.2	7.5	6.0
Conductivity @25C	µS/cm	1	-	120	140	48



	Sampl Sam	e Number ple Matrix	PE068612.051 Soil	PE068612.052 Soil	PE068612.053 Soil	PE068612.054 Soil			
	Sa	mple Date	13 Jun 2012	14 Jun 2012	14 Jun 2012	14 Jun 2012			
	Sam	ple Name	Vasse WRD, #20	Vasse WRD, #21	Vasse WRD, #21	Vasse WRD, #22			
			Bulk 0.0-3.0 Ashestos	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-1.5			
Parameter	Units	LOR							
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Me	thod: AN1	13						
Total Dissolved Solids Dried at 180°C	mg/L	10	-	96	100	36			
Alkalinity in ASLP DI Water Extract Method: A	AN135								
Bicarbonate Alkalinity as HCO3	mg/L	5	-	14	18	<5			
Carbonate Alkalinity as CO3	mg/L	1	-	<1	<1	<1			
Hydroxide Alkalinity as OH	mg/L	5	-	<5	<5	<5			
Total Alkalinity as CaCO3	mg/L	5	-	12	15	<5			
Sulphate in ASLP DI Water Extract Method: A	N275								
Sulphate	mg/L	1	-	19	24	5			
· · · F · · ·	5								
Elucrido by Ion Soloctivo Electrodo in ASLE DI	Water Leachs	to Moth	od: AN141						
	Water Leacha		100. AN 141						
Fluoride by ISE	mg/L	0.1	-	0.6	0.5	<0.1			
Metals in Water (ASLP DI) by ICPOES Method: AN320/AN321									
Calcium, Ca	mg/L	0.2	-	6.0	8.1	1.4			
Magnesium, Mg	mg/L	0.1	-	2.0	2.3	0.4			
Phosphorus, P	mg/L	0.05	-	<0.05	<0.05	<0.05			
Potassium, K	mg/L	0.1	-	0.8	0.6	2.0			
Sodium, Na	mg/L	0.5	-	9.7	11	3.9			
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318								
Aluminium, Al	µg/L	1	-	<1	4	5			
Antimony, Sb	µg/L	1	-	<1	<1	<1			
Arsenic, As	µg/L	1	-	<1	<1	<1			
Barium, Ba	µg/L	1	-	150	140	130			
Bismuth, Bi	µg/L	1	-	<1	<1	<1			
Boron, B	µg/L	5	-	27	22	74			
Cadmium, Cd	µg/L	0.1	-	<0.1	<0.1	<0.1			
Chromium, Cr	µg/L	1	-	<1	<1	2			
Cobalt, Co	µg/L	1	-	<1	<1	<1			
Copper, Cu	µg/L	1	-	<1	<1	<1			
Iron, Fe	µg/L	5	-	<5	15	<5			
Lead, Pb	µg/L	1	-	<1	<1	<1			
Manganese, Mn	µg/L	1	-	<1	60	2			
Molybdenum, Mo	µg/L	1	-	<1	<1	<1			
Nickel, Ni	µg/L	1	-	<1	<1	<1			
Selenium, Se	µg/L	2	-	<2	<2	<2			
Silver, Ag	µg/L	1	-	<1	<1	<1			
Strontium, Sr	µg/L	1	-	49	15	55			
I hallium, TI	µg/L	1	-	<1	<1	<1			
I horium, Th	µg/L	1	-	<1	<1	<1			
lin, Sn	µg/L	1	-	<1	<1	<1			
Uranium, U	µg/L	1	-	<1	<1	<1			
	µg/L	1	-	<1	<1	<1			
۷.۱۱۵, ۲۱۱	µg/L	1 1	-		35	JZ			



	Sample Number Sample Matrix					PE068612.054 Soil
	San	ple Name	13 Jun 2012 Vasse WRD, #20 Bulk 0.0-3.0	14 Jun 2012 Vasse WRD, #21 Bulk 0.0-1.5	14 Jun 2012 Vasse WRD, #21 Bulk 1.5-3.0	14 Jun 2012 Vasse WRD, #22 Bulk 0.0-1.5
Parameter	Units	LOR	Asbestos			
Mercury in ASLP DI Water Extract Method: Al	N311/AN312					
Mercury	mg/L	0.0005	-	<0.0005	<0.0005	<0.0005
Sample Subcontracted Method:						
Sample Subcontracted*	No unit	-	-	-	-	-
Fibre ID in bulk materials Method: AN602 FibreID						
Asbestos Detected	No unit	-	No	-	-	-



PE068612 R0

Descender	Sample Sam Sar Sam	e Number ble Matrix nple Date ple Name	PE068612.056 Soil 14 Jun 2012 Vasse WRD, #25 Bulk 0.0-1.5	PE068612.057 Soil 14 Jun 2012 Vasse WRD, #25 Bulk 1.5-3.0	PE068612.058 Soil 14 Jun 2012 Vasse WRD, #25 Bulk 0.0-3.0 Asbestos	PE068612.059 Soil 14 Jun 2012 Vasse WRD, #26 Bulk 0.0-1.5	PE068612.060 Soil 14 Jun 2012 Vasse WRD, #26 Bulk 1.5-3.0
Parameter	Units	LOR			1000000		
Total Sulfur by LECO Furnace Method: AN20	2						
Total Sulfur*	%w/w	0.005	<0.005	<0.005	-	<0.005	0.057
Maximum Potential Acidity*	kg H2SO4/T	0.5	<0.5	<0.5	-	<0.5	1.7

HCI Extractable S, Ca and Mg in Soil ICP OES Method: AN014

	Acid Soluble Sulphur (SHCI)	%w/w	0.005	0.012	0.013	-	0.013	0.009
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Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	NIL	NIL	-	NIL	NIL
Initial Effervescence*	No unit	-	NO	NO	-	NO	NO
Effervescence on Warming*	No unit	-	NO	NO	-	NO	NO
Titration - Green Colouration?*	No unit	-	NO	NO	-	NO	NO
Titration - Precipitate Formed?*	No unit	-	NO	NO	-	NO	NO
ANC as % CaCO ₃	% CaCO3	0.1	0.5	0.4	-	0.4	0.3
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.5	0.4	-	0.5	0.3
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	4.7	4.0	-	4.2	3.0
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	4.6	3.9	-	4.1	2.9

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	<0.25	-	<0.25	1.5
Net Acid Production Potential	kg H2SO4/T	-400	-5	-4	-	-5	-1
Total Oxidisable Sulphur	%w/w	0.005	<0.005	<0.005	-	<0.005	0.048

Silver, Ag*	ppm	0.1	<0.1	<0.1	-	<0.1	<0.1
Arsenic, As*	ppm	1	32	30	-	57	45
Barium, Ba*	ppm	2	282	141	-	291	157
Beryllium, Be*	ppm	0.1	1	0.8	-	0.9	0.6
Bismuth, Bi*	ppm	0.1	0.4	0.4	-	0.5	0.3
Cadmium, Cd*	ppm	0.1	0.1	<0.1	-	<0.1	<0.1
Cobalt, Co*	ppm	0.1	21.3	17.4	-	11	5.2
Copper, Cu*	ppm	2	54	46	-	27	20
Manganese, Mn*	ppm	0.5	5660	4090	-	3780	2750
Molybdenum, Mo*	ppm	0.1	0.9	1.1	-	1.6	1
Nickel, Ni*	ppm	2	25	31	-	26	14
Lead, Pb*	ppm	1	60	25	-	26	19
Rubidium, Rb*	ppm	0.05	1.62	2.28	-	5.91	3.93
Antimony, Sb*	ppm	0.1	2.5	2.6	-	2.4	1.6
Selenium, Se*	ppm	2	<2	<2	-	3	<2
Tin, Sn*	ppm	0.3	1.1	1	-	1.6	1
Tellurium, Te*	ppm	0.1	0.2	0.2	-	0.3	0.2
Thorium, Th*	ppm	0.05	9.59	8.14	-	12.5	9
Thallium, TI*	ppm	0.1	0.3	0.2	-	0.3	0.1
Uranium, U*	ppm	0.05	3.62	3.32	-	2.87	1.96
Tungsten, W*	ppm	0.1	1.9	1.7	-	1.3	1
Zinc, Zn*	ppm	5	30	34	-	30	23
Lithium, Li*	ppm	0.1	21	17	-	7.9	4.4
Cerium, Ce*	ppm	0.05	246	78.7	-	43.8	29.6
Cesium, Cs*	ppm	0.05	0.14	0.22	-	0.4	0.27
Gallium, Ga*	ppm	0.2	11.3	10.9	-	14.3	9
Hafnium, Hf*	ppm	0.05	2.91	2.44	-	4	2.76
Indium, In*	ppm	0.02	0.05	0.04	-	0.08	0.06
Lanthanum, La*	ppm	0.05	13.8	12.1	-	8.12	5.02
Niobium, Nb*	ppm	0.1	5.2	4.8	-	7.3	4.5
Scandium, Sc*	ppm	0.2	2.5	2.6	-	2.4	1.6
Tantalum, Ta*	ppm	0.05	0.58	0.52	-	0.79	0.49


PE068612 R0

	Sampl Sam Sai Sam	e Number ple Matrix mple Date ple Name	PE068612.056 Soil 14 Jun 2012 Vasse WRD, #25 Bulk 0.0-1.5	PE068612.057 Soil 14 Jun 2012 Vasse WRD, #25 Bulk 1.5-3.0	PE068612.058 Soil 14 Jun 2012 Vasse WRD, #25 Bulk 0.0-3.0	PE068612.059 Soil 14 Jun 2012 Vasse WRD, #26 Bulk 0.0-1.5	PE068612.060 Soil 14 Jun 2012 Vasse WRD, #26 Bulk 1.5-3.0
Parameter	Units	LOR			Asbestos		
ICPAES after Four Acid Digest Digest Method	d: ICP40Q						
Aluminium, Al*	ppm	100	46300	43000	-	45300	29500
Chromium, Cr*	ppm	10	50	80	-	120	120
Iron, Fe*	ppm	100	420000	451000	-	444000	482000
Strontium, Sr*	ppm	1	23	18	-	24	6
Titanium, Ti*	ppm	10	1790	1640	-	2330	1410
Vanadium, V*	ppm	1	62	64	-	120	68
Zirconium, Zr*	ppm	1	81	72	-	114	80
Calcium, Ca*	ppm	50	1100	890	-	1370	540
Potassium, K*	ppm	100	460	510	-	950	570
Magnesium, Mg*	ppm	20	2010	1640	-	930	450
Sodium, Na*	ppm	50	1020	880	-	280	150
Phosphorus, P*	ppm	20	180	250	-	320	270
Sulphur, S*	ppm	20	320	330	-	580	480
Rare Earth Metals in soil by ICPMS Method: I	MS12S						
Mercury, Hg*	ppm	0.1	<0.1	<0.1	-	<0.1	<0.1
Rhenium, Re*	ppm	0.05	<0.05	<0.05	-	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Diges	t, ICPMS M	ethod:					
Ge*	ppm	0.5	6.1	5.1	-	4.0	5.6

ASLP (Australian Standard Leaching Procedure) DI Water Method: AN007

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	-	50	50
Mass of leaching solution used	g	-	1000	1000	-	1000	1000
Leaching solution used*	No unit	-	DI Water	DI Water	-	DI Water	DI Water
pH of solids leachate	pH Units	-	7.2	7.4	-	7.6	7.1
Conductivity @25C	µS/cm	1	240	220	-	130	65



	Sampl Sam Sai Sai	e Number ple Matrix nple Date	PE068612.056 Soil 14 Jun 2012	PE068612.057 Soil 14 Jun 2012	PE068612.058 Soil 14 Jun 2012	PE068612.059 Soil 14 Jun 2012	PE068612.060 Soil 14 Jun 2012
	Sam	pie Name	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0
Parameter	Units	LOR			Asbestos		
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	thod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	168	172	-	96	56
Alkalinity in ASLP DI Water Extract Method: /	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	31	20	-	56	13
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	-	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	-	<5	<5
Total Alkalinity as CaCO3	mg/L	5	26	17	-	46	10
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	25	25	-	12	8
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	te Meth	od: AN141			· · · · · · · · · · · · · · · · · · ·	
Fluoride by ISE	mg/L	0.1	0.7	0.7	-	0.5	0.4
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	7.4	6.4	-	17	5.1
Magnesium, Mg	mg/L	0.1	4.5	3.9	-	2.6	1.2
Phosphorus, P	mg/L	0.05	<0.05	<0.05	-	<0.05	<0.05
Potassium, K	mg/L	0.1	1.6	1.9	-	2.1	0.9
Sodium, Na	mg/L	0.5	28	26	-	5.2	2.7
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318						
Aluminium, Al	μg/L	1	11	26	-	3	13
Antimony, Sb	µg/L	1	<1	<1	-	<1	<1
Arsenic, As	µg/L	1	<1	<1	-	<1	<1
Barium, Ba	µg/L	1	85	73	-	230	210
Bismuth, Bi	µg/L	1	<1	<1	-	<1	<1
Boron, B	µg/L	5	48	29	-	35	72
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	-	<0.1	0.2
Chromium, Cr	µg/L	1	3	<1	-	<1	<1
Cobalt, Co	µg/L	1	<1	<1	-	<1	<1
Copper, Cu	µg/L	1	<1	<1	-	<1	<1
Iron, Fe	µg/L	5	<5	80	-	14	7
Lead, Pb	µg/L	1	<1	<1	-	<1	10
Manganese, Mn	µg/L	1	3	3	-	3	<1
Molybdenum, Mo	µg/L	1	<1	<1	-	<1	<1
Nickel, Ni	µg/L	1	<1	<1	-	<1	<1
Selenium, Se	µg/L	2	<2	<2	-	<2	<2
Silver, Ag	µg/L	1	<1	<1	-	<1	<1
Strontium, Sr	µg/L	1	55	40	-	49	38
Thallium, Tl	µg/L	1	<1	<1	-	<1	<1
Thorium, Th	µg/L	1	<1	<1	-	<1	<1
Tin, Sn	µg/L	1	<1	<1	-	<1	<1
Uranium, U	µg/L	1	<1	<1	-	<1	<1
Vanadium, V	µg/L	1	<1	<1	-	<1	<1
Zinc, Zn	µg/L	1	50	52	-	52	39



	Sample	e Number	PE068612.056	PE068612.057	PE068612.058	PE068612.059	PE068612.060
	Sample Matrix		Soil	Soil	Soil	Soil	Soil
	Sar	nple Date	14 Jun 2012				
	Sam	ple Name	Vasse WRD. #25	Vasse WRD. #25	Vasse WRD. #25	Vasse WRD. #26	Vasse WRD. #26
			Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0
					Ashestos		
Parameter	Units	LOR	-		71000000		
Mercury in ASLP DI Water Extract Method: Al	N311/AN312						
Mercury	mg/L	0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005
Sample Subcontracted Method:							
Sample Subcontracted*	No unit	-	-	-	-	-	-
Fibre ID in bulk materials Method: AN602							
FibreID							
		1					
Asbestos Detected	No unit	-	-	-	No	-	-



PE068612 R0

	Sampl Sam Sai Sam	e Number ple Matrix mple Date ple Name	PE068612.061 Soil 12 Jun 2012 Vasse WRD, #27 Bulk 0.3	PE068612.062 Soil 14 Jun 2012 Vasse WRD, #28 Bulk 0.0-1.5	PE068612.063 Soil 14 Jun 2012 Vasse WRD, #28 Bulk 1.5-3.0	PE068612.064 Soil 14 Jun 2012 Vasse WRD, #29 Bulk 0.0-1.5	PE068612.065 Soil 14 Jun 2012 Vasse WRD, #29 Bulk 1.5-3.0
Parameter	Units	LOR					
Total Sulfur by LECO Furnace Method: AN20	2						
Total Sulfur*	%w/w	0.005	0.039	0.060	0.097	<0.005	0.036
Maximum Potential Acidity*	kg H2SO4/T	0.5	1.2	1.8	3.0	<0.5	1.1
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN	014					
Acid Soluble Sulphur (SHCI)	%w/w	0.005	0.043	0.013	0.072	0.020	0.019

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	NIL	NIL	NIL	NIL	NIL
Initial Effervescence*	No unit	-	NO	NO	NO	NO	NO
Effervescence on Warming*	No unit	-	NO	NO	NO	NO	NO
Titration - Green Colouration?*	No unit	-	NO	NO	NO	NO	NO
Titration - Precipitate Formed?*	No unit	-	NO	NO	YES	YES	YES
ANC as % CaCO ₃	% CaCO3	0.1	0.2	0.2	0.4	0.7	0.2
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.2	0.3	0.5	0.8	0.3
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	2.2	2.5	4.5	7.2	2.5
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	2.2	2.4	4.4	7.0	2.4

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	1.4	0.78	<0.25	0.52
Net Acid Production Potential	kg H2SO4/T	-400	-2	-1	-4	-8	-2
Total Oxidisable Sulphur	%w/w	0.005	<0.005	0.047	0.026	<0.005	0.017

Metals in soil by Four Acid digest, ICPMS Method: IMS40Q

Silver, Ag*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic, As*	ppm	1	26	50	47	33	30
Barium, Ba*	ppm	2	24	257	288	85	398
Beryllium, Be*	ppm	0.1	0.8	0.9	1	0.6	0.9
Bismuth, Bi*	ppm	0.1	0.6	0.6	0.6	0.4	0.5
Cadmium, Cd*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	0.1
Cobalt, Co*	ppm	0.1	9.2	10.7	9.7	12.3	25
Copper, Cu*	ppm	2	16	30	29	27	42
Manganese, Mn*	ppm	0.5	1140	7010	6920	2700	4980
Molybdenum, Mo*	ppm	0.1	1.5	1.2	1.2	0.7	1
Nickel, Ni*	ppm	2	30	26	25	22	37
Lead, Pb*	ppm	1	15	27	29	22	21
Rubidium, Rb*	ppm	0.05	1.17	5.61	4.75	1.46	0.74
Antimony, Sb*	ppm	0.1	3.6	3.1	3.1	2.1	2.6
Selenium, Se*	ppm	2	<2	<2	<2	<2	<2
Tin, Sn*	ppm	0.3	1.3	1.8	2	1.1	1.5
Tellurium, Te*	ppm	0.1	0.2	0.2	0.2	0.1	0.2
Thorium, Th*	ppm	0.05	9.25	15.2	15.1	7.2	11.2
Thallium, TI*	ppm	0.1	<0.1	0.2	0.2	<0.1	<0.1
Uranium, U*	ppm	0.05	2.4	2.77	2.3	2.7	4.17
Tungsten, W*	ppm	0.1	1.5	1.4	1.5	1.5	2.2
Zinc, Zn*	ppm	5	30	33	29	22	22
Lithium, Li*	ppm	0.1	24	8.9	13	8.4	28
Cerium, Ce*	ppm	0.05	31.7	43.4	69.1	58.5	36.2
Cesium, Cs*	ppm	0.05	0.09	0.39	0.28	0.11	0.09
Gallium, Ga*	ppm	0.2	11.9	16.9	19.1	10.3	13.2
Hafnium, Hf*	ppm	0.05	3.19	4.76	5.05	2.24	3.51
Indium, In*	ppm	0.02	0.04	0.1	0.1	0.05	0.07
Lanthanum, La*	ppm	0.05	11.3	7.04	7.73	10.1	19.7
Niobium, Nb*	ppm	0.1	6.3	8.3	9.5	4.8	6.3
Scandium, Sc*	ppm	0.2	3.6	3.1	3.1	2.1	2.6
Tantalum, Ta*	ppm	0.05	0.73	0.9	1.03	0.52	0.71



	Sampl Sam Sar Sarr	e Number ple Matrix mple Date ple Name	PE068612.061 Soil 12 Jun 2012 Vasse WRD, #27 Bulk 0.3	PE068612.062 Soil 14 Jun 2012 Vasse WRD, #28 Bulk 0.0-1.5	PE068612.063 Soil 14 Jun 2012 Vasse WRD, #28 Bulk 1.5-3.0	PE068612.064 Soil 14 Jun 2012 Vasse WRD, #29 Bulk 0.0-1.5	PE068612.065 Soil 14 Jun 2012 Vasse WRD, #29 Bulk 1.5-3.0
Parameter	Units	LOR					
ICPAES after Four Acid Digest Digest Method							
Aluminium, Al*	ppm	100	45600	52700	63200	34000	57300
Chromium, Cr*	ppm	10	30	90	80	70	70
Iron, Fe*	ppm	100	234000	424000	353000	466000	424000
Strontium, Sr*	ppm	1	11	11	26	15	17
Titanium, Ti*	ppm	10	2290	2620	3150	1450	2130
Vanadium, V*	ppm	1	71	118	121	50	77
Zirconium, Zr*	ppm	1	88	133	139	69	99
Calcium, Ca*	ppm	50	390	620	1970	2170	510
Potassium, K*	ppm	100	160	800	850	320	210
Magnesium, Mg*	ppm	20	860	610	860	1240	1250
Sodium, Na*	ppm	50	770	260	670	670	1010
Phosphorus, P*	ppm	20	310	210	190	280	230
Sulphur, S*	ppm	20	610	600	1150	450	460
Rare Earth Metals in soil by ICPMS Method: I	MS12S						
Mercury, Hg*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Rhenium, Re*	ppm	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS M	ethod:					
Ge*	ppm	0.5	2.7	3.9	3.2	4.8	3.6
ASLP (Australian Standard Leaching Procedure	e) DI Water	Method: A	AN007				

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	50	50	50
Mass of leaching solution used	g	-	1000	1000	1000	1000	1000
Leaching solution used*	No unit	-	DI Water				
pH of solids leachate	pH Units	-	6.6	6.6	7.3	8.3	6.6
Conductivity @25C	µS/cm	1	300	100	410	230	160



	Sampi Sam Sai Sam	e Number ple Matrix mple Date ple Name	PE068612.061 Soil 12 Jun 2012 Vasse WRD, #27 Bulk 0.3	PE068612.062 Soil 14 Jun 2012 Vasse WRD, #28 Bulk 0.0-1.5	PE068612.063 Soil 14 Jun 2012 Vasse WRD, #28 Bulk 1.5-3.0	PE068612.064 Soil 14 Jun 2012 Vasse WRD, #29 Bulk 0.0-1.5	PE068612.065 Soil 14 Jun 2012 Vasse WRD, #29 Bulk 1.5-3.0
Parameter	Units	LOR					
Total Dissolved Solids (TDS) in ASLP DI Water	Extract Met	thod: AN1	13				
Total Dissolved Solids Dried at 180°C	mg/L	10	196	68	264	160	164
Alkalinity in ASLP DI Water Extract Method: A	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	<5	11	47	50	<5
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	<5	9	39	41	<5
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	47	12	85	26	22
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	ote Meth	od: AN141 0.6	0.2	0.5	1.0	0.3
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	9.1	5.3	48	17	1.1
Magnesium, Mg	mg/L	0.1	9.2	1.6	6.1	3.9	1.4
Phosphorus, P	mg/L	0.05	0.08	<0.05	<0.05	<0.05	<0.05
Potassium, K	mg/L	0.1	1.9	2.1	4.2	2.6	0.4
Sodium, Na	mg/L	0.5	27	6.5	19	20	24
Trace Metals in ASLP DI Extract by ICPMS M	ethod: AN318						
Aluminium, Al	µg/L	1	35	<1	6	9	4
Antimony, Sb	µg/L	1	<1	<1	<1	<1	<1
Arsenic, As	µg/L	1	<1	<1	<1	<1	<1
Barium, Ba	µg/L	1	100	210	110	130	72
Bismuth, Bi	µg/L	1	<1	<1	<1	<1	<1
Boron, B	µg/L	5	86	74	53	41	72
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	2	<1	<1	<1	1
Cobalt, Co	µg/L	1	<1	<1	<1	<1	<1
Copper, Cu	µg/L	1	<1	<1	<1	<1	<1
Iron, Fe	µg/L	5	78	<5	16	44	50
Lead, Pb	µg/L	1	<1	<1	<1	5	<1
Manganese, Mn	µg/L	1	<1	7	6	2	1
Molybdenum, Mo	µg/L	1	<1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	<1	<1	<1	<1	<1
Selenium, Se	µg/L	2	<2	<2	<2	<2	<2
Silver, Ag	µg/L	1	<1	<1	<1	<1	<1
Strontium, Sr	µg/L	1	150	19	200	72	15
Thallium, TI	µg/L	1	<1	<1	<1	<1	<1
Thorium, Th	µg/L	1	<1	<1	<1	<1	<1
Tin, Sn	µg/L	1	<1	<1	<1	<1	<1
Uranium, U	µg/L	1	<1	<1	<1	<1	<1
Vanadium, V	µg/L	1	<1	<1	<1	<1	<1
∠inc, ∠n	µg/L	1	32	34	27	40	31



	Sampl	e Number	PE068612.061	PE068612.062	PE068612.063	PE068612.064	PE068612.065
	Sam	ple Matrix	Soil	Soil	Soil	Soil	Soil
	Sai	nple Date	12 Jun 2012	14 Jun 2012	14 Jun 2012	14 Jun 2012	14 Jun 2012
	Sam	ple Name	Vasse WRD, #27	Vasse WRD, #28	Vasse WRD, #28	Vasse WRD, #29	Vasse WRD, #29
			Bulk 0.3	Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-1.5	Bulk 1.5-3.0
Parameter	Units	LOR					
Mercury in ASLP DI Water Extract Method: Al	N311/AN312						
Mercury	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sample Subcontracted Method:							
Sample Subcontracted*	No unit	-	-	-	-	-	-
Fibre ID in bulk materials Method: AN602							
FibreID							
Asbestos Detected	No unit	-	-	-	-	-	-



PE068612 R0

	Sample Samj Sar Sam	e Number ble Matrix nple Date ple Name	PE068612.066 Soil 14 Jun 2012 Vasse WRD, #30 Bulk 0.0-1.5	PE068612.067 Soil 14 Jun 2012 Vasse WRD, #30 Bulk 1.5-3.0	PE068612.068 Soil 14 Jun 2012 Vasse WRD, #30 Bulk 0.0-3.0 Asbestos	PE068612.069 Soil Vasse WRD, #31 Bulk 0.0-1.5	PE068612.070 Soil Vasse WRD, #31 Bulk 1.5-3.0
Parameter	Units	LOR			Aspestos		
Total Sulfur by LECO Furnace Method: AN202	2						
Total Sulfur*	%w/w	0.005	0.036	<0.005	-	0.058	<0.005
Maximum Potential Acidity*	kg H2SO4/T	0.5	1.1	<0.5	-	1.8	<0.5
HCI Extractable S, Ca and Mg in Soil ICP OES	Method: AN)14					

Acid Soluble Sulphur (SHCI)	%w/w	0.005	0.028	0.015	-	0.018	0.015

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	NIL	NIL	-	NIL	NIL
Initial Effervescence*	No unit	-	NO	NO	-	NO	NO
Effervescence on Warming*	No unit	-	NO	NO	-	NO	NO
Titration - Green Colouration?*	No unit	-	NO	NO	-	NO	NO
Titration - Precipitate Formed?*	No unit	-	YES	YES	-	YES	YES
ANC as % CaCO ₃	% CaCO3	0.1	0.3	0.5	-	0.4	0.5
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.3	0.6	-	0.5	0.6
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	2.7	5.2	-	4.5	5.4
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	2.7	5.1	-	4.4	5.3

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	0.25	<0.25	-	1.2	<0.25
Net Acid Production Potential	kg H2SO4/T	-400	-2	-6	-	-3	-6
Total Oxidisable Sulphur	%w/w	0.005	0.008	<0.005	-	0.040	<0.005

Metals in soil by Four Acid digest, ICPMS Method: IMS40Q

Silver, Ag*	ppm	0.1	<0.1	<0.1	-	<0.1	<0.1
Arsenic, As*	ppm	1	31	33	-	42	37
Barium, Ba*	ppm	2	104	70	-	76	114
Beryllium, Be*	ppm	0.1	0.8	0.7	-	0.4	0.6
Bismuth, Bi*	ppm	0.1	0.5	0.4	-	0.6	0.7
Cadmium, Cd*	ppm	0.1	<0.1	<0.1	-	<0.1	<0.1
Cobalt, Co*	ppm	0.1	14.8	11.3	-	3	4.5
Copper, Cu*	ppm	2	33	25	-	47	44
Manganese, Mn*	ppm	0.5	3030	2700	-	159	246
Molybdenum, Mo*	ppm	0.1	1	0.9	-	1.6	1.6
Nickel, Ni*	ppm	2	33	22	-	27	30
Lead, Pb*	ppm	1	31	23	-	37	39
Rubidium, Rb*	ppm	0.05	0.72	1.48	-	2.69	3.58
Antimony, Sb*	ppm	0.1	3.2	2.1	-	3.1	3.3
Selenium, Se*	ppm	2	<2	<2	-	3	2
Tin, Sn*	ppm	0.3	1.2	1	-	2.7	2.5
Tellurium, Te*	ppm	0.1	0.2	0.2	-	0.4	0.4
Thorium, Th*	ppm	0.05	10.3	7.1	-	14	13.5
Thallium, TI*	ppm	0.1	0.5	0.1	-	<0.1	<0.1
Uranium, U*	ppm	0.05	4.1	2.78	-	2.27	2.07
Tungsten, W*	ppm	0.1	1.6	1.6	-	2.4	2.3
Zinc, Zn*	ppm	5	22	22	-	42	57
Lithium, Li*	ppm	0.1	17	7.7	-	16	18
Cerium, Ce*	ppm	0.05	28.4	53.2	-	33.4	39.9
Cesium, Cs*	ppm	0.05	0.08	0.1	-	0.23	0.28
Gallium, Ga*	ppm	0.2	11.4	9.4	-	20.8	20.2
Hafnium, Hf*	ppm	0.05	3.11	2.16	-	5.06	5.12
Indium, In*	ppm	0.02	0.06	0.05	-	0.15	0.13
Lanthanum, La*	ppm	0.05	15.1	9.47	-	12.2	13.6
Niobium, Nb*	ppm	0.1	5.1	4.3	-	10.7	10.1
Scandium, Sc*	ppm	0.2	3.2	2.1	-	3.1	3.3
Tantalum, Ta*	ppm	0.05	0.58	0.46	-	1.14	1.08



PE068612 R0

	Sampl	e Number	PE068612.066	PE068612.067	PE068612.068	PE068612.069	PE068612.070
	Sam	ple Matrix	Soil	Soil	Soil	Soil	Soil
	San	npie Date	Vasse WRD #30	Vasse WRD #30	Vasse WRD #30	Rulk 0 0-1 5	Rulk 1 5-3 0
	Gain		Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-3.0	Daile 0.0 1.0	Dank 1.0 0.0
Parameter	Units	LOR			Asbestos		
ICPAES after Four Acid Digest Digest Method	I: ICP40Q						
Aluminium, Al*	ppm	100	45400	34900	-	74100	68300
Chromium, Cr*	ppm	10	50	<10	-	130	130
Iron, Fe*	ppm	100	467000	493000	-	361000	343000
Strontium, Sr*	ppm	1	10	13	-	53	28
Titanium, Ti*	ppm	10	1800	1480	-	3530	3330
Vanadium, V*	ppm	1	69	50	-	137	137
Zirconium, Zr*	ppm	1	88	61	-	150	149
Calcium, Ca*	ppm	50	670	1470	-	1930	2110
Potassium, K*	ppm	100	170	300	-	1060	820
Magnesium, Mg*	ppm	20	1010	1200	-	880	810
Sodium, Na*	ppm	50	630	650	-	500	480
Phosphorus, P*	ppm	20	290	300	-	250	210
Sulphur, S*	ppm	20	610	410	-	1070	600
Rare Earth Metals in soil by ICPMS Method: II	NS12S						
Mercury, Hg*	ppm	0.1	<0.1	<0.1	-	<0.1	<0.1
Rhenium, Re*	ppm	0.05	<0.05	<0.05	-	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS M	ethod:					
Ge*	ppm	0.5	4.1	4.8	-	6.8	5.9

ASLP (Australian Standard Leaching Procedure) DI Water Method: AN007

Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	-	50	50
Mass of leaching solution used	g	-	1000	1000	-	1000	1000
Leaching solution used*	No unit	-	DI Water	DI Water	-	DI Water	DI Water
pH of solids leachate	pH Units	-	6.7	8.3	-	8.2	7.9
Conductivity @25C	µS/cm	1	170	230	-	120	130



	Sampl Sam	e Number ple Matrix	PE068612.066 Soil	PE068612.067 Soil	PE068612.068 Soil	PE068612.069 Soil	PE068612.070 Soil
	Sai	mple Date	14 Jun 2012	14 Jun 2012	14 Jun 2012	Vasse WRD, #31	Vasse WRD, #31
	Sam	ple Name	Vasse WRD, #30	Vasse WRD, #30	Vasse WRD, #30	Bulk 0.0-1.5	Bulk 1.5-3.0
			Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-3.0		
Parameter	Units	LOR	12		Asbestos		
Total Dissolved Solids Dried at 180°C	mg/L	10	144	152	-	104	108
Alkalinity in ASLP DI Water Extract Method: /	AN135						
Bicarbonate Alkalinity as HCO3	mg/L	5	7	61	-	71	74
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	-	<1	<1
Hydroxide Alkalinity as OH	mg/L	5	<5	<5	-	<5	<5
Total Alkalinity as CaCO3	mg/L	5	6	50	-	58	61
Sulphate in ASLP DI Water Extract Method: A	N275						
Sulphate	mg/L	1	36	24	-	5	5
Fluoride by Ion Selective Electrode in ASLP DI	Water Leacha	nte Meth	0.6	0.9		0.7	0.6
	3.						
Metals in Water (ASLP DI) by ICPOES Metho	d: AN320/AN3	321					
Calcium, Ca	mg/L	0.2	7.9	18	-	16	19
Magnesium, Mg	mg/L	0.1	4.2	3.8	-	2.9	2.7
Phosphorus, P	mg/L	0.05	<0.05	<0.05	-	<0.05	<0.05
Potassium, K	mg/L	0.1	0.9	1.6	-	2.2	1.7
Sodium, Na	mg/L	0.5	16	17	-	4.2	4.0
Trace Metals in ASLP DI Extract by ICPMS Me	ethod: AN318						
Aluminium, Al	µg/L	1	40	37	-	<1	69
Antimony, Sb	µg/L	1	<1	<1	-	<1	<1
Arsenic, As	µg/L	1	<1	<1	-	<1	<1
Barium, Ba	µg/L	1	110	110	-	130	220
Bismuth, Bi	µg/L	1	<1	<1	-	<1	<1
Boron, B	µg/L	5	41	44	-	35	58
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	-	<0.1	<0.1
Chromium, Cr	µg/L	1	1	1	-	<1	<1
Cobalt, Co	µg/L	1	<1	<1	-	<1	<1
Copper, Cu	µg/L	1	<1	<1	-	<1	<1
Iron, Fe	µg/L	5	32	28	-	<5	15
Lead, Pb	µg/L	1	<1	<1	-	<1	<1
Manganese, Mn	µg/L	1	<1	<1	-	1	<1
Molybdenum, Mo	µg/L	1	<1	<1	-	<1	<1
Nickel, Ni	µg/L	1	<1	<1	-	<1	<1
Selenium, Se	µg/L	2	<2	<2	-	<2	<2
Silver, Ag	µg/L	1	<1	<1	-	<1	<1
Strontium, Sr	µg/L	1	99	110	-	30	89
Thallium, Tl	µg/L	1	<1	<1	-	<1	<1
Thorium, Th	µg/L	1	<1	<1	-	<1	<1
Tin, Sn	µg/L	1	<1	<1	-	<1	<1
Uranium, U	µg/L	1	<1	<1	-	<1	<1
Vanadium, V	µg/L	1	<1	<1	-	<1	<1
Zinc, Zn	µg/L	1	39	35	-	30	41



	Sample	e Number	PE068612.066	PE068612.067	PE068612.068	PE068612.069	PE068612.070
	Sam	ole Matrix	Soil	Soil	Soil	Soil	Soil
	Sar	nple Date	14 Jun 2012	14 Jun 2012	14 Jun 2012	Vasse WRD, #31	Vasse WRD, #31
	Sam	ple Name	Vasse WRD, #30	Vasse WRD, #30	Vasse WRD, #30	Bulk 0.0-1.5	Bulk 1.5-3.0
			Bulk 0.0-1.5	Bulk 1.5-3.0	Bulk 0.0-3.0		
Parameter	Units	LOR			Asbestos		
Mercury in ASLP DI Water Extract Method: Al	N311/AN312						
Mercury	mg/L	0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005
Comple Subscrittented Methods							
Sample Subcontracted Method:							
Sample Subcontracted*	No unit	-	-	-	-	-	-
Eibro ID in bulk materials Method: AN602							
FIDIe ID III DUIK IIIdterials Methou. AN002							
FibreID							
Asbestos Detected	No unit	-	-	-	No	-	-



PE068612 R0

	Sampl Sam Sam	e Number ple Matrix ple Name	PE068612.071 Soil Vasse WRD, #1 Bulk Surface	PE068612.072 Soil Vasse WRD, #11 Bulk Surface	PE068612.073 Soil Vasse WRD, #14 Bulk Surface	PE068612.074 Soil Vasse WRD, #27 Bulk Surface	PE068612.075 Soil Eyre Pit #10b Bulk			
Parameter	Units	LOR								
Total Sulfur by LECO Furnace Method: AN20	2									
Total Sulfur*	%w/w	0.005	<0.005	<0.005	<0.005	0.039	0.049			
Maximum Potential Acidity*	kg H2SO4/T	0.5	<0.5	<0.5	<0.5	1.2	1.5			
HCI Extractable S, Ca and Mg in Soil ICP OES Method: AN014										
Acid Soluble Sulphur (SHCI)	%w/w	0.005	0.010	0.015	0.039	0.051	0.036			

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: AN212

Fizz Rating Reaction*	No unit	-	NIL	NIL	NIL	NIL	NIL
Initial Effervescence*	No unit	-	NO	NO	NO	NO	NO
Effervescence on Warming*	No unit	-	NO	NO	NO	NO	NO
Titration - Green Colouration?*	No unit	-	NO	NO	NO	NO	NO
Titration - Precipitate Formed?*	No unit	-	YES	YES	YES	YES	No
ANC as % CaCO ₃	% CaCO3	0.1	0.2	0.2	0.2	0.3	0.3
ANC as % CaMg(CO ₃)2	%w/w	0.1	0.3	0.3	0.2	0.3	0.3
Acid Neutralisation Capacity/Neutralisation	kg CaCO3/T	1	2.5	2.5	1.7	2.7	3.2
Acid Neutralisation Capacity/Neutralisation	kg H2SO4/T	1	2.4	2.4	1.7	2.7	3.2

Net Acid Generation Potential (NAGP) Method: AN215

Total Oxidisable Sulphur	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25	0.40
Net Acid Production Potential	kg H2SO4/T	-400	-3	-3	-3	-3	-3
Total Oxidisable Sulphur	%w/w	0.005	<0.005	<0.005	<0.005	<0.005	0.013

Metals in soil by Four Acid digest, ICPMS Method: IMS40Q

Silver, Ag*	ppm	0.1	<0.1	<0.1	0.1	<0.1	0.2
Arsenic, As*	ppm	1	49	44	23	41	14
Barium, Ba*	ppm	2	29	114	68	25	655
Beryllium, Be*	ppm	0.1	0.7	0.4	0.3	0.5	0.6
Bismuth, Bi*	ppm	0.1	0.6	0.5	0.2	0.7	<0.1
Cadmium, Cd*	ppm	0.1	0.1	<0.1	<0.1	<0.1	0.5
Cobalt, Co*	ppm	0.1	43.2	8.1	6.1	11.4	83.7
Copper, Cu*	ppm	2	19	40	18	22	21
Manganese, Mn*	ppm	0.5	13400	1390	1530	1160	67300
Molybdenum, Mo*	ppm	0.1	0.9	1.5	1	2.3	0.6
Nickel, Ni*	ppm	2	63	26	14	37	19
Lead, Pb*	ppm	1	34	26	17	17	25
Rubidium, Rb*	ppm	0.05	0.31	1.25	0.56	0.57	3.33
Antimony, Sb*	ppm	0.1	6.7	4.7	2.5	6.1	1.1
Selenium, Se*	ppm	2	<2	2	<2	<2	<2
Tin, Sn*	ppm	0.3	2.7	2.4	0.9	1.6	0.4
Tellurium, Te*	ppm	0.1	0.3	0.4	0.1	0.3	<0.1
Thorium, Th*	ppm	0.05	8.03	11.1	3.69	9.45	1.43
Thallium, TI*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	2
Uranium, U*	ppm	0.05	3.76	1.83	1.3	2.46	1.1
Tungsten, W*	ppm	0.1	1.8	2.1	1.2	2	0.8
Zinc, Zn*	ppm	5	89	50	42	36	44
Lithium, Li*	ppm	0.1	2.7	4.4	1.3	12	2.5
Cerium, Ce*	ppm	0.05	73.8	34.1	22.5	30	145
Cesium, Cs*	ppm	0.05	0.11	0.16	0.14	0.12	0.18
Gallium, Ga*	ppm	0.2	16	16.3	5	13.9	5.1
Hafnium, Hf*	ppm	0.05	3.33	4.1	1.45	3.6	0.5
Indium, In*	ppm	0.02	0.09	0.13	0.05	0.06	0.02
Lanthanum, La*	ppm	0.05	33.1	10	4.5	13.3	15.4
Niobium, Nb*	ppm	0.1	7.4	7.5	2.6	7.2	1.3
Scandium, Sc*	ppm	0.2	12.5	17.5	7	17.3	5.4
Tantalum, Ta*	ppm	0.05	1.01	0.93	0.35	0.86	0.2



PE068612 R0

	Sample Samı Sam	ample Number PE068612.071 Sample Matrix Soil Sample Name Vasse WRD, #1 Bulk Surface		PE068612.072 Soil Vasse WRD, #11 Bulk Surface	PE068612.073 Soil Vasse WRD, #14 Bulk Surface	PE068612.074 Soil Vasse WRD, #27 Bulk Surface	PE068612.075 Soil Eyre Pit #10b Bulk
Parameter	Units	LOR					
ICPAES after Four Acid Digest Digest Method	: ICP40Q						
Aluminium, Al*	ppm	100	49700	43700	21500	54800	20200
Chromium, Cr*	ppm	10	70	110	90	70	60
Iron, Fe*	ppm	100	534000	494000	584000	318000	462000
Strontium, Sr*	ppm	1	<1	<1	<1	4	46
Titanium, Ti*	ppm	10	2550	2630	810	2610	410
Vanadium, V*	ppm	1	81	114	33	81	13
Zirconium, Zr*	ppm	1	101	119 40		100	13
Calcium, Ca*	ppm	50	540	1090 950		480	510
Potassium, K*	ppm	100	<100	220 130		130	2220
Magnesium, Mg*	ppm	20	1000	1090 420		1040	1390
Sodium, Na*	ppm	50	100	310 160		900	1070
Phosphorus, P*	ppm	20	200	240	340	420	270
Sulphur, S*	ppm	20	320	500	740	660	690
Rare Earth Metals in soil by ICPMS Method: II	MS12S						
Mercury, Hg*	ppm	0.1	<0.1	<0.1	<0.1	<0.1	0.6
Rhenium, Re*	ppm	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals in soil by Nitric/Hydrofluoric Acid Digest	, ICPMS Me	ethod:					
Ge*	ppm	0.5	2.1	5.3	6.2	3.1	2.7
ASLP (Australian Standard Leaching Procedure) DI Water	Method: /	AN007				
Percentage Solids*	%	-	-	-	-	-	-
Mass of test sample for extraction	g	-	50	50	50	50	50
Mass of leaching solution used	g	-	1000	1000	1000	1000	1000

DI Water

6.8

51

DI Water

6.9

52

DI Water

6.6

130

DI Water

6.7

320

DI Water

6.7

170

No unit

pH Units

µS/cm

-

-

1

Leaching solution used*

pH of solids leachate

Conductivity @25C



Build Surface Build Surface Build Surface Build Surface Build Surface Build Surface Parameter UND LOB E Total Dissolved Solds (TOS) III ASLP DI Water Extract Method: AN113 Total Dissolved Solds Cord at the" mpit 10 22 40 76 169 100 Allalinsky in ASLP DI Water Extract Method: AN135 E 97 6 -0 6 Chelowek Maxing wtCOS mpit 1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0		Sampl Sam	ole Number PE068612.071 PE068612.072 nple Matrix Soil Soil mple Name Vasse WRD #1 Vasse WRD #11		PE068612.073 Soil	PE068612.075 Soil Evro Bit #10b						
Permeter Lote Total Dissolved Solds (TOS) in ASLP DI Water Extract Method: AN13 Teal Dissolved Solds (TOS) in ASLP DI Water Extract Method: AN13 Decrement Advances (TOS) in ASLP DI Water Extract Method: AN13 Decrement Advances (TOS) model 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 <td< td=""><td></td><td>Jain</td><td>ipie Name</td><td>Bulk Surface</td><td>Bulk Surface</td><td>Bulk Surface</td><td>Bulk Surface</td><td>Bulk</td></td<>		Jain	ipie Name	Bulk Surface	Bulk Surface	Bulk Surface	Bulk Surface	Bulk				
Parameter Units Units Total Dissolved Solids (TDS) in ASLP DI Water Extract Method: AN135 Exating in ASLP DI Water Extract Method: AN135 Bearonte / Marring us (EG2) mgl. 0 12 17 0 -6 0 Canassaa Alashing at CG2 mgl. 0 12 17 0 -6 0 Standowske Alashing at CG2 mgl. 0 12 17 0 -6 -6 Canassaa Alashing at CG2 mgl. 0 12 17 0 -6 -6 Suphate in ASLP DI Water Extract Method: AN141 -6 -6 -6 0 Fluoride by Ion Selective Electrode in ASLP DI Water Exaschate Method: AN141 -7 4 46 42 -2 Fluoride by Ion Selective Electrode in ASLP CI Water Exaschate Method: AN141 -7 -6 6.0 -6 -7 6.0 0.3 0.4 1.4 1.7 4.0 42 -2 MagazianNg mgqL 0.1 1.3 1.4												
Total Dissolved Solds (Tots) in ASLP DI Water Extract Method: AN139 Example Solds Dired at 199°C mgl 10 22 40 78 168 160 Alkalinity in ASLP DI Water Extract Method: AN139 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Parameter	Units	LOR									
Tual Tual Number Model Shale at MOC mpt 10 32 40 76 169 109 Alkalinity in ASLP DI Water Extract Method: ANT35	Total Dissolved Solids (TDS) in ASLP DI Water	Extract Me	thod: AN1	13								
Akalanity in ASLP DI Water Extract Magit 5 12 17 6 45 6 Constant Akality as CO3 mgL 1 41 41 41 41 Topos Akality as CO3 mgL 5 45 45 45 45 Topos Akality as CO3 mgL 5 45 45 45 45 Topos Akality as CO3 mgL 1 7 4 45 45 45 Stappate mgL 0 1 7 4 45 46 41 Constant as Co2000 mgL 0 1 1 0.4 0.5 0.5 0.5 Constant as Co2000 mgL 0.1 1.5 1.4 1.7 0.5 0.5 0.5 Constant (ASLP DI Water CaSLP DI Water CasLP Water CaSLP DI Water CaSLP Mater CaSLP DI Water CaSLP 1.5 1.4 1.7 1.9 1.9 Caseano So mgL 0.8 40.5 40.5 40.5 40.5 Mapetet	Total Dissolved Solids Dried at 180°C	mg/L	10	32	40	76	168	100				
Bioactoria Maining as 1003 mpL 5 12 17 6 43 6 Debrance Maining as C01 mpL 5 43 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 45 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 46 4	Alkalinity in ASLP DI Water Extract Method:	AN135										
Cubrane Maining and Column (and	Bicarbonate Alkalinity as HCO3	mg/L	5	12	17	6	<5	6				
Injegozova Analinity as C4003 mgL 6 45 45 45 46 45 Suphate in ASLP DI Water Extract Method: ANZ75 Subhate mgL 1 7 4 45 40 21 Fluoride by Ion Selective Electrode in ASLP DI Water Leachate Method: ANI11 0.4 0.3 0.5 0.3 Metals in Water (ASLP DI) by ICPOES mgL 0.1 1.1 0.4 0.3 0.5 0.3 Metals in Water (ASLP DI) by ICPOES Method: ANI20/AN321 0.1 1.6 1.4 1.7 11 4.9 Metals in Water (ASLP DI) by ICPOES Method: ANI20/AN321 0.5 0.5 0.5 0.5 0.65 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.01 0.0	Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1				
Total Abaliny as CACO3 myL 5 9 14 <5 <5 <5 Suphate in ASLP DI Water Extract Method: AVZ75 4 45 46 21 Fluoride by Ion Solective Electrode in ASLP DI Water Lacehate Method: AVL11 0.4 0.1 1.1 0.4 0.3 0.6 0.3 Method: AVL20 Method: AVL20 Method: AVL20 Mage 0.1 1.1 0.4 0.3 0.6 0.3 Method: AVL20 Method: AVL20 Method: Method: AVL20 Colspan= Method: AVL20 Method: AVL20 Method: AVL20 Method: AVL20 Colspan= Method: AVL20 Method: AVL20 Method: AVL20 Method: AVL20 Method: AVL20 Method: AVL20 Method: AVL20 Method: AVL20 Method: AVL20 Method: AVL20 Method: AVL20 <td <="" colspan="4" td=""><td>Hydroxide Alkalinity as OH</td><td>mg/L</td><td>5</td><td><5</td><td><5</td><td><5</td><td><5</td><td><5</td></td>	<td>Hydroxide Alkalinity as OH</td> <td>mg/L</td> <td>5</td> <td><5</td> <td><5</td> <td><5</td> <td><5</td> <td><5</td>				Hydroxide Alkalinity as OH	mg/L	5	<5	<5	<5	<5	<5
Suppate in ASLP DI Water Extract March I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I	Total Alkalinity as CaCO3	mg/L	5	9	14	<5	<5	<5				
Buphate mgl. 1 7 4 45 49 21 Fluoride by Ion Selective Electrode in ASLP DI Water Leachate Method: AN1411 Pluoride by Ion Selective Electrode in ASLP DI Water Leachate Method: AN141 Pluoride by Ion Selective Electrode in ASLP DI Water Leachate Method: AN140 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Sulphate in ASLP DI Water Extract Method: AN275											
Florido by los Selective Electrode in ASLP DI Water Leachest Method: XM141 Ivuerie by I8E ng L 0.1 1.1 0.4 0.3 0.5 0.3 Charles by I8E ng L 0.2 4.8 3.8 19 8.5 4.2 Magnetium, Rich ng L 0.2 4.8 3.8 19 8.5 4.2 Magnetium, Rich ng L 0.05 <0.05	Sulphate	mg/L	1	7	4	45	48	21				
Flucide by ISE mpL 0.1 1.1 0.4 0.3 0.5 0.3 Metals in Water (ASLP DI) by ICPOES Method: AN320/AN321 Cathun, Ca mgL 0.2 4.6 3.8 19 8.5 4.2 Magnesium, Mg mgL 0.1 1.5 1.4 1.7 11 4.9 Propapora, P mgL 0.06 <-0.05	Fluoride by Ion Selective Electrode in ASLP DI Water Leachate Method: AN141											
Mates in Water (ASLP DI) by ICPOES Method: NASDAMASEL Caloim, Ca mg/L 0.2 4.8 3.8 19 5.5 4.2 Magnesim, Mg mg/L 0.1 1.5 1.4 1.7 11 4.9 Phosphora, P mg/L 0.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.05 40.	Fluoride by ISE	mg/L	0.1	1.1	0.4	0.3	0.5	0.3				
Calcum, Ca mpL 0.2 4.6 3.8 19 8.5 4.2 Magnesium, Mg mpL 0.1 1.5 1.4 1.7 11 4.0 Prespherins, P mpL 0.1 0.3 0.35 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 -0.05 <td< td=""><td>Metals in Water (ASLP DI) by ICPOES Metho</td><td>od: AN320/AN3</td><td>321</td><td></td><td></td><td></td><td></td><td></td></td<>	Metals in Water (ASLP DI) by ICPOES Metho	od: AN320/AN3	321									
Magnesium, Mg mgL 0.1 1.5 1.4 1.7 11 4.9 Phosphoux, P mgL 0.05 <0.05	Calcium, Ca	mg/L	0.2	4.6	3.8	19	8.5	4.2				
Phosphore, P mgL 0.05 <	Magnesium, Mg	mg/L	0.1	1.5	1.4	1.7	11	4.9				
Production Na mg/L 0.1 0.3 0.3 0.4 1.8 1.1 Sodium, Na mg/L 0.5 1.5 2.5 1.7 31 19 Trace Metals in ASLP DI Extract by ICPMS Method: AN318 Aurinium, Al µg/L 1 <1	Phosphorus, P	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Sodum, Na mgL 0.5 1.6 2.5 1.7 31 19 Trace Metals in ASLP DI Extract by ICPMS Method: AN318 Autimium, Al µgL 1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1	Potassium, K	mg/L	0.1	0.3	0.3	0.4	1.8	1.1				
Trace Metals in ASLP DI Extract by ICPMS Method: AM318 Auminium, Al µgL 1 <1	Sodium, Na	mg/L	0.5	1.5	2.5	1.7	31	19				
Aurninum, Alµg/L1 $<$ f1 $<$ f1<	Trace Metals in ASLP DI Extract by ICPMS	lethod: AN318										
Antimony, Sbµg/L1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1 <td>Aluminium, Al</td> <td>µg/L</td> <td>1</td> <td><1</td> <td><1</td> <td><1</td> <td><1</td> <td>7</td>	Aluminium, Al	µg/L	1	<1	<1	<1	<1	7				
Assenic, As μgL 1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1	Antimony, Sb	µg/L	1	<1	<1	<1	<1	<1				
Baium, Ba μg/L 1 58 100 130 120 71 Bismuth, Bi μg/L 1 <1	Arsenic, As	µg/L	1	<1	<1	<1	<1	<1				
Bismuth, BiµpL1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1	Barium, Ba	µg/L	1	58	100	130	120	71				
Boron, Bµg/L52118<5<526Cadmum, Cdµg/L0.1<0.1	Bismuth, Bi	µg/L	1	<1	<1	<1	<1	<1				
Cadmum, Cd µg/L 0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1	Boron, B	µg/L	5	21	18	<5	<5	26				
Chromium, Cr $\mu g/L$ 1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1<1	Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Cobalt, Co µg/L 1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1	Chromium, Cr	µg/L	1	<1	<1	<1	<1	<1				
Copper, Cu µg/L 1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1	Cobalt, Co	µg/L	1	<1	<1	<1	<1	<1				
Iron, Fe $\mu g/L$ 5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5<5 <td>Copper, Cu</td> <td>µg/L</td> <td>1</td> <td><1</td> <td><1</td> <td><1</td> <td><1</td> <td><1</td>	Copper, Cu	µg/L	1	<1	<1	<1	<1	<1				
Lead, Pb µg/L 1 2 2 <1 <1 2 Manganese, Mn µg/L 1 3 3 <1	Iron, Fe	µg/L	5	<5	<5	<5	<5	30				
Manganese, Mn LpgL 1 3 3 <1 1 4 Molybdenum, Mo µg/L 1 <1	Lead, PD	µg/L	1	2	2	<1	<1	2				
Molyodenum, Mo LgL 1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1	Manganese, Mn	µg/L	1	3	3	<1	<1	4				
Hunce, ne HypL i K1		µg/L	1	<1	<1 <1	<1	~1	<1				
Selenium, set µy/L 2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2	Polonium So	µg/L	1	<1	<1 	~1	~1	~1				
Image Image <thimage< th=""> <thi< td=""><td>Silver Ag</td><td>µg/L</td><td>4</td><td>~~</td><td>~2</td><td>-2</td><td>-2</td><td>-2</td></thi<></thimage<>	Silver Ag	µg/L	4	~~	~2	-2	-2	-2				
Description pg/L i OP	Strontium Sr	µg/L	1	L C		<1	150	30				
Instruction, if it is a structure in the structure	Thallium TI	µg/L	1	پس د	عد د1	<1	<1	<1				
Instant, In Image: Pyr. I Image: Ima		µg/L	1	-1	-1	<1	<1	<1				
Import Import<	Tin Sn	µg/L	1	~1 ~1	21	<1	<pre><1</pre>	<1				
Vanadium, V µg/L 1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1	Uranium. U	μg/L μα/l	1	<1	<1	<1	<1	<1				
Zinc, Zn µg/L 1 43 39 43 46 50	Vanadium, V	µa/L	1	<1	<1	<1	<1	<1				
	Zinc, Zn	μg/L	1	43	39	43	46	50				



	Sample Number Sample Matrix Sample Name		PE068612.071 Soil Vasse WRD, #1 Bulk Surface	PE068612.072 Soil Vasse WRD, #11 Bulk Surface	PE068612.073 Soil Vasse WRD, #14 Bulk Surface	PE068612.074 Soil Vasse WRD, #27 Bulk Surface	PE068612.075 Soil Eyre Pit #10b Bulk
Parameter	Units	LOR					
Mercury in ASLP DI Water Extract Method: Al	N311/AN312						
Mercury	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sample Subcontracted Method:							
Sample Subcontracted*	No unit	-	-	-	-	-	-
Fibre ID in bulk materials Method: AN602 FibreID			1	1			
Asbestos Detected	No unit	-	-	-	-	-	-



PE068612 R0

MB blank results are compared to the Limit of Reporting LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample. DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

Acid Neutralising Capacity or Neutralisation Potential(ANC/NP) Method: ME-(AU)-[ENV]AN212

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Fizz Rating Reaction*	LB044685	No unit	-	NIL		
	LB044687	No unit	-	NIL		
	LB044688	No unit	-	NIL		
	LB044689	No unit	-	NIL		
Initial Effervescence*	LB044685	No unit	-	No		
	LB044687	No unit	-	NO		
	LB044688	No unit	-	NO		
	LB044689	No unit	-	NO		
Effervescence on Warming*	LB044685	No unit	-	No		
	LB044687	No unit	-	NO		
	LB044688	No unit	-	NO		
	LB044689	No unit	-	NO		
Titration - Green Colouration?*	LB044685	No unit	-	No		
	LB044687	No unit	-	NO		
	LB044688	No unit	-	NO		
	LB044689	No unit	-	NO		
Titration - Precipitate Formed?*	LB044685	No unit	-	No		
	LB044687	No unit	-	NO		
	LB044688	No unit	-	NO		
	LB044689	No unit	-	NO		
ANC as % CaCO ₃	LB044685	% CaCO3	0.1	<0.1		
	LB044687	% CaCO3	0.1	<0.1		
	LB044688	% CaCO3	0.1	<0.1		
	LB044689	% CaCO3	0.1	<0.1		
ANC as % CaMg(CO ₃)2	LB044685	%w/w	0.1	<0.1		
	LB044687	%w/w	0.1	<0.1		
	LB044688	%w/w	0.1	<0.1		
	LB044689	%w/w	0.1	<0.1		
Acid Neutralisation Capacity/Neutralisation Potential	LB044685	kg CaCO3/T	1	<1.0	9 - 15%	NA
	LB044687	kg CaCO3/T	1	<1.0	0 - 10%	NA
	LB044688	kg CaCO3/T	1	<1.0	0 - 6%	NA
	LB044689	kg CaCO3/T	1	<1.0	0 - 21%	NA
Acid Neutralisation Capacity/Neutralisation Potential kg H₂SO₄/t	LB044685	kg H2SO4/T	1	<1.0	9 - 15%	NA
	LB044687	kg H2SO4/T	1	<1.0	0 - 10%	NA
	LB044688	kg H2SO4/T	1	<1.0	0 - 6%	NA
	LB044689	kg H2SO4/T	1	<1.0	0 - 21%	NA



PE068612 R0

MB blank results are compared to the Limit of Reporting LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample. DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

Alkalinity in ASLP DI Water Extract Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Bicarbonate Alkalinity as HCO3	LB045276	mg/L	5	<5	
	LB045897	mg/L	5	<5	
	LB046072	mg/L	5	<5	
Carbonate Alkalinity as CO3	LB045276	mg/L	1	<1	
	LB045897	mg/L	1	<1	
	LB046072	mg/L	1	<1	
Hydroxide Alkalinity as OH	LB045276	mg/L	5	<5	
	LB045897	mg/L	5	<5	
	LB046072	mg/L	5	<5	
Total Alkalinity as CaCO3	LB045276	mg/L	5	<5	2 - 14%
	LB045897	mg/L	5	<5	0 - 3%
	LB046072	mg/L	5	<5	0 - 2%

ASLP (Australian Standard Leaching Procedure) DI Water Method: ME-(AU)-[ENV]AN007

Parameter	QC	Units	LOR	MB
	Reference			
Mass of test sample for extraction	LB044168	g	-	50
	LB044169	g	-	50
	LB044171	g	-	50
	LB044282	g	-	50
Mass of leaching solution used	LB044168	g	-	1000
	LB044169	g	-	1000
	LB044171	g	-	1000
	LB044282	g	-	1000
Leaching solution used*	LB044168	No unit	-	DI Water
	LB044169	No unit	-	DI Water
	LB044171	No unit	-	DI Water
	LB044282	No unit	-	DI Water
pH of solids leachate	LB044168	pH Units	-	5.9
	LB044169	pH Units	-	5.6
	LB044171	pH Units	-	5.3 - 5.5
	LB044282	pH Units	-	5.5
Conductivity @25C	LB044168	µS/cm	1	<1
	LB044169	µS/cm	1	2 - 8
	LB044171	µS/cm	1	<1 - 4
	LB044282	µS/cm	1	<1



PE068612 R0

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample. DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: the absolute difference of the two results divided by the average of the two results as a percentage. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

Fluoride by Ion Selective Electrode in ASLP DI Water Leachate Method: ME-(AU)-[ENV]AN141

Parameter	QC	Units	LOR	MB	DUP %RPD	LCS	MS
	Reference					%Recovery	%Recovery
Fluoride by ISE	LB045249	mg/L	0.1		0 - 2%	95 - 96%	
	LB045620	mg/L	0.1	<0.1	0 - 2%	95%	
	LB045909	mg/L	0.1	<0.1	0 - 3%	94 - 96%	84 - 90%
HCI Extractable S. Ca and Mg in Soil ICP OES Mothod: ME (ALI) [ENVIAN(14						

oil ICP OES Met 10d: ME-(AU)-[ENV]AN014

Parameter	QC Poforonco	Units	LOR	MB	DUP %RPD	LCS
	Itererence					/orcecovery
Acid Soluble Sulphur (SHCI)	LB044676	%w/w	0.005	<0.005	3 - 4%	NA
	LB044677	%w/w	0.005	<0.005	0%	NA
	LB044678	%w/w	0.005	<0.005	1 - 3%	NA
	LB044680	%w/w	0.005	<0.005	1%	NA

Mercury in ASLP DI Water Extract Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	МВ	DUP %RPD
Mercury	LB045268	mg/L	0.0005	<0.0005	0%
	LB045496	mg/L	0.0005	<0.0005	0%

Metals in Water (ASLP DI) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Calcium, Ca	LB045269	mg/L	0.2	<0.2	1 - 4%
	LB045494	mg/L	0.2	<0.2	5 - 15%
Magnesium, Mg	LB045269	mg/L	0.1	<0.1	1 - 4%
	LB045494	mg/L	0.1	<0.1	2%
Phosphorus, P	LB045269	mg/L	0.05	<0.05	0%
	LB045494	mg/L	0.05	<0.05	0%
Potassium, K	LB045269	mg/L	0.1	<0.1	1 - 3%
	LB045494	mg/L	0.1	<0.1	3%
Sodium, Na	LB045269	mg/L	0.5	<0.5	2%
-	LB045494	mg/L	0.5	<0.5	1 - 8%

Sulphate in ASLP DI Water Extract Method: ME-(AU)-[ENV]AN275

Parameter	QC	Units	LOR	MB	DUP %RPD
	Reference				
Sulphate	LB045730	mg/L	1	<1	1 - 6%
	LB046126	mg/L	1	<1	8 - 14%



PE068612 R0

MB blank results are compared to the Limit of Reporting LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample. DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: the absolute difference of the two results divided by the average of the two results as a percentage. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

Total Dissolved Solids (TDS) in ASLP DI Water Extract Method: ME-(AU)-[ENV]AN113

Parameter	QC	Units	LOR	MB	DUP %RPD	LCS
	Reference					%Recovery
Total Dissolved Solids Dried at 180°C	LB045319	mg/L	10	<10	10 - 17%	NA
	LB045530	mg/L	10	<10	33 - 50%	NA
	LB046178	mg/L	10	<10	4 - 8%	NA
Total Sulfur by LECO Furnace Method: ME-(AU)-[ENV]AN202		·				

Parameter	QC	Units	LOR	MB	DUP %RPD	LCS
	Reference					%Recovery
Total Sulfur*	LB044305	%w/w	0.005	<0.005	0 - 20%	100 - 114%

Trace Metals in ASLP DI Extract by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC	Units	LOR	MB	DUP %RPD
	Reference	1		l	
Aluminium, Al	LB045270	µg/L	1	<1	0 - 4%
	LB045757	µg/L	1	<1	12 - 27%
	LB046050	µg/L	1	<1	6 - 20%
Antimony, Sb	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Arsenic, As	LB045270	µg/L	1	<1	0 - 32%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Barium, Ba	LB045270	µg/L	1	<1	5 - 10%
	LB045757	µg/L	1	<1	7 - 19%
	LB046050	µg/L	1	<1	3 - 8%
Bismuth, Bi	LB045270	µg/L	1	<1	0%
	LB045757	μg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Boron, B	LB045270	μg/L	5	<5	0 - 12%
	LB045757	µg/L	5	<5	10 - 23%
	LB046050	µg/L	5	<5	0 - 5%
Cadmium, Cd	LB045270	µg/L	0.1	<0.1	0%
	LB045757	µg/L	0.1	<0.1	5 - 194%
	LB046050	µg/L	0.1	<0.1	0%
Chromium, Cr	LB045270	µg/L	1	<1	0 - 3%
	LB045757	µg/L	1	<1	0 - 3%
	LB046050	µg/L	1	<1	0 - 5%
Cobalt, Co	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Copper, Cu	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Iron, Fe	LB045270	µg/L	5	<5	7 - 12%
	LB045757	µg/L	5	<5	3 - 34%
	LB046050	µg/L	5	<5	0 - 69%
Lead, Pb	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	176 - 190%
	LB046050	µg/L	1	<1	0 - 30%
Manganese, Mn	LB045270	µg/L	1	<1	0 - 39%
	LB045757	µg/L	1	<1	0 - 4%
	LB046050	µg/L	1	<1	0 - 87%
Molybdenum, Mo	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Nickel, Ni	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%



PE068612 R0

MB blank results are compared to the Limit of Reporting LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample. DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: the absolute difference of the two results divided by the average of the two results as a percentage. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

Trace Metals in ASLP DI Extract by ICPMS Method: ME-(AU)-[ENV]AN318 (continued)

				MB	DUP %RPD
Selenium, Se	LB045270	µg/L	2	<2	0%
	LB045757	µg/L	2	<2	0%
	LB046050	µg/L	2	<2	0%
Silver, Ag	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Strontium, Sr	LB045270	µg/L	1	<1	0 - 6%
	LB045757	µg/L	1	<1	0 - 5%
	LB046050	µg/L	1	<1	1 - 3%
Thallium, TI	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Thorium, Th	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Tin, Sn	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Uranium, U	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Vanadium, V	LB045270	µg/L	1	<1	0%
	LB045757	µg/L	1	<1	0%
	LB046050	µg/L	1	<1	0%
Zinc, Zn	LB045270	µg/L	1	<1	0 - 14%
	LB045757	µg/L	1	<1	0 - 30%
	LB046050	µg/L	1	<1	7 - 12%



METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN007	Contaminants of interest in a waste material are leached out of the waste with a selected leaching solution under controlled conditions. The ratio of sample to extraction fluid is 100 g to 2 L (1 to 20 by mass). The concentration of each contaminant of interest is determined in the leachate by appropriate methods after separation from the sample by filtering.
AN014	This method is for the determination of soluble sulphate (SO4-S) by extraction with hydrochloric acid. Sulphides should not react and would normally be expelled. Sulphur is determined by ICP.
AN113	Total Dissolved Solids: A well-mixed filtered sample of known volume is evaporated to dryness at 180°C and the residue weighed. Approximate methods for correlating chemical analysis with dissolved solids are available. Reference APHA 2540 C.
AN135	Alkalinity (and forms of) by Titration: The sample Extract is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN202	The sulphur is oxidised to sulphur dioxide gas in a tube furnace using oxygen to aid the oxidation process. The evolved sulphur dioxide is measure by an infra red cell. The infra red cell output is calibrated against the value of a known standard sample to provide the total sulphur value of the unknown sample.
AN202	Maximum Potential Acidity of the sample is a calculation that expresses the total sulphur result as kg of H2SO4/tonne.
AN212	Samples are initially evaluated to determine the strength of reagents needed using a `'fizz' test. Samples are then subjected to an excess of hydrochloric acid followed by alkaline back titration to pH 7. Results are expressed in kg H2SO4/tonne or Kg CaCO3/tonne after correction for moisture content if applicable.
AN215	This is purely a calculation based on results obtained from Total Sulphur, Sulphate Method, and Acid Neutralisation Capacity Method (ME-(AU)-[ENV]AN212).
AN275	Sulphate by Aquakem DA from ASLP DI Water Extract: Sulphate is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulphate concentration in the sample. Reference APHA 4500-SO42 Internal reference AN275.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.



METHOD SUMMARY

PE068612 R0

METHOD	METHODOLOGY SUMMARY	
AN602	Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic `clues`, which provide a reasonable degree of certainty, dispersion staining is a mandatory `clue` for positive identification. If sufficient `clues` are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.	

FOOTNOTES

- IS Insufficient sample for analysis.
- LNR Sample listed, but not received. * This analysis is not covered by the scope of accreditation.
- Performed by outside laboratory.
- LOR Limit of Reporting
- $\uparrow\downarrow$ Raised or Lowered Limit of Reporting

Samples analysed as received. Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-11.pdf

QFH

QFL

NVL

QC result is above the upper tolerance

QC result is below the lower tolerance

The sample was not analysed for this analyte

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.au.sgs.com/terms_and_conditions_au. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Not Validated

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

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Client:	SGS
Job number:	12_0735
Sample:	12_0735_01
Client ID:	PE068612.001 eyre pit 1
Date:	01/08/12
Analysis:	Semi-quantitative mineralogical analysis by x-ray diffraction (XRD)

Sample Preparation

The sample was supplied to Microanalysis Australia as particulates in a bag. A representative sub –sample was removed and lightly ground such that 90% was passing 20 μ m. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non crystalline) material will add to the background. The search match software used was Eva or Sleve+. An up to date ICDD card set was used. The x-ray source was copper radiation.

No standards were used in the quantification process. The concentrations were calculated using the peak area integration method where the area of the 100 % peak for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for some attention to be paid to preferred orientation but is limited in considering substitution and lattice strain.

Summary

The phases are listed in order of interpreted concentration:

Mineral phase	Concentration (%w/w)	ICDD match probability
Goethite (Fe +3 O (O H))	47.4%	good
Kaolinite-1A (Al2 Si2 O5 (O H)4)	33.4%	good
Hematite (Fe1.85 H0.45 O3)	19.2%	good





Client:	SGS
Job number:	12_0735
Sample:	12_0735_03
Client ID:	PE068612.003 eyre pit 3
Date:	01/08/12
Analysis:	Semi-quantitative mineralogical analysis by x-ray diffraction (XRD)

Sample Preparation

The sample was supplied to Microanalysis Australia as particulates in a bag. A representative sub –sample was removed and lightly ground such that 90% was passing 20 μ m. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non crystalline) material will add to the background. The search match software used was Eva or Sleve+. An up to date ICDD card set was used. The x-ray source was copper radiation.

No standards were used in the quantification process. The concentrations were calculated using the peak area integration method where the area of the 100 % peak for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for some attention to be paid to preferred orientation but is limited in considering substitution and lattice strain.

Summary

The phases are listed in order of interpreted concentration:

Mineral phase	Concentration (%w/w)	ICDD match probability
Hematite (Fe2 O3)	56.5%	good
Goethite (Fe +3 O (O H))	35.8%	good
Pseudorutile (Fe9.48 Mn0.54		
Ti19.32 O50)	7.7%	low





Client:	SGS
Job number:	12_0735
Sample:	12_0735_06
Client ID:	PE068612.010 eyre pit 10
Date:	01/08/12
Analysis:	Semi-quantitative mineralogical analysis by x-ray diffraction (XRD)

Sample Preparation

The sample was supplied to Microanalysis Australia as particulates in a bag. A representative sub –sample was removed and lightly ground such that 90% was passing 20 μ m. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non crystalline) material will add to the background. The search match software used was Eva or Sleve+. An up to date ICDD card set was used. The x-ray source was copper radiation.

No standards were used in the quantification process. The concentrations were calculated using the peak area integration method where the area of the 100 % peak for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for some attention to be paid to preferred orientation but is limited in considering substitution and lattice strain.

Summary

The phases are listed in order of interpreted concentration:

Mineral phase	Concentration (%w/w)	ICDD match probability
Goethite (Fe +3 O (O H))	51.0%	good
Hematite, syn (Fe1.957 O3)	25.1%	good
Kaolinite (Al2 O3 ·2 Si O2 ·2 H2 O)	23.9%	good





Client:	SGS
Job number:	12_0735
Sample:	12_0735_05
Client ID:	PE068612.008 eyre pit 8
Date:	01/08/12
Analysis:	Semi-quantitative mineralogical analysis by x-ray diffraction (XRD)

Sample Preparation

The sample was supplied to Microanalysis Australia as particulates in a bag. A representative sub –sample was removed and lightly ground such that 90% was passing 20 μ m. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non crystalline) material will add to the background. The search match software used was Eva or Sleve+. An up to date ICDD card set was used. The x-ray source was copper radiation.

No standards were used in the quantification process. The concentrations were calculated using the peak area integration method where the area of the 100 % peak for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for some attention to be paid to preferred orientation but is limited in considering substitution and lattice strain.

Summary

The phases are listed in order of interpreted concentration:

Mineral phase	Concentration (%w/w)	ICDD match probability		
Kaolinite-1A (Al2 Si2 O5 (O H)4)	86.5%	good		
Goethite, syn (Fe O (O H))	13.5%	good		





Client:	SGS
Job number:	12_0735
Sample:	12_0735_04
Client ID:	PE068612.006 eyre pit 6
Date:	01/08/12
Analysis:	Semi-quantitative mineralogical analysis by x-ray diffraction (XRD)

Sample Preparation

The sample was supplied to Microanalysis Australia as particulates in a bag. A representative sub –sample was removed and lightly ground such that 90% was passing 20 μ m. Grinding to this size helps eliminate preferred orientation.

Analysis

Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non crystalline) material will add to the background. The search match software used was Eva or Sleve+. An up to date ICDD card set was used. The x-ray source was copper radiation.

No standards were used in the quantification process. The concentrations were calculated using the peak area integration method where the area of the 100 % peak for each mineral phase is summed and the relative percentages of each phase calculated based on the relative contribution to the sum. This method allows for some attention to be paid to preferred orientation but is limited in considering substitution and lattice strain.

Summary

The phases are listed in order of interpreted concentration:

Mineral phase	Concentration (%w/w)	ICDD match probability
Quartz (Si O2)	46.5%	good
Goethite (Fe +3 O (O H))	38.8%	good
Hematite, syn (Fe1.987 O3)	14.8%	good









- CLIENT DETAILS		LABORATORY DETAI	LS
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Project	FMG Christmas Creek Ref 1296580100	SGS Reference	PE068612 R0
Order Number	(Not specified)	Report Number	0000044859
Samples	73	Date Reported	21/08/2012 12:21:08
		Date Received	25 Jun 2012

COMMENTS

The document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

Fibre Identification performed by Approved Identifier Karin White.

Four Acid Digest Metals subcontracted to SGS Perth Minerals, 10 Reid Rd Newburn WA, NATA Accreditation Number 1936, WM142946 and WM142962

XRD subcontracted to Microanalysis Australia, Suite 6 642 Albany Hwy Victoria Park WA 6100, Job NUmber 12_0735

ASLP DI AI, Cd and Pb replicate RPD for sample "Vasse WRD, #9 Bulk 1.5-3.0" was outside acceptance criteria due to sample heterogeneity. ASLP DI Zn, Pb and Ba replicate RPD for sample "Vasse WRD, #15 Bulk 0.0-1.5" was outside acceptance criteria due to sample heterogeneity. ASLP DI Pb replicate RPD for sample "Vasse WRD, #18 Bulk 0.0-1.5" was outside acceptance criteria due to sample heterogeneity. ASLP DI Mn replicate RPD for sample "Vasse WRD, #25 Bulk 0.0-1.5" was outside acceptance criteria due to sample heterogeneity. ASLP DI AI and Fe replicate RPD for sample "Eyre Pit #10b Bulk" was outside acceptance criteria due to sample heterogeneity.

SIGNATORIES

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RESULTS -								
Fibre ID in bull	< materials					Method	AN602	
Laboratory Reference	Client Reference	Matrix	Sample Description	Date Sampled	Fibre Identification			Est.%w/w
PE068612.022	Vasse WRD, #5 Bulk 0.0-3.0 Asbestos	Soil	rocks, soil, 495g	13 Jun 2012	No Asbestos Detected Organic Fibres Detected			
PE068612.033	Vasse WRD, #10 Bulk 0.0-3.0 Asbestos	Soil	rocks, soil, 620g	13 Jun 2012	No Asbestos Detected Organic Fibres Detected			
PE068612.042	Vasse WRD, #15 Bulk 0.0-3.0 Asbestos	Soil	rocks, soil, 710g	13 Jun 2012	No Asbestos Detected Organic Fibres Detected			
PE068612.051	Vasse WRD, #20 Bulk 0.0-3.0 Asbestos	Soil	rocks, soil, 860g	13 Jun 2012	No Asbestos Detected Organic Fibres Detected			
PE068612.058	Vasse WRD, #25 Bulk 0.0-3.0 Asbestos	Soil	rocks, soil, 470g	14 Jun 2012	No Asbestos Detected Organic Fibres Detected			
PE068612.068	Vasse WRD, #30 Bulk 0.0-3.0 Asbestos	Soil	rocks, soil, 680g	14 Jun 2012	No Asbestos Detected Organic Fibres Detected			



METHOD SUMMARY

PE068612 R0

- METHOD

METHODOLOGY SUMMARY

Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic `clues`, which provide a reasonable degree of certainty, dispersion staining is a mandatory `clue` for positive identification. If sufficient `clues` are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.

FOOTNOTES

Amosite Chrysotile Crocidolite Amphiboles

- Brown Asbestos White Asbestos
- Blue Asbestos
 - Amosite and/or Crocidolite

NA - I LNR - I

- Not Analysed
- Listed, Not Required
- Not Accredited

Insofar as is technically feasible, this report is consistent with the analytical reporting recommendations in the Western Australia Department of Health Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia-May 2009.

Sampled by the client.

Where reported: 'Asbestos Detected': Asbestos detected by polarized light microscopy, including dispersion staining. Where reported: 'No Asbestos Found': No Asbestos Found by polarized light microscopy, including dispersion staining. Where reported: 'UMF Detected': Mineral fibres of unknown type detected by polarized light microscopy, including dispersion staining. Confirmation by another independent analytical technique may be necessary.

Even after disintegration it can be very difficult, or impossible, to detect the presence of asbestos in some asbestos -containing bulk materials using polarised light microscopy. This is due to the low grade or small length or diameter of asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-11.pdf

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.au.sgs.com/terms_and_conditions_au. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This test report shall not be reproduced, except in full.





APPENDIX C

Geotechnical Laboratory Data and Testpit Logs
	TETRA TECH TEST PIT LOGGING SHEET									
				TP No:	L					
				Project No: 129	5580100					
Cliente Fontano	Matal Casar C	huistana Carala		Sheet 1 o	f 1	2012				
Client: Fortesc	ue Metal Group C	nristmas Creek			Date Started: 12 June 2012					
Project Title: F	MG Christmas Cre	ek, Vasse Waste Ro	ock Dump Geotech	nnical Investigation	Dated Completed: 12 June 2012					
Location: Vass	e WRD, Christmas	Creek		1	Logged By: S Berry					
EA	STING	NORT	HING	RL(m)	-					
				Material Description		DCP				
Dej	pth(M)	Graphic Log	Classification		Moisture Condition		Sample Type & ID	General Comments		
				strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm	Sample Type & ID General Comments Genera			
From	То									
				Moderately sorted GRAVEL, subangular to subrounded,						
				coarse, some cobbles, minor boulders, trace silt and clay,						
				red/brown, dry: 80% porous Hematite shale, 20%						
0	0.5		Fill	Kaolinite, trace Goethite & Chert						
		<u> </u>								
					1					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No:	2				
				Project No: 129	6580100				
Client: Fortes	ue Metal Group C	hristmas Creek		Sneet 10	Date Started: 14 June	2012			
Drojost Titler F	MG Christmas Cro	ok Vassa Wasta Br	ack Dump Cootack	neical Investigation	Dated Completed: 14	luno 2012			
Project Inde. P		ek, vasse waste ki	ock Dump Geoteci						
Location: Vass	e WRD, Christmas	Creek		D1/)	Logged By: S Berry				
EA	511NG	NUKI	HING	KL(M)	-				
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP	Sample Type & ID	General Comments	
From	То			strength, son type, particle size, plasticity, moisture state, colour		Blows/100mm			
0	3		Natural / Alluvium	Well sorted silty (50%) GRAVEL (50%), subangular to rounded, fine to medium, red/brown, dry: 60% Goethite (medium), 40% Goethite (friable)					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No:	3				
				Project No: 129	5580100				
Client: Fortes	cue Metal Group (hristmas Creek		Sneet 1 0	Date Started: 13 June	2012			
Project Title: I	FMG Christmas Cre	eek, Vasse Waste R	ock Dump Geotec	nnical Investigation	Dated Completed: 13 June 2012				
Location: Vas	se WRD, Christmas	Creek			Logged By: S Berry				
E/	ASTING	NORT	THING	RL(m)					
De	epth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments	
From	То			strength, son type, particle size, plasticity, moisture state, colour		blows/100mm			
) 1		Fill	Poorly sorted gravelly SILT, angular to subrounded, fine to coarse, some cobbles, red/brown, dry: 70% Shale, 30% Goethite					
1			Fill	60% Shale, 40% Goethite					
2	2 3		Fill	30% Shale, 20% Goethite, 50% Chert					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No:	1				
				Project No: 129	5580100				
Client: Fortes	cue Metal Group (°hristmas Creek		Sneet 1 o	Date Started: 13 June	2012			
Droject Title: F	MG Christmas Cro	ak Vassa Wasta B	ock Dump Cootool	heical Investigation	Dated Completed: 12	luno 2012			
rioject intie. r			ock Dump Geoteci						
Location: Vass	E WRD, Christmas	Creek		Pl (m)	Logged By: S Berry				
E#	STING	NORI	ning		-				
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP	Sample Type & ID	General Comments	
From	From To			strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm			
	10		Fill	Poorly sorted silty GRAVEL, angular to subrounded, fine to medium, some cobbles up to 30cm, red/brown, dry: 50% Martite (medium), 50% Goethite (hard)					
1	. 2		Fill	Moderately sorted gravelly SILT, angular to subrounded, medium to coarse, some cobbles up to 15cm, red/brown, dry: 40% Goethite (medium), 40% Goethite (friable) 20% Shale					
2	3		Fill	40% Goethite (friable), 40% Martite (friable), 2-% Goethite (medium)					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No:	5				
				Project No: 129	5580100				
Cliente Featers	Matal Casura	Chaistana Carali		Sheet 1 o	1 Data Charled 12 luna	2012			
Client: Fortest	ue Metal Group	LINISTIMAS Creek							
Project Title: F	MG Christmas Cro	eek, Vasse Waste R	ock Dump Geotech	hnical Investigation	Dated Completed: 13	June 2012			
Location: Vass	e WRD, Christma	Creek		T	Logged By: S Berry				
EA	STING	NOR	THING	RL(m)					
						1			
_				Material Description		DCP			
Dej	pth(M)	Graphic Log	Classification		Moisture Condition		Sample Type & ID	General Comments	
				strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm			
From	То								
				Poorly sorted GRAVEL (50%), angular to subrounded,					
				medium to coarse, some cobbles (20%) and silt (30%),					
				red/brown, dry: 40% Martite (hard), 30% Martite					
0	1		Fill	(friable), 30% Goethite (friable)					
				Poorly sorted GRAVEL (40%), angular to subrounded, fine					
				to coarse, some cobbles (40%) and silt (20%), red/brown,					
				dry: 60% Goethite (friable), 30% glassy Goethite, 10%					
1	2		Fill	Goethite (medium)					
				Poorly sorted GRAVEL (60%), angular to subrounded,					
				medium to coarse, some cobbles (30%), minor silt (10%),					
				red/brown, dry: 80% Goethite (medium), 20% Martite					
2	3		Fill	(medium)					
1	1	1	1		1	1	1		

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No:	6				
				Project No: 129	6580100				
Cliente Featers	Matal Casura	Chuistana Caralı		Sheet 1 o	f 1	2012			
Client: Fortesc	cue Metal Group	LINISTMAS CREEK			Date Started: 13 June	2012			
Project Title: F	MG Christmas Cr	eek, Vasse Waste R	ock Dump Geotec	hnical Investigation	Dated Completed: 13	June 2012			
Location: Vass	e WRD, Christma	s Creek		-	Logged By: S Berry				
EA	STING	NOR	THING	RL(m)	_				
			1					I	
				Material Description		DCP			
De	pth(M)	Graphic Log	Classification		Moisture Condition		Sample Type & ID	General Comments	
				strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm			
From	То								
				Poorly sorted GRAVEL (40%), angular to subrounded, fine					
				to medium, some cobbles (20%) and silt (40%).					
				red/brown, dry: 60% glassy Goethite, 30% Goethite					
0	1		Fill	(hard) 10% Martite (medium)					
				Poorly sorted GRAVEL (40%) angular to subrounded fine					
				to medium, some cobbles (40%) and silt (20%).					
				red/brown, dry: 60% glassy Goethite, 30% Goethite					
1	2		Fill	(hard) 10% Martite (medium)					
				Moderately sorted silty (40%) GRAVEL (50%) angular to					
				subrounded, fine to coarse, minor cobbles (10%).					
				red/brown, dry: 50% Goethite (medium), 40% Goethite					
2	3		Fill	(friable), 10% Shale					
		1							

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No:	7				
				Project No: 129	6580100				
Client: Fortes	cue Metal Group ([°] hristmas Creek		Sheet 1 0	T 1 Date Started: 14 June	2012			
Droject Titles	MC Christmas Cr	ak Vassa Wasta B	osk Dump Cootos	heical Investigation	Dated Completed: 14 June 2012				
Project Inte. P		eek, vasse waste k	ock Dump Geoteci		Dated Completed: 14	Julie 2012			
Location: Vass	e WRD, Christmas	Creek		D ((a))	Logged By: S Berry				
EA	STING	NOK	HING	кцт)	-1				
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments	
From	From To								
C			Fill	Moderately sorted GRAVEL (30%), angular to subrounded, medium to coarse, cobbles (55%) up to 40cm, trace to minor silt (15%), red/brown, dry: 70% Shale, 30% Goethite (friable)					
1	. 2		Fill	Poorly sorted GRAVEL (30%), angular to subrounded, fine to coarse, cobbles (50%) up to 50cm, some to minor silt (20%), red/brown, dry: 70% glassy Goethite, 30% Shale					
2	: 3		Fill	Moderately sorted GRAVEL (30%), angular to subrounded, fine to coarse, cobbles (65%) up to 80cm, trace silt (5%), red/brown, dry: 100% glassy Goethite					

	TETRA TECH TEST PIT LOGGING SHEET									
				TP No:	8					
				Project No: 129	6580100					
Client: Fortess	we Metal Group (hristmas Crook		Sheet 1 c	of 1	2012				
chent: Fortest										
Project Title: F	MG Christmas Cre	ek, Vasse Waste R	ock Dump Geoteci	hnical Investigation	Dated Completed: 13	npietea: 13 June 2012				
Location: Vass	e WRD, Christmas	Creek			Logged By: S Berry					
EA	STING	NORT	HING	RL(m)	-					
De	pth(M)	Graphic Log	Classification	Material Description strength, Soil type, particle size, plasticity, moisture state, colour	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments		
From	То					-				
0	1		Fill	Moderately sorted GRAVEL (40%), angular to subrounded, medium to coarse, cobbles (50%) up to 50cm, minor silt (10%), red/brown, dry: 50% Martite (medium), 40% Goethite (medium), 10% Goethite (friable)						
1	2		Fill	Moderately sorted GRAVEL (40%), angular to subrounded, medium to coarse, some cobbles (30%) up to 20cm & silt (30%), red/brown, dry: 70% Goethite (medium), 30% Goethite (friable)						
2	3		Fill	Moderately sorted GRAVEL (30%), angular to subrounded, medium to coarse, cobbles (65%) up to 70cm, trace silt (5%), red/brown, dry: 70% Goethite (hard), 30% Goethite (friable)						

TETRA TECH TEST PIT LOGGING SHEET								
				TP No:	9			
				Project No: 129	6580100			
Client: Fortess	we Metal Group (Christmas Crook		Sheet 1 o	f 1 Data Startadu 13 luna	2012		
chent. Fortest	ue wetai droup (LIITISLIIIdS CIEEK			Date Started. 15 Julie	2012		
Project Title: F	MG Christmas Cre	eek, Vasse Waste R	ock Dump Geotech	hnical Investigation	Dated Completed: 13	June 2012		
Location: Vass	e WRD, Christmas	Creek		T	Logged By: S Berry			
EA	STING	NOR	HING	RL(m)	_			
			1					
Day	oth(M)			Material Description		DCP		
De	pen(ivi)	Graphic Log	Classification		Moisture Condition		Sample Type & ID	General Comments
				strength, Soil type, particle size, plasticity, moisture state, colour	CH TEST PT LOGGING SHEET TP No:9 The contract of 1 The started is lane 2012 The started is lane			
From	То		-					
				Poorly sorted silty GRAVEL, angular to subrounded, fine				
0	1		Fill	to coarse, some cobbles, red/brown, dry: 80% glassy				
0	-							
1	2		Fill	50% glassy Goethite, 30% Goethite, 20% Chert				
2	3		Fill	50% glassy Goethite, 30% Goethite, 20% Chert				

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 1	10				
				Project No: 129	6580100				
Client: Fortes	cue Metal Group (hristmas Creek		Sheet 10	Date Started: 13 June	2012			
Project Title: F	MG Christmas Cre	ek. Vasse Waste R	ock Dumn Geotech	nnical Investigation	Dated Completed: 13	lune 2012			
	o WPD Christmas	Crook			Logged Du C Perry				
EDCATION: VASS	STING	NOR	THING	RL(m)					
					-1				
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP	Sample Type & ID	General Comments	
From	То			strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm			
0	1		Fill	Poorly sorted silty GRAVEL, angular to subrounded, fine to coarse, some cobbles up to 20cm, red/brown, dry: 50% Martite (medium), 30% Goethite (medium), 20% Goethite (friable)					
1	. 2		Fill	50 Goethite (friable), 30 Goethite (medium), 20% glassy Goethite					
2	3		Fill	SILT, some moderately sorted gravel, medium to coarse, some cobbles up to 10cm, red/brown, dry: 20% Goethite (friable), 80% Shale					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 1	1				
				Project No: 129	5580100				
				Sheet 1 o	f1				
Client: Forteso	cue Metal Group C	hristmas Creek			Date Started: 12 June	2012			
Project Title: F	MG Christmas Cre	ek, Vasse Waste Ro	ock Dump Geotech	nnical Investigation	Dated Completed: 12	June 2012			
Location: Vass	e WRD, Christmas	Creek			Logged By: S Berry				
EA	STING	NORT	HING	RL(m)					
						-			
				Material Description		DCP			
Depth(M)									
		Graphic Log	Classification		Moisture Condition	DI (100	Sample Type & ID	General Comments	
-	-			strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm			
From	10								
				Poorly sorted GRAVEL, angular to subrounded, medium					
				to coarse, some cobblles and small boulders, trace silt					
				and clay, red/brown, dry: 60% Hematite shale, 20%				Minor salt precipitae on surface of some	
0	0.5		Fill	Goethite shale, 20% Chert, minor Kaolinite				clasts, minor upslope vegetation	

TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 1	2			
				Project No: 129	5580100			
				Sheet 1 o	1	2012		
Client: Forteso	cue Metal Group G	nristmas Creek			Date Started: 13 June	2012		
Project Title: F	MG Christmas Cre	ek, Vasse Waste R	ock Dump Geotech	hnical Investigation	Dated Completed: 13	June 2012		
Location: Vass	e WRD, Christmas	Creek		T	Logged By: S Berry			
EA	STING	NORT	HING	RL(m)	-			
						1		
				Material Description		DCP		
De	pth(M)	Graphic Log	Classification		Moisture Condition		Sample Type & ID	General Comments
	1			strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm		
From	То							
				Poorly sorted GRAVEL (60%), angular to subrounded, fine				
				to coarse, some cobbles (20%) & silt (20%), red/brown,				
0	1		Fill	dry: 80% Goethite (hard), 20% glassy Goethite				
				Moderately sorted GRAVEL (40%), angular to				
				subrounded, medium to coarse, cobbles (40%) up to				
				25cm, some to minor silt (20%), red/brown, dry: 40%				
1	2		F:11	Goethite (medium), 30% Hematite (hard), 30% glassy				
1	2		FIII	Goethite				
				Moderately sorted GRAVEL (40%), angular to				
				subrounded, medium to coarse, some cobbles (30%) up				
				(medium) 30% Martite (medium) 40% Goethite				
2	3		Fill	(medium)				
1							1	

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 1	13				
				Project No: 129	6580100				
Client: Fortes	cue Metal Group (hristmas Creek		Sneet 1 0	T 1 Date Started: 13 June	2012			
Droject Title: F	MC Christmas Cro	ok Vassa Wasta B	ock Dump Cootool	heical Investigation	Datad Campleted: 12 June 2012				
Project Intie. P		ek, vasse waste k	ock Dump Geoteci		Dated Completed: 13 June 2012				
Location: Vass	e WRD, Christmas	Creek		244	Logged By: S Berry				
EA	STING	NOR	HING	кцт)	-				
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments	
From	From To					blows/100mm			
C			Fill	Moderately sorted GRAVEL (25%), angular to subrounded, medium to coarse, cobbles (45%) up to 30cm, some to minor silt (30%), red/brown, dry: 50% Martite (hard), 50% Shale					
1	. 2		Fill	Moderately sorted GRAVEL (20%), angular to subrounded, medium to coarse, cobbles (50%) up to 20cm, some to minor silt (30%), red/brown, dry: 50% glassy Goethite, 50% Goethite (friable)					
2	2 3		Fill	Poorly sorted GRAVEL (20%), angular to subrounded, medium to coarse, cobbles (50%) up to 20cm, some silt (30%), red/brown, dry: 70% Goethite (friable), 30% Shale					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 1	4				
				Project No: 129	6580100				
Client: Fortesc	ue Metal Group C	hristmas Creek		Sheet 1 o	Date Started: 12 June	2012			
Project Title: F	MG Christmas Cre	ek, Vasse Waste R	ock Dump Geotech	nnical Investigation	Dated Completed: 12	June 2012			
Location: Vass	e WRD, Christmas	Creek			Logged By: S Berry				
EA	STING	NORT	HING	RL(m)					
Dej	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP	Sample Type & ID	General Comments	
From To				strength, soli type, particle size, plasticity, moisture state, colour		Blows/100mm			
0	0.5		Fill	Poorly sorted GRAVEL, subangular to subrounded, medium to coarse, some cobbles & boulders, trace silt, red/brown, dry: 60% Hematite shale, 30% Goethite, 10% Martite				Minor upslope vegetation	

	TETRA TECH TEST PIT LOGGING SHEET										
						TP No: 1	5				
						Project No: 129	5580100				
Client	Fortesc	ue Metal Groun	Christ	mas Creek		Sheet 1 o	Date Started: 13 June	2012			
Droios	+ Title: Ef	AG Christmas C	rook V	lassa Wasta Ba	sk Dump Cootosk	nical Investigation					
Projec	t nue. ri		ieek, v	vasse waste no	ck Dump Geoteci		Dated Completed. 15	June 2012			
Locatio	on: Vasse	WRD, Christma	as Cree	ek		D1()	Logged By: S Berry				
	EAS			NORT	HING	KL(M)	-				
	Dep	th(M)	6	Graphic Log	Classification	Material Description	Moisture Condition	DCP	Sample Type & ID	General Comments	
Fr	om	То	_			strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm			
						Poorly sorted GRAVEL (40%), angular to subrounded, fine					
	0		1		Fill	to coarse, some cobbles (20%) up to 50cm & silt (40%), red/brown, dry: 50% Goethite (medium), 50% Goethite (friable)					
	1		2		Fill	Poorly sorted GRAVEL (40%), angular to subrounded, fine to coarse, cobbles (40%) up to 70cm, some to minor silt (20%), red/brown, dry: 40% Goethite (friable), 40% Goethite (hard), 20% Hematite (hard)					
	2		3		Fill	Poorly sorted GRAVEL (30%), angular to subrounded, fine to coarse, cobbles (40%) up to 70cm & silt (30%), red/brown, dry: 30% Goethite (medium), 30% Goethite (friable), 40% Martite (hard)					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 1	6				
				Project No: 129	5580100				
Cliente Fontano	Matal Carrier	Chaistana Caral		Sheet 1 o	f 1	2012			
Client: Fortesc	ue Metal Group C	Infistmas Creek							
Project Title: F	MG Christmas Cre	ek, Vasse Waste R	ock Dump Geotech	nnical Investigation	Dated Completed: 14	June 2012			
Location: Vass	e WRD, Christmas	Creek		1	Logged By: S Berry				
EA	STING	NORT	THING	RL(m)	-				
						202			
De	pth(M)			Material Description		DCP			
		Graphic Log	Classification		Moisture Condition		Sample Type & ID	General Comments	
From	То	-		strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm			
FIOIII	10								
				Describe sector of CDAN(EL (400%) sector sector sector description					
				Poorly sorted GRAVEL (40%), angular to subrounded, fine					
0	1		Fill	red/brown, dry: 100% glassy Goethite					
				Dearly control CDAN(EL (EQ)) angular to subrounded fine					
				to coarse, cobbles (40%) up to 50cm, trace to minor silt					
				(10%), red/brown, moist to wet: 70% glassy Goethite.					
1	2		Fill	30% Goethite (hard)					
				Moderately control CRAVEL (EQS() apprulate					
				subrounded medium to coarse cobbles (30%) up to					
				40cm, some to minor silt (20%), red/brown, moist to wet,					
				trace fibrous organic material at base: 50% Goethite					
2	3		Fill	(medium), 50% Goethite (friable)					
					 				
1	1	1	1	1	1	1			

	TETRA TECH TEST PIT LOGGING SHEET										
						TP No: 1	8				
						Project No: 129	5580100				
Client: I	Fortesci	ie Metal Groun	Christ	tmas Creek		Sheet 1 o	Date Started: 13 June	2012			
Droject	Title: EA	AC Christmas C	chilist	Vasca Wasta Ba	ak Dump Cootos	herical Investigation					
Project			еек, ч		Jock Dump Geoteci		Dated Completed. 15				
Location	1: Vasse	WRD, Christma	s Cree	ek		P1(m)	Logged By: S Berry				
	EAS			NORT			-				
	Dep	th(M)		Graphic Log	Classification	Material Description	Moisture Condition	DCP	Sample Type & ID	General Comments	
			_			strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm			
Fro	m	То									
	0		1		Fill	Moderately sorted GRAVEL (50%), angular to subrounded, medium to coarse, some cobbles (20%) up to 80cm & silt (30%), red/brown, dry: 30% Goethite (medium), 30% glassy Goethite, 40% Shale					
	1		2		Fill	Poorly sorted GRAVEL (40%), angular to subrounded, fine to coarse, cobbles (40%) up to 50cm, some to minor silt (20%), red/brown, dry: 60% Goethite (friable), 40% Goethite (medium)					
	2		3		Fill	Poorly sorted GRAVEL (50%), angular to subrounded, fine to coarse, cobbles (30%) up to 50cm & silt (30%), red/brown, dry: 80% Goethite (friable), 20% glassy Geothite					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 1	9				
				Project No: 129	6580100				
Client: Fortes	cue Metal Group (Christmas Creek		Sneet 1 o	T 1 Date Started: 13 June	2012			
Droject Title: F	MG Christmas Gr	ak Vassa Wasta B	lask Dump Costos	hnical Investigation	Dated Completed: 12	June 2012			
Project Intie. P		eek, vasse vvaste n	ock Dump Geoteci	nnical investigation					
Location: Vass	e WRD, Christmas	s Creek		D ((a))	Logged By: S Berry				
EA	STING	NOR	IHING	KL(M)	-				
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments	
From	То					5104371001111			
C			Fill	Poorly sorted GRAVEL (40%), angular to subrounded, fine to coarse, some cobbles (30%) up to 40cm & silt (30%), red/brown, dry: 50% Hematite (hard), 50% Goethite (hard)					
1	. 2		Fill	Poorly sorted GRAVEL (30%), angular to subrounded, fine to coarse, cobbles (40%) up to 90cm, some silt (30%), red/brown, dry: 60% Goethite (medium), 30% Goethite (friable), 10% glassy Goethite					
2	2 3		Fill	Poorly sorted GRAVEL (50%), angular to subrounded, fine to coarse, cobbles (30%) up to 50cm & silt (20%), red/brown, dry: 50% Goethite (hard), 40% Hematite (hard), 10% Goethite (friable)					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 3	6				
				Project No: 129	6580100				
Client: Fortes	cue Metal Group (hristmas Creek		Sneet 1 o	T 1 Date Started: 13 June	2012			
Broject Title: E	MG Christmas Cro	ok Vasso Wasto P	ock Dump Gootoch	hnical Investigation	Dated Completed: 12	luno 2012			
		Creak							
FA		NOR	THING	BI (m)	Logged By: 5 Berry				
					-				
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments	
From	То								
0) 1		Fill	Poorly sorted GRAVEL (40%), angular to subrounded, fine to coarse, cobbles (40%) up to 70cm, boulders up to 1m, some silt (20%), red/brown, dry: 30% glassy Goethite, 70% Goethite (friable)					
1	. 2		Fill	60% Shale, 30% glassy Goethite, 10% Goethite (medium)					
2	3		Fill	60% Shale, 30% glassy Goethite, 10% Goethite (medium)					

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 2	1				
				Project No: 129	6580100				
Client: Fortes	une Motel Group (hristmas Crook		Sheet 1 o	f 1 Data Startadi 14 luna	2012			
Client: Fortes	cue Metal Group C	Infistmas Creek			Date Started: 14 June	2012			
Project Title: F	MG Christmas Cre	ek, Vasse Waste R	ock Dump Geotech	nnical Investigation	Dated Completed: 14	June 2012			
Location: Vass	e WRD, Christmas	Creek			Logged By: S Berry				
EA	STING	NOR	THING	RL(m)	-				
De	pth(M)	Graphic Log	Classification	Material Description strength, Soil type, particle size, plasticity, moisture state, colour	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments	
From	То					-			
C	1		Fill	Poorly sorted GRAVEL (70%), angular to subrounded, fine to coarse, cobbles (10%) up to 30cm, some to minor silt (20%), red/brown, dry: 80% Goethite (hard), 20% glassy Goethite					
1	. 2		Fill	Poorly sorted GRAVEL (80%), angular to subrounded, fine to coarse, cobbles (5%) up to 15cm, minor silt (15%), red/brown, dry: 80% glassy Goethite, 20% Hematite (hard)					
2	3		Fill	Well sorted GRAVEL (80%), angular to subrounded, medium to coarse, cobbles (5%) up to 20cm, minor silt (15%), red/brown, dry: 80% glassy Goethite, 20% Hematite (hard)					

	TETRA TECH TEST PIT LOGGING SHEET										
	TP No: 22										
				Project No: 129	6580100						
Client: Fortess	rue Metal Group (hristmas Creek		Sheet 1 c	Date Started: 14 Juna	2012					
Draiget Titler 5	MC Christmas C	ak Vassa Wast- D	ook Dump Costl	heical Investigation	Dated Complete - 14	Luna 2012					
Froject Title: F	wid christmas Cre	en, vasse waste K	ock Dump Geoteci	nnicai nivesiigdliUli	Dated Completed: 14	June 2012					
Location: Vass	e WRD, Christmas	Creek		PI (m)	Logged By: S Berry						
EA	UNITE	NORT		KL(M)	-1						
Dej	pth(M)	Graphic Log	Classification	Material Description strength, Soil type, particle size, plasticity. moisture state. colour	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments			
From To		1									
0	1		Natural / Alluvium	Moderately sorted GRAVEL (40%), subangular to subrounded, medium to coarse, cobbles (40%) up to 20cm, some to minor silt (20%), red/brown, dry: 100% glassy Goethite							
1				Inferred Bedrock							

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 2	5				
				Project No: 129	6580100				
				Sheet 1 c	f1	2012			
Client: Fortes	cue Metal Group C	hristmas Creek			Date Started: 14 June 2012				
Project Title: F	MG Christmas Cre	ek, Vasse Waste R	ock Dump Geotech	nnical Investigation	Dated Completed: 14	June 2012			
Location: Vass	e WRD, Christmas	Creek	******		Logged By: S Berry				
EA	STING	NORT	HING	RL(m)					
				Material Description		DCP			
De	pth(M)	Graphic Log	Classification		Maisture Condition		Comple Tune & ID	Concrol Commonte	
		Graphic Log	Classification	strength Soil type particle size plasticity moisture state colour	woisture condition	Blows/100mm	Sumple Type & ID	General Comments	
From	То					510437 1001111			
				Moderately control gravely (25%) SUT (45%) angular to					
				subrounded fine to coarse, cobbles (20%) up to 30cm					
0	1		Fill	red/brown, dry: 50% Goethie (friable), 50% Shale					
				Moderately control city (40%) CRAVEL (40%) angular to					
				subrounded fine to coarse, cobbles (20%) up to 60cm					
1	3		Fill	red/brown, dry: 100% Goethite (bard)					
	3								
			1						

	TETRA TECH TEST PIT LOGGING SHEET								
				TP No: 2	6				
				Project No: 129	5580100				
Client: Forton	we Metal Group (hristmas Crook		Sheet 1 o	f 1 Data Startadi 14 Juna	2012			
client: rortes					Date Started. 14 Julie	2012			
Project Title: F	MG Christmas Cre	ek, Vasse Waste R	ock Dump Geotech	hnical Investigation	Dated Completed: 14	June 2012			
Location: Vass	e WRD, Christmas	Creek		T	Logged By: S Berry				
EA	STING	NORT	HING	RL(m)	-				
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP	Sample Type & ID	General Comments	
From	То	-		strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm			
0	1		Fill	Poorly sorted GRAVEL (40%), angular to subrounded, fine to coarse, cobbles (45%) up to 90cm, minor silt (15%), red/brown, dry: 70% Goethite (friable), 30% Goethite (medium)					
1	2		Fill	Poorly sorted GRAVEL (40%), angular to subrounded, fine to coarse, cobbles (45%) up to 80cm, minor silt (15%), red/brown, dry: 25% glassy Goethite, 25% Goethite (friable), 25% Goethite (medium), 25% Shale					
2	3		Fill	Poorly sorted GRAVEL (40%), angular to subrounded, fine to coarse, cobbles (45%) up to 30cm, minor silt (15%), red/brown, dry: 40% Goethite (hard), 20% Goethite (friable), 40% Hematite (hard)					

	TETRA TECH TEST PIT LOGGING SHEET										
	TP No: 27										
				Project No: 129	5580100						
Client: Fortess	rue Metal Group C	hristmas Creek		Sheet 1 o	1 1 Date Started: 12 June	2012					
Design Titles					Data Campleted: 12 June 2012						
rioject nue: F		en, vasse vvaste K	ock Dump Geoteci	inical investigation							
Location: Vass	e wRD, Christmas	Creek		RI (m)	Logged By: S Berry 						
		NON			-						
De	pth(M)	Graphic Log	Classification	Material Description strength, Soil type, particle size, plasticity, moisture state, colour	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments			
From	То					-					
0	0.5		Fill	Poorly sorted GRAVEL, subangular to subrounded, fine to medium, some cobbles & boulders, trace silt, red/brown, dry: 40% Chert, 30% Ochreous Goethite friable, trace Hematite shale							

				TETRA TECH TEST PIT	LOGGING SHEET			
				TP No: 2	8			
				Project No: 129	6580100			
Client: Fortes	rue Metal Group ([°] hristmas Creek		Sheet 1 o	T 1 Date Started: 14 June	2012		
Droject Title: F	MG Christmas Gr	ak Vassa Wasta B	lock Dump Cootool	heical Investigation	Dated Completed: 14	luno 2012		
Project Intie. P			ock Dump Geoteci	nnical investigation	Dated Completed: 14	June 2012		
Location: Vass	e WRD, Christmas	Creek		D ((a))	Logged By: S Berry			
EA	STING	NOK	IHING	KL(M)	-			
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments
From	То							
C	1		Fill	Poorly sorted GRAVEL (50%), angular to subrounded, fine to coarse, cobbles (35%) up to 40cm, minor silt (15%), red/brown, dry: 70% Goethite (medium), 30% Goethite (friable)				
1	. 2		Fill	Moderately sorted GRAVEL (60%), angular to subrounded, fine to coarse, cobbles (30%) up to 70cm, trace to minor silt (10%), red/brown, dry: 30% Goethite (friable), 70% Goethite (medium)				
2	3		Fill	Poorly sorted GRAVEL (60%), angular to subrounded, fine to coarse, cobbles & boulders (30%) up to 100cm, trace to minor silt (10%), red/brown, dry: 50% Goethite (friable), 50% Shale				

						TETRA TECH TEST PIT	LOGGING SHEET			
						TP No: 2	9			
						Project No: 129	5580100			
Client	Fortesc	ue Metal Groun	Christn	nas Creek		Sheet 1 o	Date Started: 14 June	2012		
Drojost	Title: Ef	AG Christmas C	ook Va	nuo ereen	sk Dump Cootosk	nical Investigation	Dated Completed: 14	luno 2012		
Project	The. Fr		eek, va		ck Dump Geoteci		Dated Completed. 14	June 2012		
Locatio	n: Vasse	WRD, Christma	s Creek	k NORT		D1()	Logged By: S Berry			
	EAS		-	NORT	HING	KL(M)	-			
	Dep	th(M)	Gi	raphic Log	Classification	Material Description	Moisture Condition	DCP	Sample Type & ID	General Comments
Fro	-	То				strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm		
FIU	/m	10								
	0		1		Fill	Poorly sorted silty (30%) GRAVEL (30%), angular to subrounded, fine to coarse, cobbles & boulders (40%) up to 100cm, red/brown, dry: 40% Hematite (hard), 30% Hematite (friable), 30% Martite (friable)				
	1		2		Fill	Poorly sorted GRAVEL (30%), angular to subrounded, fine to coarse, cobbles (55%) up to 60cm, minor silt (15%), red/brown, dry: 50% Goethite (hard), 50% Hematite (friable)				
	2		3		Fill	Poorly sorted GRAVEL (40%), angular to subrounded, fine to coarse, cobbles (45%) up to 30cm, minor silt (15%), red/brown, dry: 50% glassy Goethite, 50% Goethite (medium)				

				TETRA TECH TEST PIT	LOGGING SHEET			
				TP No: 5	30			
				Project No: 129	6580100			
Client: Forton	une Motel Group (Christmas Crook		Sheet 1 c	of 1	2012		
Client: Fortes	cue Metal Group C	Infistmas Creek			Date Started: 14 June	2012		
Project Title: F	MG Christmas Cre	ek, Vasse Waste R	ock Dump Geotec	hnical Investigation	Dated Completed: 14	June 2012		
Location: Vass	e WRD, Christmas	Creek			Logged By: S Berry			
EA	STING	NOR	THING	RL(m)	-			
De	pth(M)	Graphic Log	Classification	Material Description	Moisture Condition	DCP Blows/100mm	Sample Type & ID	General Comments
From	То					-		
0	1		Fill	Poorly sorted gravelly (30%) SILT (40%), angular to subrounded, fine to coarse, cobbles (30%) up to 50cm, red/brown, dry: 40% Hematite (hard), 30% Goethite (medium), 30% Goethite (friable)				
1	. 2		Fill	Poorly sorted silty (30%) GRAVEL (40%), angular to subrounded, fine to coarse, cobbles (30%) up to 60cm, red/brown, moist: 100% Goethite (friable)				
2	3		Fill	Poorly sorted silty (30%) GRAVEL (40%), angular to subrounded, fine to coarse, cobbles (30%) up to 80cm, red/brown, moist: 70% Goethite (friable), 30% glassy Goethite				

				TETRA TECH TEST PIT	LOGGING SHEET			
				TP No: 3	1			
				Project No: 129	5580100			
				Sheet 1 o	f1	2012		
Client: Fortes	cue Metal Group C	hristmas Creek			Date Started: 14 June	2012		
Project Title: F	MG Christmas Cre	ek, Vasse Waste R	ock Dump Geotech	hnical Investigation	Dated Completed: 14	June 2012		
Location: Vass	e WRD, Christmas	Creek		·	Logged By: S Berry			
EA	STING	NORT	HING	RL(m)	-			
								ſ
				Material Description		DCP		
De	pth(M)	Graphic Log	Classification		Moisture Condition		Sample Type & ID	General Comments
				strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm		
From	То							
				Poorly sorted GRAVEL (50%), angular to subrounded, fine				
				to coarse, cobbles (45%) up to 80cm, trace silt (5%),				
0	2		Fill	red/brown, moist: 50% Shale, 50% glassy Goethite				
				Poorly sorted GRAVEL (50%) angular to subrounded fine				
				to coarse, cobbles (40%) up to 30cm, trace to minor silt				
				(10%), red/brown, moist: 30% Shale, 40% glassy Goethite.				
2	3		Fill	30% Goethite (friable)				

				TETRA TECH TEST PIT	LOGGING SHEET			
				TP No: 3	33			
				Project No: 129	6580100			
Cliente Fontano	Matal Casura	Chuistere Currels		Sheet 1 o	f 1	2012		
Client: Fortesc	cue Metal Group	LINISTMAS CREEK			Date Started: 14 June	2012		
Project Title: F	MG Christmas Cr	eek, Vasse Waste F	ock Dump Geotec	hnical Investigation	Dated Completed: 14	June 2012		
Location: Vass	e WRD, Christma	s Creek		1	Logged By: S Berry			
EA	STING	NOR	THING	RL(m)	-			
				Material Description		DCP		
Dej	pth(M)	Graphic Log	Classification		Moisture Condition		Sample Type & ID	General Comments
	1			strength, Soil type, particle size, plasticity, moisture state, colour		Blows/100mm		
From	То							
				Moderately sorted GRAVEL (40%), subangular to				
				subrounded, fine to coarse, cobbles (40%) up to 30cm,				
			Natural /	some to minor silt (20%), red/brown, dry: 100% glassy				
0	1		Alluvium	Goethite				
				Moderately sorted GRAVEL (40%), subangular to				
				subrounded, fine to coarse, cobbles (40%) up to 30cm,				
			Natural /	some to minor silt (20%), red/brown, dry: 100% glassy				
1	2	2	Alluvium	Goethite				
2				Inferred Bedrock				
1	1	1				1		



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nt	Tetratech P	ty Ltd			Report N	0.	P 1206052	24-N
ject	Christmas (Creek			Test Date	e ate	07/07/2012	2
							10/01/2012	_
Sample No.	12060524	12060526	12060528	12060530	12060532	12060534	12060536	7
Client ID	#2	#3	#4	#8	#9	#13	#19	
Depth (m)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Moisture Content (%)	3.3	11.5	3.0	6.8	5.2	9	5.6	
Sample No.	12060538	12060542	12060544	12060546	12060524	12060526	12060528	
Client ID	#21	#26	#30	#33	#2	#3	#4	
Depth (m)	1.0	1.0	1.0	1.0	2.0	2.0	2.0	_
Moisture Content (%)	5.9	6.8	11.3	7.2	2.8	11.3	7.0	
Sample No.	12060530	12060532	12060534	12060536	12060538	12060542	12060544	
Client ID	#8	#9	#13	#19	#21	#26	#30	
Depth (m)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Moisture Content (%)	6.1	7.6	11.2	9.2	8.1	6.7	13.2	
REMARKS:								
	Sample/s sup	plied by the clie	ent				Page 1 of 1	RE
This document is accreditation requised ISO/IES 17025. measurements in	issued in accordance uirements. Accredite The results of the test cluded in this docum	e with NATA's ed for compliance sts, calibrations, a nent are traceable	with nd/or C	Authorised Sign	natory		Ĩ	



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lient	Tetratech P	ty Ltd		//0/200121111	Report N	0.	P 1206054	6-MC
roject	Christmas (Creek			Test Date Report Date	ate	07/07/2012 10/07/2012	<u>2</u> 2
Sample No.	12060546	12060524	12060526	12060528	12060530	12060532	12060534	
Client ID	#33	#2	#3	#4	#8	#9	#13	
Depth (m)	2.0	3.0	3.0	3.0	3.0	3.0	3.0	
Moisture Content (%)	6.8	3.1	7.7	8.9	5.6	5.8	12.3	
Sample No.	12060536	12060538	12060542	12060544				
Client ID	#19	#21	#26	#30				
Depth (m)	3.0	3.0	3.0	3.0				
Moisture Content (%)	8.2	7.9	7.1	11.8				
ES/REMARKS-								
<u>ES/REMARKS:</u>								
	• • • •	- P J. L d P.					Dage 1 of 1	

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated. Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details. Trilab Pty Ltd ABN 25 065 630 506

Australian/National Standards.

C. Channon

Laboratory No. 9926





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	Tetratech P	ty Ltd			Report No.	P 12060523-G
roject	Christmas (Creek			Test Date	25/07/2012
					Report Date	01/08/2012
Sample No.	12060523	12060529	12060535	12060545		
Client ID	#2	#8	#19	#33		
Depth (m)	0.0-3.0	0.00-3.0	0.00-3.0	0.0-3.0		
Moisture (%)	3.3	6.7	8.7	6.2		
AS SIEVE SIZE (mm)		•	PEI	RCENT PASSI	NG	
150						
75						
53			100			
37.5	100	100	89	100		
26.5	99	92	89	93		
19	97	83	69	77		
9.5	87	76	38	76		
4.75	74	55	14	74		
2.36	59	39	11	52		
1.18	47	29	8	39		
0.600	40	20	6	33		
0.425	38	15	5	31		
0.300	35	13	5	28		
0.150	30	11	3	23		
0.075	24	7	2	19		





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Client	Tetratech	n Pty Lt	d							F	Repo	ort N	lo.			Ρ	120	605	23-0	G
Project	Christma	s Creeł	<							-	Test	Date	e			25	7/2	2012	2	
										F	Repo	ort D	ate			1/8	8/20)12		
Client ID	#2										De	pth ((m)		0.0)-3.0)			
Sieve Size	Passing												<u> </u>							
(mm)	%	1															7	ТП		
150.0																				
75.0			90													/				
53.0															X					
37.5	100																			
26.5	99		80		$\left \right $	+++		 \vdash	+	++		+	+	\mathbf{H}		-+		++		
19.0	97																			
9.5	87		70																	
4.75	74		"						\prod				Λ							
2.36	59																			
1.18	47		60			+++						/		++-				++		
0.600	40	(%)																		
0.425	38	sing	_																	
0.300	35	Pas	50								/									
0.150	30									X										
0.075	24		40			$\parallel \parallel$				11										
									1											
			30																	
							ľ													
			20																	
			10																	ĺ
			0.01				0.1			1					10				10)0
								Pa	ticle	Siz	e (mm)								
	I I																			
TES/REMARKS	<u>S:</u>																			
	N	Moisture	Conter	it 3.3%	6															
	5	Sample/s	s suppli	ed by t	he cli	ent											Page	1 of 1	R	EP33
This docume	ent is issued in a	ccordance	with NA	TA's aco	credita	tion												へ		

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Client	Tetratech	n Pty Lte	d							Rep	ort N	lo.			P 1	206	605	29-0	G
Project	Christma	s Creeł	<							Test	Date	9			25/	7/2	012	,	
-										Rep	ort D	ate			1/8	/20	12	•	
Client ID	#8									De	pth ((m)		0.0	0-3.	0	<u>· </u>		
Sieve Size	Passing										1	()				-			
(mm)	%	1	100						Π							17			l
150.0																			
75.0			90													4_			
53.0																			
37.5	100																		
26.5	92		80		+++				+		+	+	++		+	+	$\left \right $		
19.0	83													K			$\left \right \right $		
9.5	76		70											1					
4.75	55		-														$\left \right \right $		
2.36	39												$\ $						
1.18	29		60						+		+	+	\mathbb{A}		_				
0.600	20	(%) f																	
0.425	15	ssing	50																
0.300	13	Ра										/							
0.150	11																		
0.075	1		40						+		+/+								
											1								
			30																
									X	[]									
			20						4		+	++							
			10																
						\mathbb{H}													
			0			01				Ц 1				10				 10	00
			0.01			0.1	P	artic	le S	' ize (mm	.)								
							ſ	ai (16		. <u>_</u> e (iiii	'								
TES/REMARKS	<u>3:</u>	Anieture	Contont	6 7%															
	IN S	Sample/s	supplied	by the	client	i									F	Page '	1 of 1	RF	EP3?
																	<u> </u>		

Laboratory No. 9926





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Client	Tetratech	h Pty Lto	b									Rep	ort	No.				P 12	206(053	5-0	3
Project	Christma	as Creek	(Tes	t Da	te				25/7	7/20	12		
												Rep	ort	Dat	е			1/8/	201	2		
Client ID	#19											De	epth	(m)		0.00)-3.0)			
Sieve Size	Passing	1	00 -																			
(mm)	%																					
150.0																				1		
75.0			90 🔶					_	_		_		-	\vdash	+				₽	+		
53.0	100																					
37.5	89																					
26.5	89		80 +												\parallel				\square	\parallel		
19.0	69																					
9.5	38		70 🔶			+++		_			\square		_		\parallel			-	++	\parallel		
4.75	14																	/				
2.36	11																	/				
1.18	8	~	60												$\uparrow \uparrow$				++			
0.000	5	%) 6																				
0.425	5	Issin	50										_					_	\downarrow			
0.300	3	Å																				
0.075	2																					
0.070	2		40												+				++	++		
			30										_						$\downarrow \downarrow$			
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			20															+	++			
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			10										\mid	\square					$\downarrow \downarrow$			
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							╟─	-														
			0 + 0.01				0.1					1					10				لىبىي 10	0
									Р	artic	le S	Size (mr	n)									
												-										
TES/REMARKS	S.																					
	<u></u>	Moisture	Conter	nt 8.7%	6																	
	:	Sample/s	suppli	ed by t	he cli	ent												Pa	age 1	of 1	RE	:P:
This docum	ent is issued in a	accordance	with NA		oraditat	tion																

Laboratory No. 9926





Perth 2 Kimmer Place, Queens Park WA 6107 Ph: +61 8 9258 8323

Client	Tetratech	n Pty Ltd								I	Repor	t No	-			P 12	2060	545	5-G
Project	Christma	s Creek									Test D)ate	to		:	25/7 1/8/'	/201	12	
Client ID	#33										Dep	th (n	n)		0.0-3	<u>1/0/2</u> 3.0	2012		
Sieve Size	Passing												.,						
(mm)	%	10	° 1							ТП						Τ	/		П
150.0																			
75.0		9	۰ ــــ											Ш					Ш
53.0		·																	
37.5	100																		
26.5	93	8	o 		++	+++		_		+++			++	\square		+		\square	Ш
19.0	77													₩		1			
9.5	76	-											\int						
4.75	74	7	"										1						П
2.36	52											/							
1.18	39	6	o		++							+	++			+			Щ
0.600	33	(%)																	
0.425	31	sing										/							
0.300	28	Sed 5	0																Ħ
0.150	23																		
0.075	19	4	o 🗕 🗕											Ш		\perp			Ш
										X									
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		1	0													+			H
			₀ ــــــ							Щ									Щ
·			0.01			C).1			1	I			1	0				100
								Pa	rticle	Siz	e (mm)								
TES/REMARKS	<u>S:</u>																		
	N	Moisture C Sample/s	Content	ö.2% hv the	clior	nt										Da	no 1 o	f 1	RED
		Jampie/s	sapplieu	by the	CIICI	n		 								гa	ye i 0	<u></u>	NEP

Laboratory No. 9926




Perth 2 Kimmer Place, Queens Park WA 6107 Ph: +61 8 9258 8323

		ATTERBE		TS TEST	REPOR	Т		
Cli	ent Tetratech P	ty Ltd	AS 1289 2.1.1, 1	<u>3.1.1, 3.1.2, 3.2.</u>	Report N	0.	P 1206052	3-AL
Pro	oject Christmas (Creek			Test Date	e eto	19/07/2012	
					Report	ale	23/07/2012	2
	Sample No.	12060523	12060527	12060533	12060537	12060541	12060545	
	Client ID	#2	#4	#13	#21	#26	#33	
	Depth (m)	0.0-3.0	0.00-3.0	0.00-3.0	0.00-3.0	0.00-3.0	0.0-3.0	
	Liquid Limit (%)	22	30	31	NP	31	27	
	Plastic Limit (%)	13	25	24	NP	21	15	
	Plasticity Index (%)	9	5	7	NP	10	12	
	Linear Shrinkage (%)	3.0*	2.0	1.5*	1.0	4.5*	5.5	
	Field Moisture Content (%)	3.3	9.9	11.1	8.4	10.2	6.2	
NOTES	S/REMARKS: The samples	were tested over	en dried, dry si	eved and in a	125-250mm m	ould.		
Semi	NP=Non Plas	lic	* Crumbling	oourrod	Cualization -	Jurrod	Deve 4 14	DEDAGAS
<u>Samp</u> Th	This document is issued in accordance accreditation requirements. Accredite ISO/IES 17025. The results of the test measurements included in this docum Australian/National Standards.	e with NATA's ed for compliance sts, calibrations, an ent are traceable	with nd/or to	Authorise C. Cl instrument or sa	+ Curling OCC ed Signatory hannon ample at the time	of test unless	rage 1 or 1	REP30101



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Client	Tetratech P	ty Ltd			Report No.	P 12060523-EN
Project	Christmas C	Creek			Test Date	17/07/2012
					Report Date	25/07/2012
Sample No.	12060523	12060531	12060537	12060545		
Client ID	#2	#9	#21	#33		
Depth (m)	0.0-3.0	0.00-3.0	0.00-3.0	0.0-3.0		
Description	Red Sand	Red Sand	Brown Sand	Red Sand		
Emerson Class	5	5	6	5		
<u>ES/REMARKS:</u>						
ES/REMARKS: ple/s supplied by th	e client		Tested with Di	stilled water at	21°C	Page 1 of 1 REP





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	PERMEABI	LITY BY FALI	LING HEAD TEST REPOR	т				
	Test Method AS 1289 6.7.2	2, 5.1.1 , KH2 (Based or	n K H Head (1988) Manual of Laboratory Testin	ig,10.7)				
Client	Tetratech Pty Ltd		Report No.	P 12060	523-FHPT			
Project	Christmas Creek		Test Date Report Date	Test Date 10/08/2012 Report Date 14/08/2012				
Client ID	#2		Depth (m)	0.0-3.0				
Descriptio	Brown Lightly Gravelled Sa	indy Silt	Sample Type	Disturbe	d			
		RESULTS	OF TESTING					
Compaction Met	thod	AS1289.5.1.1 - Sta	andard Compaction					
Maximum Dry D	ensity (t/m ³)	2.53	Hydraulic Gradient		15.3			
Optimum Moistu	ure Content (%)	9.5	Surcharge (kPa)		2.9			
Placement Mois	ture Content (%)	9.6		11.62				
Moisture Ratio (%)	100.6	Water Type		Distilled			
Placement Wet	Density (t/m ³)	2.72	Percentage Material Retained/Sieve Size (0 % on 19 mm				
Density Ratio (%	6)	98.0	Sample Height and Diameter (mm)		77.6 by 101.4 mm			
F	PERMEABILITY	k ₍₂₀₎ =	1.1E-09 (m/	sec)				
		Perm	neability					
9.000E-09								
8.000E-09								
7.000E-09								
6.000E-09								
5.000E-09								
4.000E-09								

3.000E-09 2.000E-09 1.000E-09 0.000E+00 0 1000 2000 5000 6000 7000 3000 4000 Elapsed Time of Test (mins) Remarks: The above specimen was remoulded to a target of 98% of Standard Dry Density and at 102% of Optimum Moisture Content. Sample/s supplied by client The compaction data was supplied by the client. Tested as received Page: 1 of 1 REP36301 This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IES 17025. Authorised Signatory The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards. G. Hamilton Laboratory No. 9926

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2.600E-07

2.400E-07

2.200E-07

2.000E-07 L

10

20

30

k20 (m/sec)

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	PERMEABII	LITY BY FAL	LING HEAD TEST REPORT						
	Test Method AS 1289 6.7.2	2, 5.1.1 , KH2 (Based o	n K H Head (1988) Manual of Laboratory Testing,10.7)						
Client	Tetratech Pty Ltd		Report No. P 1206	0529-FHPT					
Project	Christmas Creek		Test Date 0/01/19	900					
			Report Date 0/01/19	00					
Client ID	#8		Depth (m) 0.00-3.0						
Descriptio	Brown Slity Sandy Gravell		Sample Type Disturb	ed					
		RESULTS	OF TESTING						
Compaction Me	ethod	AS1289.5.1.1 - St	andard Compaction						
Maximum Dry D	Density (t/m ³)	2.59	6.9						
Optimum Moist	ure Content (%)	11.5	2.7						
Placement Mois	sture Content (%)	11.6	Head Pressure Applied (kPa)	12.12					
Moisture Ratio	(%)	101.3	Water Type	Distilled					
Placement Wet	: Density (t/m³)	2.83	Percentage Material Retained/Sieve Size (mm)	0 % on 19 mm					
Density Ratio (%	%)	97.9	Sample Height and Diameter (mm)	177.9 by 152 mm					
F	PERMEABILITY	k ₍₂₀₎ =	2.3E-07 (m/sec)						
		Pern	neability						
3.000E-07									
2.800E-07									

 Remarks:
 The above specimen was remoulded to a target of 98% of Standard Dry Density and at 102% of Optimum Moisture Content.

 Sample/s supplied by client
 The compaction data was supplied by the client.
 Tested as received
 Page: 1 of 1
 REP36301

Elapsed Time of Test (mins)

40

50

60

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			F Test M		MEA AS 1289	BILI	ITY	BY KH2 (F		LIN	G H	EA	D TE		REP		T q.10.7)			
C	lient	Tetr	atech P	ty Ltd			,							Reno	ort No).	P 12	, 2060!	541-FF	IPT	
	licit	1011		iy Lia										Кере			1 12		51111		
Р	roiect	Chris	stmas (Creek										Tost	Data		19/0	10/20	10		
														Popo	Dale	oto	14/0	10/20	12 12		
<u> </u>	liont ID	#26												Dont	h(m)		0.00	0/20	12		
	escriptio	#20 Brov	/n Siltv	Sand	v Grav	/ell								Sam	n (m) ble T	vpe	Dist	urbe	d		
					,	-															
								RE	SULTS	OF T	ESTI	NG									
Com	paction Me	ethod					AS12	289.5.	1.1 - St	andar	d Cor	npact	tion								
Maxiı	mum Dry I	Density	(t/m ³)					2.51		Hydra	aulic C	Gradie	ent							10.6	
Optin	num Moist	ture Cor	itent (%)					10.0		Surcl	harge	(kPa)								0.0	
Place	ement Moi	sture Co	ontent (%	»)				10.2		Head	Pres	sure A	Applied	l (kPa)						12.12	
Moist	ture Ratio	(%)					102.0			Wate	er Type	e							Distilled		
Place	ement We	t Density	/ (t/m³)					2.71		Perce	entage	e Mate	erial Re	etained/S	Sieve	Size (n	nm)		0 % (on 19	mm
Dens	ity Ratio ('	%)						97.8		Sam	ple He	eight a	ind Dia	imeter (n	nm)				116.6 b	oy 152	2.4 mm
		PER	ME	ABI	LIT	Y		k (2	20) =			8.	4E	-07		(m/	seo	c)			
									Pern	neabil	ity										
	8.900E-07																				
	8.800E-07		•	+-+																	
	8.700E-07																				
	8.600E-07							\smallsetminus													
	0.000E-07																				
(sec)	0.400E-07																				
U U	8.300E-07																				
X	8.200E-07																				
	8.100E-07																				
	8.000E-07																				
	7.900E-07																				
	7.800E-07	0		2							6			8			1	0			12
		0		2					Ela	osed Tin	ne of Te	st (mins)	0				<u> </u>			12
Rema	arks:	The a	bove sp	ecimen	was re	emould	ed to a	a targe	et of 989	% of S	standa	rd Dry	/ Dens	ity and a	t 1029	% of O	ptimu	m Mo	isture C	onten	t.
Sam	ole/s supp	lied by c	lient		The co	ompac	tion da	ita wa	s suppli	ed by	the cl	ient.	Т	ested as	s rece	ived		Page:	1 of 1	RI	EP36301
	This docu requireme The resul included i Standard	ument is is ents. Acc Its of the t in this doo s.	sued in ac redited for ests, calibr ument are	cordanc complia rations, a traceab	e with N/ nce with and/or me le to Aus	ATA's ac ISO/IES easurem tralian/N	ccreditat 5 17025. nents National	tion				Auti	iorised S	Signatory						A	

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	PERMEAB	ILITY BY FAI	LING HEAD T	EST REPOR	T			
	Test Method AS 1289 6.	7.2, 5.1.1 , KH2 (Based	on K H Head (1988) Manı	al of Laboratory Testi	ng,10.7)			
Client	Tetratech Pty Ltd			Report No.	P 12060	543-FHPT		
Droinot	Christman Crock							
Project	Christmas Creek			Test Date	17/08/20)12		
				Report Date	13/08/20)12		
Client ID	#30	-	Depth (m) 0.00-3.					
Descriptio	Brown Silty Sandy Gravel	l		Sample Type	Disturbe	d		
		RESULT	IS OF TESTING					
Compaction Me	ethod	AS1289.5.1.1 - 5	Standard Compaction					
Maximum Dry D	Density (t/m ³)	2.32	Hydraulic Gradient			10.6		
Optimum Moist	ure Content (%)	14.0	Surcharge (kPa)			0.0		
Placement Mois	sture Content (%)	14.2	Head Pressure Applie	12.12				
Moisture Ratio	(%)	101.2	Water Type	Distilled				
Placement Wet	Density (t/m ³)	2.59	Percentage Material I	Percentage Material Retained/Sieve Size (mm)				
Density Ratio (%	%)	97.9	Sample Height and D	iameter (mm)		116.6 by 152.4 mm		
F	PERMEABILITY	k ₍₂₀₎ =	= 4.6	E- 07 (m/	/sec)			
4.900E-07		Pe	rmeability					
4.800E-07								
4 700E 07								



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	DIRECT SHEAR TEST R Test Method: AS 1289.6.2.2 / KH2 based on P	REPORT K.H. Head Vol. 2
Client	Tetra Tech Australia Pty Ltd	Report No. 12080180- DS
Project	Christmas Creek	Test Date 6/08/2012 Report Date 14/08/2012
Client ID	Sample #3	Depth (m) 0.00-3.00
Descriptio	n Sam	ple Type Three individual -4.75mm specimens - remoulded as requested by the client
Failure Cri	eria Residual @ 7 m	nm Displacement
Ê 0.1 +	Vertical Displacement/Relative Displacement/	cement Plot
i) 0 -0.1 -0.2	2 3 4	5 6 7 8
L -0.3 - -0.4 - -0.5 -		
0.6 0.7 0.7 0.7		
Vertical	Relative Displacement (mm	n)
	Shear Stress/Displacement F	Plot
180		199.9 kPa
160 -		
140		
iss (k		
IL Stre		
⁰⁸ Shea		100.3 kPa
60		50.4 LD2
40		SU.1 KPA
20		
0	1 2 3 4	5 6 7 8
	Relative Displacement (mm	n)
otes/Remarks	Please review the results if the Cohesion is above 2 kPa whe	en plotted with a line of best fit.
ranh nat ta aa	Note: Area correction based on square sample equation.	by the client Provide the prove
naph not to sc	Sample/s supplied i	by the Client Page 1 of 4 REP03
This docum requiremen results of th document a	ent is issued in accordance with NATA's accreditation Auti s. Accredited for compliance with ISO/IES 17025. The e tests, calibrations, and/or measurements included in this re traceable to Australian/National Standards.	thorised Signatory
		Laboratory No. 9



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		DIRECT SH	EAR TEST F					
Client	Tetra Tech Aus	stralia Pty Ltd		Report No.	12080180- DS	S		
- • <i>i</i>								
Project	Christmas Cree	9K		Test Date	6/08/2012			
				Report Date	14/08/2012			
Client ID	Sample #3		0	Depth (m)	0.00-3.00	~		
Description	n		Sam	specime	ens - remoulded	as		
	4 a mi a	Р	aaidual @ 7 n	requeste	ed by the client			
Failure Crit	teria	Residual - Norma	l Stress vs She	ar Stress				
200		Nesidual - Norma	<u>1 011633 V3 0116</u>					
200								
				•				
150								
Pa)								
s (kl								
tres								
ທີ່ ພູ 100 —								
She								
50								
o								
0	50	100 No	150 rmal Stress (kPa)	200	250	300		
					# Hand duar	41		
Shea	ar Angle (°)	39.0 #	Cohesion	(kPa) 0.0	# mand drawn orig	in in		
Specimen Co	ndition	Inundated	Normal S	Stress (kPa)	Shear Stre	ss (kPa)		
Rate of Strain	nensions (mm) (mm/min)	60^60 0.008	Stage 1 Stage 2	50.1 100.3	42.0	8 9		
Initial Moisture	e Content (%)	17.6	Stage 3	199.9	164	.5		
Initial Wet De	nsity(t/m ³)	2.50		on platted with a P	of boot fit			
oles/remarks:	Note: Area correct	tion based on square s	and the equation.	en plotted with a line	UI DESTIIT.			
raph not to sca	ale	Sample/s supplied by the client Page 2 of 4 REP						
This door	iment is issued in accorda	nce with NATA's accreditat	ion Aut	horised Signatory		^		
requirem	ents. Accredited for comp	liance with ISO/IES 17025.	The		// Ň	ATÀ		
results of documen	t the tests, calibrations, and t are traceable to Australia	d/or measurements include an/National Standards.	d in this	MA //LIMA		DITED FOR		
					COM	PETENCE		
The results of ca	alibrations and tests per	formed apply only to the	specific instrument or	sample at the time of te	st unless otherwise	clearly stated		



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	I Tes	DIRECT SHI	EAR TES	T REPORT		
Client	Tetra Tech Austra	alia Pty Ltd		Report No). 120801	80- DS
Project	Christmas Creek			Test Date	6/08/20)12
				Report Da	ite 14/08/2	2012
Client ID	Sample #3			Depth	(m) 0.00-3.	00
Description	•		S	ample Type Thre	e individual -	4.75mm
				spec	cimens - remo	oulded as
Failure Crite	eria			Peak		CIICIII
	<u>F</u>	eak - Normal S	tress vs She	ear Stress		
200						
150						
kPa)						
ss (
Stre						
001 gar						
sh						
		•				
50						
0	50	100	150	200	250	300
Ŭ		Nor	mal Stress (kP	a)	200	
	Shoor Angle (0)	40.0 #	Cohoci	on (kPa)	0 # Hand	drawn through the
						origin
Specimen Con	dition ensions (mm)	Inundated 60*60	Normal Stage 1	tress (kPa) 50 1	Sh	ear Stress (kPa) 43.4
Rate of Strain	(mm/min)	0.008	Stage 2	100.3		71.8
Initial Moisture	Content (%)	17.6	Stage 3	199.9		168.4
Initial Wet Den	sity(t/m ³)	2.50	ia abaya 2 kDr	when platted with a	line of heat fit	
Notes/Remarks.	Note: Area correction	based on square s	ample equation	a when plotted with a	line of best fit.	
Graph not to sca	le	ľ	Sample/s supp	lied by the client		Page 3 of 4 REP03302
This docu requireme results of document	ment is issued in accordance ents. Accredited for complian the tests, calibrations, and/or are traceable to Australian/N	with NATA's accreditat ce with ISO/IES 17025. measurements include lational Standards.	ion The d in this	Authorised Signatory	sl.ll	
			ν			COMPETENCE
The results of cal	ibrations and tasts parform	and apply only to the	posifio instrumor	at ar comple at the time	of toot uploop of	Laboratory No. 9926



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	I Tes	DIRECT SHEAR TEST R	EPORT .H. Head Vol. 2	
Client	Tetra Tech Austra	alia Pty Ltd	Report No.	12080180- DS
Project	Christmas Creek		Test Date	6/08/2012
			Report Date	14/08/2012
Client ID	Sample #3		Depth (m)	0.00-3.00
Description		Samp	le Type Three in	dividual -4.75mm
			reaueste	ens - remoulded as ed by the client
CL	IENT:	Tetra Tech Australia Pty Lte Christmas Creek	d A FTE F	PTEST
IK	OJECT.	Ciristinus creta	AFIE	K TEST
LA	B SAMPLE No.	12080180	DATE: - 8	00.3.00
BO	REHOLE:	Sample #3	DEPTH: 0.	00-3.00
<u>Notes/Remarks:</u> Photo not to scale	Please review the res Note: Area correction	sults if the Cohesion is above 2 kPa when based on square sample equation. Sample/s supplied b	n plotted with a line o	of best fit. Page 4 of 4 REP03302
This docume requirements results of the document ar	ent is issued in accordance s. Accredited for complian e tests, calibrations, and/or re traceable to Australian/N	e with NATA's accreditation ce with ISO/IES 17025. The measurements included in this lational Standards.	Authorised Signatory	



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	DIRECT SHEAR TEST R								
Client	Tetra Tech Australia Ptv Ltd	Report No. 12080181- DS							
	······································								
Project	Christmas Creek	Test Date 8/08/2012							
		Report Date 14/08/2012							
Client ID	Sample #9	Depth (m) 0.00-3.00							
Description	Sam	ple Type Three individual -4.75mm specimens - remoulded as requested by the client							
Failure Crite	ria Residual @ 5.5 ı	mm Displacement							
	Vertical Displacement/Relative Displacement	cement Plot							
0.8 آ	50.1 kPa								
tu 0.6 -									
		199.9 kPa							
		5 6 7 8							
Vertical	Relative Displacement (mm	n)							
	Shear Stress/Displacement F	<u>Plot</u>							
180 160 140 (CC 120 SSS 100		199.9 kPa							
ي ا		100.3 kPa							
60		50.1 kPa							
	Relative Displacement (mn	n)							
Notes/Remarks:	Please review the results if the Cohesion is above 2 kPa who	en plotted with a line of best fit							
	Note: Area correction based on square sample equation.								
Graph not to sca	e Sample/s supplied	by the client Page 1 of 4 REP03302							
This docume requirements results of the document ar	Aut is issued in accordance with NATA's accreditation Accredited for compliance with ISO/IES 17025. The tests, calibrations, and/or measurements included in this traceable to Australian/National Standards.	J. Russell							



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Tetra Tech Aus Christmas Cree	tralia Pty Ltd		Re	port No.	1208018	81- DS			
Christmas Cree									
	k		То	et Data	8/08/201	2			
			Po	Si Dale	11/08/201	12			
Sample #0			Ne	Donth (m)		0			
Sample #9		Sa	ample Ty	/pe Three in	dividual -4	.75mm			
				specime	ens - remou	ulded as			
·ia	Re	sidual @ 5.	5 mm [requeste Displacen	ed by the c nent	lient			
<u>iu</u>	Residual - Norma	l Stress vs Sl	near Stre						
			•						
	◆								
•••••									
EO	100	450	200	\	250	200			
50	No	rmal Stress (kPa	200 a))	250	300			
A I (⁰)	20.0 #	Cabaaia	m (l/Da)		# Hand c	Irawn through th			
Angle (*)	33.0 #	Conesio	n (kra)	0.0	 	origin			
tion psions (mm)	Inundated	Norm	al Stress (l	kPa) 50.1	Shea	ar Stress (kPa)			
nm/min)	0.060	Stage 1 Stage 2		100.3		56.6			
content (%)	9.3	Stage 3		199.9		163.5			
ty(t/m ³)	2.87								
Note: Area correct	results if the Cohesion	ample equation	wnen plott	ed with a line	of dest fit				
Graph not to scale				client		Page 2 of 4 REP03			
ont is issued in accorder		ion	Authorised S	Signatory		^			
s. Accredited for compl	iance with ISO/IES 17025.	The	and the second sec	1.01	//	NATA			
e tests, calibrations, and re traceable to Australia	l/or measurements include n/National Standards	d in this	amia 1	MMMM	,				
		\mathcal{V}	J. KUSS	сц		TECHNICAL			
	ia	ia Residual - Norma	ia Residual @ 5. Residual - Normal Stress vs St Residual - Normal Stress vs St 50 100 150 Normal Stress (kPa 50 100 150 Normal Stress (kPa Angle (°) 39.0 # Cohesio tion Inundated Norm sions (mm) 60*60 Stage 1 m/min) 0.060 Stage 2 Stage 3 ty(t/m ³) 2.87 Please review the results if the Cohesion is above 2 kPa Note: Area correction based on square sample equation. Sample/s supple to the specific instrument s Accredited for compliance with NSO/IES 17025. The tests, calibrations, and/or measurements included in this tests, calibrations, and/or measurements included in this tests calibrations and tests performed apply only to the specific Instrument	ia Residual @ 5.5 mm E Residual - Normal Stress vs Shear Stress Image: Stress vs Shear Stress Stress vs Shear Stress Image: Stress vs Shear Stres vs Shear Stress vs Shear Stres vs Shear Stress vs Shea	in Residual @ 5.5 mm Displacem ia Residual @ 5.5 mm Displacem Residual - Normal Stress vs Shear Stress Image: Image	specimens - remole requested by the c ia Residual @ 5.5 mm Displacement Residual @ 5.5 mm Displacement Residual @ 5.5 mm Displacement According the specific network of the specific netwo			



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Client	Tetra Tech Austr	st Method: AS 1289.0 alia Pty I to	6.2.2 / KH2 based	on K.H. Head V	ol.2	120801	81- DS			
Gilefit	Tetra Tech Austr	αιιά Γιγ ΔιΟ		керо	LINO.	120001	01-03			
Project	Christmas Creek			Tast)ate	8/08/20	12			
•				Reno	rt Date	14/08/20	ے۔ 012			
Client ID	Sample #9	Sample #0								
Descripti	on		S	ample Type	Three in	dividual -	4.75mm			
•	specimens - remoulded as									
Failure C	riteria			Peak	requeste	ed by the	client			
		Peak - Normal S	stress vs She	ar Stress						
200 T										
150 +										
(Pa)										
ss (k										
otres										
ທ ຫຼຸ 100 -	00									
She										
_										
50 -										
_										
-										
0 + 0	50	100	150	200		250	300			
•		Nor	rmal Stress (kPa	a)	-					
		40 F #	Cabaai			# Hand	drawn through th			
	Shear Angle (*)	40.5 #	Conesio	5h (KFa)	0.0		origin			
Specimen (Specimen F	imensions (mm)	Inundated	Normal St	ress (kPa)	0.1	She	ear Stress (kPa) 49.4			
Rate of Stra	lin (mm/min)	0.060	Stage 2	10	0.3		59.8			
Initial Moist	Moisture Content (%) 9.3			Stage 3 199.9 171.0						
Initial Wet E	Density(t/m ³)	2.87	n is above 2 kPa	when platted y	with a line w	of boot fit				
nes/iteman	Note: Area correctio	n based on square s	sample equation			JI DEST III				
aph not to s	scale		Sample/s supp	lied by the clier	nt		Page 3 of 4 REP033			
This d	ocument is issued in accordance	e with NATA's accredita	tion The	Authorised Sig	natory 7	//	NATA			
result	s of the tests, calibrations, and/o	r measurements include	ed in this / -	<i>Jamis</i> &	unl	7				
docun	ient are traceable to Australian/	ivalional Stanuards.		J. Russell						

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	DII Test M	RECT SHEAN ethod: AS 1289.6.2.2 /	R TEST RI	EPORT .H. Head Vol. 2	
Client	Tetra Tech Australia	Pty Ltd		Report No.	12080181- DS
Project	Christmas Creek			Test Date	8/08/2012
				Report Date	14/08/2012
Client ID	Sample #9			Depth (m) 0.00-3.00
Description			Samp	le Type Three in	ndividual -4.75mm
				reauest	ens - remoulded as ed by the client
	CLIENT: PROJECT:	Tetra Tech Au Christmas Cro	istralia Pty I eek	Ltd AFT	TER TEST
	LAD SAMPLE No	12080181		DATE: 7	1/8/12
	BORFHOLE:	Sample #9	4	DEPTH:	0.00-3.00
	DOREHOLL.	Sampre	-		
Notes/Remarks:	Please review the results Note: Area correction ba	s if the Cohesion is al sed on square sampl	bove 2 kPa wher e equation.	n plotted with a line	of best fit
Photo not to scale	e	Sam	ple/s supplied b	y the client	Page 4 of 4 REP03302
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	DIRECT SHEAR TEST R Test Method: AS 1289.6.2.2 / KH2 based on K	EPORT (.H. Head Vol. 2
Client	Tetra Tech Australia Pty Ltd	Report No. 12080182- DS
Project	Christmas Creek	Test Date 9/08/2012 Report Date 14/08/2012
Client ID	Sample #21	Depth (m) 0.00-3.00
Description	Samp	ple Type Three individual -4.75mm
		specimens - remoulded as
Failure Crite	ria Residual @ 7 m	m Displacement
	Vertical Displacement/Relative Displac	ement Plot
_ 1.5		
1 - 1		50.1 kPa
		100.3 kPa
	1 2 3 4 5	
Vertica	Relative Displacement (mm))
	Shear Stress/Displacement P	<u>Plot</u>
140		199.9 kPa
		100.3 kPa
ar Stress (
sų 60		
	Martin and a second sec	50.1 kPa
20		
0		6 7 8 9
	Relative Displacement (mm	n)
Notes/Remarks:	Please review the results if the Cohesion is above 2 kPa whe	en plotted with a line of best fit
0	Note: Area correction based on square sample equation.	
Graph not to scal	e Sample/s supplied b	by the client Page 1 of 4 REP0330;
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		DIRECI 5H Test Method: AS 1289.	EAR IESI F 6.2.2 / KH2 based on	KEPOR I K.H. Head Vol. 2			
Client	Tetra Tech Aus	stralia Pty Ltd		Report No.	1208018	2- DS	
Proiect	Christmas Cree	ek		Tost Data	0/00/201	C	
,,				Report Date	9/06/201	2 12	
Client ID	Sample #21			Dopth (m)	0.00.2.00)	
Description	Sample #21		Sam	Depth (iii) ple Type Three ind	dividual -4.	, 75mm	
				specime	ns - remou	lded as	
Eailura Crita	vria	P	esidual @ 7 r	reaueste	<u>d bv the cl</u>	ient	
		Residual - Norma	al Stress vs She	ar Stress	511L		
200		Residual - Norria					
200							
150							
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heal							
S							
50							
	♦						
0							
0	50	100 No	150 ormal Stress (kPa)	200	250	300	
Shear	Angle (°)	28.3	Cohesion	(kPa) 32.3	R ²	0.936	
pecimen Cond	dition	As Received	Normal	Stress (kPa)	Shea	r Stress (kPa)	
pecimen Dime	ensions (mm)	60*60	Stage 1	50.1 45.0			
ate of Strain (mm/min)	0.008	Stage 2	Stage 2 100.3 107.6			
nitial Moisture	Content (%) sitv(t/m ³)	12.4 2 72	199.9		136.3		
es/Remarks:	Please review the	results if the Cohesio	n is above 2 kPa wh	en plotted with a line c	of best fit		
	Note: Area correc	tion based on square	sample equation.				
aph not to scale	е		Sample/s supplied	by the client		Page 2 of 4 REP03	
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requiremen	nts. Accredited for comp	liance with ISO/IES 17025	. The	n. D. M	/	NATÀ	
results of th document a	ne tests, calibrations, an are traceable to Australia	d/or measurements include an/National Standards.	ed in this	J. Russell			
				COMPETENCE			



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	Te	DIRECT SH	IEAR TEST						
Client	Tetra Tech Austi	alia Pty Ltd		Repo	ort No.	1208018	2- DS		
Project	Christmas Creek	ζ.		Test	Date ort Date	9/08/201: 14/08/20	2		
Client ID	Sample #21)							
Description	n Sample Type Three individual -4.75mm specimens - remoulded as requested by the client								
Failure Crit	teria			Peak					
		Peak - Normal	Stress vs She	ar Stress					
200 —									
150									
a)				•					
(kF									
ress									
が <u> -</u> 100									
lhea									
0									
50									
50									
0									
0	50	100	150	200	2	50	300		
		No	ormal Stress (kPa	1)					
	Shoor Angle (°)	28 /	Cohesic	n (kPa)	37 1	P ²	0.952		
0		4			57.1	<u>г</u>			
Specimen Cor Specimen Dim	naition nensions (mm)	As Received	Normal Sti	ress (kPa)	50.1	Shea	r Stress (kPa) 51 9		
Specimen Dimensions (mm) 60^60 Rate of Strain (mm/min) 0.008			Stage 1 Stage 2	Stage 1 50.1 Stage 2 100.3			109.9		
Initial Moisture Content (%) 12.4			Stage 3	Stage 3 199.9 142			142.2		
Initial Wet Der	nsity(t/m ³)	2.72							
Notes/Remarks:	Please review the re	esults if the Cohesi	on is above 2 kPa	when plotted	with a line o	f best fit			
Graph not to sca	ale	a sased on square	Sample/s suppl	ied by the clie	nt	1	Page 3 of 4 REP03302		
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	librations and tasts norfs		· · · · · · · · · · · · · · · · · · ·			L	_aboratory No. 9926		



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DIRECT SHEAR TEST RE Test Method: AS 1289.6.2.2 / KH2 based on K.	EPORT H. Head Vol. 2
Client Tetra Tech Australia Pty Ltd	Report No. 12080182- DS
Project Christmas Creek	Test Date 9/08/2012
	Report Date 14/08/2012
Client ID Sample #21	Depth (m) 0.00-3.00
Description Sampl	le Type Three individual -4.75mm
	specimens - remoulded as requested by the client
CLIENT: Tetra Tech Australia Ptv Lt	d
PROJECT: Christmas Creek	A FTED TECT
	AFIER IESI
LAB SAMPLE No. 12080182	DATE: 10 (8 12
BOREHOLE: Sample #21	DEPTH: 0.00-3.00
Notes/Remarks: Please review the results if the Cohesion is above 2 kPa when Note: Area correction based on square sample equation. Photo not to scale Sample/s supplied by This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IES 17025. The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.	a plotted with a line of best fit a plotted with a line of best fit b plotted with a line of best fit c plotted with a line of best fit b plotted with a line of best fit c plotted with a line of best fit



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	DIRECT SHEAR TEST F Test Method: AS 1289.6.2.2 / KH2 based on	REPORT K.H. Head Vol. 2
Client	Tetra Tech Australia Pty Ltd	Report No. 12080183- DS
Project	Christmas Creek	Test Date 10/08/2012
		Report Date 14/08/2012
Client ID	Sample #30	Depth (m) 0.00-3.00
Description	Sam	specimens - remoulded as
Failure Crite	eria Residual @ 7 n	nm Displacement
(Vertical Displacement/Relative Displa	cement Plot
		50.1 kPa
	2 3 4	5 6 7 8
og -0.2 - -0.3 - -0.4 -		
Vertical	Relative Displacement (mr	n)
	Shear Stress/Displacement	<u>Plot</u>
140		199.9 kPa
120 -		
(R) 100		
ss (kł		
aar Stre		100.3 kPa
of She		
40		50.1 kPa
. /		
20		
0		
U	n 2 3 4 Relative Displacement (mi	m)
Notes/Remarks:	Please review the results if the Cohesion is above 2 kPa wh	en plotted with a line of best fit
Graph not to sca	Note: Area correction based on square sample equation. le Sample/s supplied	by the client Page 1 of 4 REP03302
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		Laboratory No. 9926



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		DIRECT SHE Test Method: AS 1289.6	EAR TEST I .2.2 / KH2 based or	REPORT NK.H. Head Vol. 2					
Client	Tetra Tech Au	stralia Pty Ltd		Report No.	12080183	3- DS			
Project	Christmas Cre	ek	Test Date Report Date	10/08/20 ²	12				
Client ID	Sample #30			Depth (m)	0.00-3.00				
Description		Sample Type Three individual -4.75mm specimens - remoulded as							
Failure Crit	eria	Re	esidual @ 7 ı	mm Displaceme	ent				
		Residual - Normal	Stress vs She	ear Stress					
200									
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(a)									
s (kF									
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		▲ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■							
50									
0 0	50	100	150	200	250	300			
		Noi	rmal Stress (kPa)						
Shea	r Angle (°)	28.2	Cohesion	(kPa) 12.7	R ²	0.999			
Specimen Con	ndition	Inundated	Normal	Stress (kPa)	Shear	Stress (kPa)			
Specimen Dim	ensions (mm)	60*60	Stage 1	50.1	050	41.2			
Rate of Strain	(mm/min)	0.008	Stage 2	100.3		64.1			
Initial Moisture	Content (%)	13.7 2.53	Stage 3	199.9		120.5			
otes/Remarks:	Please review the	results if the Cohesion	is above 2 kPa wl	hen plotted with a line	of best fit				
raph not to sca	Note: Area corrected	tion based on square s	ample equation. Sample/s supplied	d by the client	F	Page 2 of 4 REP033			
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results of document	the tests, calibrations, ar are traceable to Australi	d/or measurements included an/National Standards.	I in this	J. Russell					
			V			aboratory No. 001			
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Client Tetra Tech Australia Pty Ltd Report No. 12080183- DS Project Christmas Creek Test Date 10/08/2012 Client ID Sample #30 Depth (m) 0.00-3.00 Description Sample Type Three individual -4.75mm specimens - remoulded as recuested by the client Failure Criteria Peak Page 30 Depth (m) 0.00-3.00 Description Sample Type Training and the sample of the		Tes	DIRECT SH at Method: AS 1289	EAR TES	On K.H. Head	(T Vol. 2				
Project Christmas Creek Test Date 10/08/2012 Client ID Sample #30 Depth (m) 0.00-3.00 Description Sample Type Three individual -4.75mm specimens - remoulded as reduced by the client Failure Criteria Peak Provide the client Provide the client Peak Peak Peak Peak Peak - Normal Stress vs Shear Stress Output of the client Peak - Normal Stress vs Shear Stress Output of the client of the client Output of the client of the client Output of the client of the cl	Client	Tetra Tech Austra	alia Pty Ltd	, ninz succu	Repo	rt No.	1208018	3- DS		
Report Date 14/08/2012 Client ID Sample #30 Depth (m) 0.00-3.00 Description Sample Type Infree individual -475mm specimens - remoulded as requested by the client Failure Criteria Peak Peak Description Sample Type Three individual -475mm specimens - remoulded as requested by the client Failure Criteria Peak Peak Output of the client Stress vs Shear Stress Output of the client Stress vs Shear Stress To the client Stress vs Shear Stress (kPa) To the client Stress (kPa) Stear Angle (°) 28.7 Cohesion (kPa) 12.0 R ² 0.999 Specimen Condition Inundated Stress (kPa) Stear Angle (°) 28.7 Cohesion (kPa) 12.0 R ² 0.999 Specimen Condition Inundated Stage 1 50.1 dit 12. Stear Angle (°) 28.7 Cohesion (kPa) 12.0 R ² 0.999 Specimen Condition Inundated Stage 1 50.1 dit 12. Stear Stress (kPa) Stear Angle (°) 28.7 Cohesion (kPa) 12.0 R ² 0.999	Project	Christmas Creek			Test	Date	10/08/20	12		
Client ID Sample #30 Depth (m) 0.00-3.00 Description Sample Type Three individual 4.75mm specimens - remoulded as recuested by the client Peak Peak Depth (m) 0.00-3.00 Sample Type Three individual 4.75mm specimens - remoulded as recuested by the client Peak					Repo	rt Date	14/08/20	12		
Sample Type Trip(u) Sample Type Trip(u) Type Trip(u) Sample Type Induction Failure Criteria Peak Failure Criteria Peak Peak Normal Stress vs Shear Stress 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 0 150 <td>Client ID</td> <td colspan="9">Sample #30</td>	Client ID	Sample #30								
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reduested by the client Peak Specimen Condition Normal Stress (kPa) Specimen Condition <td>•</td> <td colspan="8">specimens - remoulded as</td>	•	specimens - remoulded as								
Peak - Normal Stress vs Shear Stress Peak - Normal Stress vs Shear Stress Peak - Normal Stress vs Shear Stress pegent of the stress of the	Failure Crite	eria			Peak	requested	a by the ci	lent		
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	document	are traceable to Australian/I	National Standards.	V	J. Russell					

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	D Test	IRECT SHEAR TEST R Method: AS 1289.6.2.2 / KH2 based on	EPORT (.H. Head Vol. 2	
Client	Tetra Tech Australi	a Pty Ltd	Report No. 12080183- D	S
Project	Christmas Creek		Test Date 10/08/2012	
			Report Date 14/08/2012	
Client ID	Sample #30		Depth (m) 0.00-3.00	
Descriptio	on	Sam	ple Type Three individual -4.75m	ım
			specimens - remoulded	as
	CLIENT: PROJECT:	Tetra Tech Australia Pty Christmas Creek	Ltd AFTER TEST	
	LAB SAMPLE No.	12080183	DATE: 13/8/12	
	BOREHOLE:	Sample #30	DEPTH: 0.00-3.00	
Notes/Remark	s: Please review the resu Note: Area correction b	Its if the Cohesion is above 2 kPa whe	en plotted with a line of best fit	
Photo not to so	cale	Sample/s supplied	by the client Page	4 of 4 REP03302
This do require results docum	bcument is issued in accordance w ments. Accredited for compliance of the tests, calibrations, and/or m ent are traceable to Australian/Na	with NATA's accreditation with ISO/IES 17025. The neasurements included in this tional Standards.	Authorised Signatory <i>Jamus Quull</i> J. Russell	NATA NATA TOMPETENCE



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	OEDOMETER TEST REPORT								
			Те	st Method:	AS1289.6.6	1, 3.5.1			
Client:	Tetratech Pty Ltd				Rep	oort No.: P	12060523-OED		
Project:	Christmas Creek				та	ot Data: 22	17/2042		
					Repo	ort Date: 5/0)8/2012		
Client Id.:	#2				De	pth (m): 0.0)-3.0		
Description:	SILTY SAND- brow	wn							
<u> </u>				TEST I	RESUL	TS			
Stage	Load	Cc	k	Cv (ı	n²/yr)	Mv (kPa ⁻¹ x10 ⁻³)) C _a x 10 ⁻³	% Consolidation	
	(kPa)		(m/s)	t ₅₀	t ₉₀				
1	25-52	0.001	2.E-10	1.34	45.00	0.012	0.50	0.0	
2	52-102	0.013	8.E-10	5.30	51.66	0.052	0.43	0.3	
3	102-202	0.018	6.E-10	32.57	53.15	0.036	0.48	0.7	
4	202-403	0.025	4.E-10	53.00	45.72	0.025	0.72	1.2	
5	403-804	0.057	7.E-10	44.04	73.41	0.030	1.51	2.3	
6	804-1606	0.120	7.E-10	56.55	71.92	0.032	2.34	4.8	
7	1606-403	0.011	8.E-11	4.25	68.05	0.004	0.11	4.4	
8	403-102	0.009	2.E-10	15.91	48.52	0.012	0.25	4.0	
Remarks:	Sample remoulded as request	ed by the clien	t					Page 2 of 2	



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			OEDO		<u>A TEST</u>	REPORT			
Client:	Tetratech Pty Ltd		10	st method.	Report No.: P 12060527-OED				
Project:	Christmas Creek				Τe	est Date: 23/7/2	012		
					Repo	ort Date: 10/08/	2012		
Client Id.:	#4				De	epth (m): 0.00-3	.0		
Description:	SILTY SAND- bro	wn							
				<u>TEST I</u>	RESUL	<u>TS</u>			
Stage	Load	Cc	k	Cv (m²/yr)	M∨ (kPa ⁻¹ x10 ⁻³)	C _a x 10 ⁻³	% Consolidation	
	(kPa)		(m/s)	t ₅₀	t ₉₀				
1	12.5-27	0.000	7.E-11	0.81	64.38	0.004	0.31	0.0	
2	27-52	0.002	7.E-10	0.62	109.51	0.022	0.26	0.1	
3	52-101	0.015	1.E-09	1.00	61.67	0.068	0.52	0.4	
4	101-202	0.025	7.E-10	0.58	39.47	0.060	0.93	1.0	
5	202-403	0.089	9.E-10	11.46	28.79	0.105	2.44	3.1	
6	403-803	0.149	9.E-10	60.72	33.52	0.090	2.96	6.6	
7	803-1604	0.154	6.E-10	73.32	40.61	0.049	3.06	10.3	
8	1604-403	0.008	7.E-11	18.78	63.26	0.004	0.03	9.9	
9	403-101	0.007	3.E-10	10.49	66.09	0.012	0.29	9.5	
Remarks:	Sample remoulded as reques	ted by the clien	t	I	<u> </u>		<u> </u>	Page 2 of 2	



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	OEDOMETER TEST REPORT Test Method: AS1289.6.6.1, 3.5.1 Client: Tetratech Pty Ltd Report No.: P 12060531-OED												
Client:	Tetratech Pty Ltd				Rep	oort No.:	P 120	60531-OED					
Project:	Christmas Creek				т	oct Data:	012						
					Rep								
Client Id.:	#9				Depth (m): 0.00-3.0								
Description:	SILTY SAND- brow	wn											
TEST RESULTS													
Stage	Load	Cc	k	Cv (I	m²/yr)	Mv (kPa ⁻¹	x10 ⁻³)	C _a x 10 ⁻³	% Consolidation				
	(kPa)		(m/s)	t ₅₀	t ₉₀								
1	12.5-27	0.000	3.E-11	0.47	25.92	0.004	ļ	0.25	0.0				
2	27-51	0.001	5.E-11	0.40	27.96	0.005	5	0.19	0.0				
3	51-101	0.014	1.E-09	0.34	59.10	0.053	3	0.46	0.3				
4	101-202	0.016	3.E-10	0.96	32.92	0.030)	0.43	0.6				
5	202-402	0.022	4.E-10	1.10	62.65	0.021	l	0.19	1.0				
6	402-802	0.040	2.E-10	1.46	29.83	0.019)	0.77	1.8				
7	802-1603	0.147	4.E-10	17.74	39.11	0.035	5	3.24	4.5				
8	1603-402	0.009	4.E-11	29.82	41.38	0.003	3	0.07	4.2				
9	402-101	0.008	1.E-10	22.51	29.68	0.010)	0.30	3.9				
Remarks:	Sample remoulded as request	ed by the clien	t						Page 2 of 2				



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			OEDO	METER		REPORT						
		-	Te	est Method:	AS1289.6.6	.1, 3.5.1						
Client:	Tetratech Pty Ltd				Report No.: P 12060535-OED							
Braiact	Christman Crock											
Project:	Christinas Creek				Test Date: 23/7/2012							
Client Id :	#19				Ponth (m): 0.00.2.0							
Description:	SILTY SAND- bro	wn				9 cm (m): 0.00-0	.0					
<u>TEST RESULTS</u>												
Store												
Stage	Loau	UC	ĸ	CV (I	m /yr)	WIV (KPa XIU)	C _a XIU	% consolidation				
	(kPa)		(m/s)	t ₅₀	t ₉₀							
1	12.5-27	0.002	6.E-10	0.22	75.26	0.025	0.22	0.0				
2	27-52	0.002	2.E-10	1.45	36.64	0.018	0.38	0.1				
3	52-101	0.006	2.E-10	0.86	28.09	0.023	0.21	0.2				
4	101-202	0.012	5.E-10	0.57	65.11	0.023	0.44	0.4				
5	202-402	0.013	2.E-10	0.73	51.16	0.013	0.37	0.7				
6	402-802	0.019	7.E-11	0.45	23.43	0.010	0.50	1.1				
7	802-1602	0.033	1.E-10	0.43	56.49	0.008	0.68	1.7				
8	1602-402	0.009	6.E-11	28.95	70.60	0.003	0.09	1.4				
9	402-101	0.007	2.E-10	13.03	72.97	0.009	0.22	1.1				
Remarks:	Sample remoulded as reques	ted by the clien	t					Page 2 of 2				



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Brisbane 346A Bilsen Road, Geebung QLD 4034 Ph: +61 7 3265 5656 Perth 2 Kimmer Place, Queens Park WA 6107 Ph: +61 8 9258 8323

Client: Tetra Tech Australia Pty Ltd Project: Christmas Creek Test Date: 14/08/2012 Report No.: 12080179 - CU Test Date: 21/08/2012 Report Date: 21/08/2012 Report Date: 21/08/2012 Report Date: 21/08/2012 Destription: SANDY GRAVELLY SILT- red brown SAMPLE & TEST DETAILS Initial Height: 2000 mm Finel Mosture Content: 9.2 % Initial Mosture Content: 9.2 % Finel Mosture Content: 9.2 % Rate of Strain: 0.006 %/min BResponse: 98 % Wot Density: 244 tm Mohr Circle Diagram							TRIAXI Tes	AL TES	ST R S1289.6	EPC	ORT				
Project: Christmas Creek Test Date: 14/08/2012 Report Date: 21/08/2012 Depth (m): 0.00-3.00 Description: SANDY GRAVELLY SILT- red brown SAMPLE & TEST DETAILS Initial Diemetric 1000 mm Initial Moisture Content: 9.2 % UD Rate: 2.0:1 Wet Density: 2.67 km³ Dry Density: 2.44 km³ B Response: 9.8 % Wet Density: 2.44 km³ Dry Density: 2.44	Clie	nt:		Tetra	a Tech Ai	ustralia Pty	Ltd		Re	port	No.:	12080179 - CU			
Project: Christmas Creek Test Date: 14/08/2012 Report Date: 21/08/2012 Description: SAMPLE & TEST DETAILS Initial Heigh: 20.0 mm Initial Diameter: 100.0 mm Initial Moisture Content: 9.2 % Rate of Strain: 0.006 %/min Initial Diameter: 100.0 mm Initial Moisture Content: 9.2 % Rate of Strain: 0.006 %/min Initial Diameter: 100.0 mm Initial Moisture Content: 9.2 % Rate of Strain: 0.006 %/min IDP Ratio: 2.0.1 Mohr Circle Diagram Idm Mohr Circle Diagram Idm Idm <th></th>															
Report Date: 21/08/2012 Description: SAMDY GRAVELLY SILT- red brown: SAMPLE & TEST DETAILS Initial Height 2000 mm Initial Moisture Content: 9.2 % Initial Juenster: 100.00 mm Initial Moisture Content: 9.2 % UD Ratio: 20.01 mm Difference Path of Strain: 0.006 %/m Initial Diameter: 100.00 mm Initial Moisture Content: 9.2 % Rate of Strain: 0.006 %/m UD Ratio: 20:1 Mohr Circle Diagram 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 <	Pro	ject:		Chris	stmas Cr	eek			Т	est D	ate:	14/08/2012			
Depth (m): 0.00-3.00 Description: SANDY GRAVELLY SILT- red brown SAMPLE & TEST DETAILS Initial Height: 200.0 mm Initial Moisture Content: 9.2 % Rate of Strain: 0.006 %/min Initial Diameter: 100.0 mm Initial Moisture Content: 9.2 % Rate of Strain: 0.006 %/min Initial Diameter: 100.0 mm Initial Moisture Content: 9.2 % Rate of Strain: 0.006 %/min UD Ratio: 20:1 m Wel Density: 2.44 t/m ³ B Response: 98 % Mohr Circle Diagram 0000 mm 1000 0000 mm 1000 0000 mm Jointial Meighte: Mohr Circle Diagram 0000 1000 0000 Jointial Meight: Jointial Meight: Jointial Meight: Jointial Meight: Jointial Meight: Jointial Meight: Jointial Meight: </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Rep</td> <td>ort D</td> <td>ate:</td> <td>21/08/2012</td> <td></td> <td></td> <td></td>									Rep	ort D	ate:	21/08/2012			
Description: SANDY GRAVELLY SILT- red brown SAMPLE & TEST DETAILS Initial Height: 200 mm Initial Dianeter: 1000 mm LD Reto: 20:1 Initial Moisture Content: 13.2 % Wet Density: 2.67 tm ³ Dry Density: 2.44 tm ³ Mohr Circle Diagram 1000 00 00 00 00 00 00 00 00	Clie	nt Id.		Sam	ple #2				D	epth	(m):	0.00-3.00			
SAMPLE & TEST DETAILS Initial Height 200.0 mm Initial Moisture Content: 9.2 % Rate of Strain: 0.006 %/min UD Ratic: 20.1 Initial Moisture Content: 11.3 % B Response: 98 % Mohr Circle Diagram Initial Provide the state of Strain: 0.006 %/min Bresponse: 98 % Mohr Circle Diagram Initial Moisture Content: 11.3 % Mohr Circle Diagram Initial Moisture Content: 11.3 % Mohr Circle Diagram Interpretation detween states: 100 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000	Des	cripti	on·	SAN	DY GRA	VELLY SIL	T- red bro	wn		- pui	<u>,.</u>				
Initial Height: 200.0 mm Initial Diameter: 100.0 mm UD Ratio: 2.0:1 Initial Moisture Content: 11.3 % Wet Density: 2.67 tm³ Dry Density: 2.44 tm³ Initial Diameter: 100.0 mm Wet Density: 2.44 tm³ Initial Diameter: 100.0 mm Mohr Circle Diagram Initial Diameter: 100.0 mm Initial Diameter: 100.0 mm B Response: 98 % Interpretation density of the state of Strain: 0.006 %/min B Response: 98 % Initial Diameter: 100.0 mm Initial Dia	200	onpe	•	0/ 11			SAM	PLE & TES	ST DET	AILS					
Initial Diameter: 100.0 mm L/D Ratio: Final Moisture Content: 11.3 % Wet Density: 26.7 t/m ³ Dry Density: 24.4 t/m ³ Mohr Circle Diagram		Initial H	leight:	200	.0 mm		Initial Moist	ture Content:	9.2	%		Rate of Str	ain:	0.006	%/min
LD Retic: 2.0:1 Wel Density: 2.67 tm ² Dry Density: 2.44 tm ³ Mohr Circle Diagram 100 00 00 00 00 00 00 00 00 0	In	itial Diar	neter:	100	.0 mm		Final Moist	ture Content:	11.3	%		B Respor	nse:	98	%
Ury Density: 2.44 unit Mohr Circle Diagram 1000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 </td <td></td> <td>L/D</td> <td>Ratio:</td> <td>2.0</td> <td>: 1</td> <td></td> <td>N N</td> <td>Wet Density:</td> <td>2.67</td> <td>t/m³</td> <td></td> <td></td> <td></td> <td></td> <td></td>		L/D	Ratio:	2.0	: 1		N N	Wet Density:	2.67	t/m ³					
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Cohesion C' (kPa): 22.9 4.8 14.0 Angle of Shear Resistance Φ' (Degrees): 36.5 38.1 37.6 Failure Criteria: Peak Principal Stress Ratio Sample Type: Single Individual Specimen (-19.0mm) remoulded to a target of 98% of Standard Maximum Dry Density Note: Graph not to scale						Interpret	ation betwee	en stages :	1 to 2	2 t	:03	1 to	3		
Failure Oriteria: Peak Principal Stress Ratio Sample Type: Single Individual Specimen (-19.0mm) remoulded to a target of 98% of Standard Maximum Dry Density Sample/s supplied by the client Note: Graph pot to scale					Anala	of Shear Dea	Cohesioi	n C' (kPa) :	22.9	4	.8 2 1	14.(27.4			
Sample Type: Single Individual Specimen (-19.0mm) remoulded to a target of 98% of Standard Maximum Dry Density Sample/s supplied by the client					Angle	or Shear Kes	stance Φ' (Failu	re Criteria	эо.э Peak F	orincina	u. I Il Stres	s Ratio	J		
Sample/s supplied by the client Note: Granh not to scale	Sample	e Type:		Single I	ndividual Spec	cimen (-19.0mm)	remoulded to a	target of 98% c	of Standard	d Maximu	um Dry [Density			
	Sample	e/s suppl	ied by t	the clien	t	. ,		-	Note: Grap	h not to	scale	•			



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				TRIA	XIAL TE	EST R : AS1289.	EPOR 6.4.2	Т				
Client:	Tetra T	ech Aust	ralia Pty	Ltd		Rep	ort No.:	12080	179 - CU			
Project:	Christm	nas Creel	K			Tes	st Date:	14/08/	/2012			
-						Reno	rt Dato:	21/08/	/2012			
Client Id.:	Sample	e #2				Der	oth (m):	0.00-3	3.00			
Descriptio	n: SANDY	GRAVE	LLY SIL	T- red br	rown	•	. /					
Stress/Strain & Pore Pressure/Strain Diagram												
160	° [350	
	-											
140											- 300	
120	0								1		- 250 _	
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r Str	-							X			Pres	
Deviato:							\neg	/			+ 150	
60	0						\top				- 100	
40	0						+/-					
20	0			/		Shear Stress					- 50	
										e Pressure		
	0		/	Cane -		. 6	2				o	
	0	1		2		3		4		5	6	
						Strain %						
					FAILURE	DETAILS	S					
		Back	Initial	Failure		Principa	Effective Str	esses		Deviator Stress	Strain	
Confining P	Pressure	F02 kDa	FO2 HDa	Pore	σ' ₁	De	σ' ₃	Do	σ'_1 / σ'_3	112 10-	1 47 0/	
748 Ki 789 ki	Fa Pa	301 kPa	303 кРа 301 kРа	547 kPa	1042 k	iPa	1∠0 k 242 k	Fa Pa	4.000	445 KPa 800 kPa	3.48 %	
1050 k	κPa	304 kPa	304 kPa	591 kPa	1959 k	Pa	459 k	Pa	4.268	1500 kPa	5.34 %	
Sample Type:	Single Indiv	idual Specime	n (-19.0mm) r	emoulded to	a target of 98%	of Standard	Maximum Dry	Density	· · · · · · · · · · · · · · · · · · ·			
Sample/s supplied	by the client				Ν	ote: Graph i	not to scale					



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				TRIA	XIAL T	EST RE d: AS1289.6.4.		Т				
Client:	Tet	ra Tech A	ustralia Pt	y Ltd		Report	No.:	1208017	9 - CU			
						-						
Project:	Ch	ristmas Cı	reek			Test Date: 14/08/2012						
-						Report D)ate:	21/08/20	12			
Client Id ·	Sa	mnle #2				Denth	(m):	0.00-3.00)			
Descriptio	n'SA	NDY GRA		I T- red br	own	Deptil	().	0.00 0.00	,			
<u>2000.</u>												
				MIT Meth	od - Eff	ective Stres	ss Pat	h				
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	1400 -	-										
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					s =	$(\sigma'_{1} + \sigma'_{3})/2$	kPa					
					2	1 - 5/						
Sample Type:	Singl	e Individual Spe	cimen (-19.0mm	n) remoulded to	a target of 98°	% of Standard Max	imum Dry	Density				
Sample/s supplied	d by the o	client				Note: Graph not to	o scale					



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				TI		KIAL 7	EST	REPOR 9.6.4.2	RT		
lient:	Tet	ra Tech A	ustralia	a Pty Ltd			Rep	ort No.:	12080179	9 - CU	
roject:	Chi	istmas C	reek				T€	Test Date: 14/08/2012			
							Repo	ort Date:	21/08/201	12	
lient Id.:	Sar	mple #2					De	pth (m):	0.00-3.00)	
escriptic	n:SA	NDY GRA	VELLY	SILT- r	ed bro	own					
				Cam	bridg	e Metho	od - Effe	ective Str	ess Path		
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		-						(
	1400 -	-									
		-									
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kPa		-									
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a'' - 0		-									
9) = b											
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	0 -) 2	200	400	6	600	800	1000	1200	1400	1600
					I	$\sigma = (\sigma'_1 + 2)$	σ' ₃)/3 kI	a			
nole Type:	Cincl	Individual Sa	ocimon (10	(mm) rome:	Idad to c	target of 00	% of Standa	d Maximum Dr	v Density		
mple/s supplie	d by the c	lient		.oning remou		a laiyel UI 90	Note: Graph	not to scale			



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		TRIAXIAL 1 Test Metho	EST REPOR	RT
Client:	Tetra Tech Australia	Pty Ltd	Report No.:	12080179 - CU
Project:	Christmas Creek		Test Date:	14/08/2012
			Report Date:	21/08/2012
Client Id	I.: Sample #2		Depth (m):	0.00-3.00
Descript	tion: SANDY GRAVELLY	SIL1- red brown		
1	CLIENT:	Tetra Tech Aus	tralia Ptv I td	
	PROJECT:	Christmas Cree	k	
	T I D C I T I D C I			AFTER TEST
	LAB SAMPLE No.	12080179		DATE: 20 of 12
	BOREHULE:	Sample #2		DEPTH: 0.00-3.00
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		and the second second	- Alerak	
	The second			A CONTRACTOR
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	Res Eres		ALC:	
Sample Type:	Single Individual Specimen (-19.	0mm) remoulded to a target of 98	% of Standard Maximum Dr	y Density
Sample/s supp	plied by the client		Note: Graph not to scale	
NAT	This Document is	issued in accordance with NATA's	Autho J	rised Signatory
ACCREDITE	accreditation required	ments. Accredited for compliance with esults of the tests, calibrations, and/or	1 Jam	u blussell
COMPETE	measurements inclu	ded in this document are traceable to	V J	. Russell



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		TRIAXIA Test M	L TE	AS1289.6.4.2	RT			
Clien	t:	Tetra Tech Australia Pty Ltd		Report No.	: 12080179) - CU		
Proje	ect:	Christmas Creek		Test Date	: 14/08/201	2		
				Report Date	: 21/08/201	2		
Clien	t Id.:	Sample #2		Depth (m)	: 0.00-3.00			
Desc	riptio	n: SANDY GRAVELLY SILT- red brown						
	1374 -	Volume v's Time (Log Sc	ale)				
	10/4							
	4070						— t0	
	1372 -							
	1370 -							
uls)	1368 -							
ume (I								
Vol	1366 -	-150					— t50	
	1364 -							
	1362							
	1002							
	-						— t100	
	1360 -					n	_	
	1358 + 0.0	1 0.1 1		10		100		 1000
		Т	l'ime (min	s)				
			C 1/7	36.00	m²/vear			
			Mv:	0.546	m²/MN			
			k:	6.23E-09	m/s			
Sample ⁻	Туре:	Single Individual Specimen (-19.0mm) remoulded to a target	t of 98% c	of Standard Maximum	Dry Density			
Sample/s	s supplied	l by the client	No	ote: Graph not to scale	. ,			



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		TRIA	XIAL TES	ST RI	EPORT			
Client:	Tetra Tech Aus	tralia Pty Ltd		Re	oort No.:	12080184 - CU		
Project:	Christmas Cree	k		Te	est Date: ort Date:	6/08/2012 21/08/2012		
Client Id ·	Sample #33			De	enth (m).	0.00-3.00		
Description		GRAVEL - red h	orown		<u>, pui (iii):</u>	0.00 0.00		
Description		SA	AMPLE & TES	ST DET	AILS			
Initial Heigh Initial Diamete L/D Rati	nt: 170.0 mm nr: 85.2 mm n: 2.0 : 1	Initial N Final N	loisture Content: loisture Content: Wet Density: Dry Density:	9.3 10.3 2.73 2.50	% % t/m ³ t/m ³	Rate of Si B Respo	train: 0.006 onse: 96	%/min %
		I	Mohr Circle	Diagra	am			
1400								
1000								
008 (kba)								
ar Stress								
9400 -								
200								
0	200 400	600 80	00 1000 Principa	120 al Stress	0 1400 (kPa)	1600 1800	2000	2200
		Interpretation bei	tween stages :	1 to 2		1 to	3	
	Angle of	Cohe Shear Resistance	SION C" (KPa) : 	31.5 38.4		15. 20	.4	
	Angle Of	F	ailure Criteria:	Peak P	rincipal Stres	s Ratio	v	
Sample Type:	Single Individual Specime	en (-19mm) remoulded to	a target of 98% of	Standard N	iaximum Dry De	nsity		
Sample/s supplied b	by the client		1	Note: Grap	h not to scale			



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				TRIA	KIAL T	EST R	EPOR 5.4.2	T			
Client:	Tetra Te	ech Aust	ralia Pty	Ltd		Repo	ort No.:	12080	84 - CU	l	
Project:	Christm	as Creeł	¢			Tes Repor	t Date: t Date:	6/08/20 21/08/2)12 2012		
Client Id.:	Sample	#33				Dep	th (m):	0.00-3.	00		
Descriptior	SILTY S	SANDY G	RAVEL	- red bro	own						
			Stress	/Strain a	& Pore P	Pressure/	/Strain D	Diagram			050
2000 Ed y 1500 1000 500									Sha	ear Stress re Pressure	- 300 - 250 e - 200 e - 200 e - 200 e - 150 - 100 - 50 - 0
	0	1	2		3	4 Strain %	5		6	7	8
					FAII I IR						
		Back	Initial	Failure		Principal	Effective St	resses		Deviator Stress	Strain
Confining P	ressure	Pressure	Pore	Pore	σ	1	σ'	3	$\boldsymbol{\sigma'}_1 / \boldsymbol{\sigma'}_3$		
747 kF	Pa	501 kPa	501 kPa	573 kPa	875	kPa	174	kPa	5.030	701 kPa	1.20 %
1000 k	Pa	501 kPa	501 kPa	656 kPa	1603	kPa kDa	344	kPa kPa	4.660	1259 kPa	2.59 %
1250 k	Pa	494 KPa	494 kPa	786 кРа	2098	кга	440	(ra	4.769	тьъх кра	4.90 %
Sample Type:	Single Individ	dual Specimer	n (-19mm) rer	moulded to a t	arget of 98%	of Standard M	aximum Dry [Density			· · · · · · · · · · · · · · · · · · ·
Sample/s supplied	by the client					Note: Graph n	ot to scale				



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				Т	RIAX	IAL T	EST RI	EPOR	T				
Client:	Tet	tra Tech	Australi	a Pty Lte	d		Repo	rt No.:	1208	0184 - 0	CU		
Project:	Ch	ristmas (Creek				Test	Date:	6/08/2	2012			
							Report	Date:	21/08	8/2012			
Client Id.:	Sa	mple #3	3				Dept	th (m):	0.00-3	3.00			
Descriptio	n: SIL	TY SAN	DY GR	AVEL - r	ed brow	/n							
				МІТ	Metho	d - Effe	ctive Str	ess Pat	:h				
	2000	-											
		-											
	1800 -												
	1.000	-											
	1000 -	-											
Pa	1400 -	-											
/2 k		-											
- d'3)	1200 -	-											
= (ơ' ₁		-											
t :	1000 -	-											
		-											
	800 -	-					/						
	600 -	-					/						
	000	-											
	400 -						/						
		-					/						
	200 -	-	/			+/-							
		-											
	0 -) 20	00 4	00 6	00 8	300	1000 12	200 1	400	1600	1800	2000	
						s =	$(\sigma'_{1} + \sigma'_{3})/2$	kPa					
a	<u></u>			•									
Sample Type: Sample/s supplie	Singl d by the o	e Individual S client	Specimen (-1	9mm) remou	lded to a targ	get of 98% (of Standard Ma Note: Graph no	ximum Dry [ot to scale	Density				
	.,												



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				Т	RIAXI Tes	AL T		REPO	RT				
Client:	Tetra	a Tech	Australia	a Pty Ltc	ł		Rep	ort No.:	1208	0184 - 0	CU		
	<u>.</u>		. .										
roject:	Chris	stmas (Creek				Те	st Date:	6/08/	2012			
		1					Repo	ort Date:	21/0	8/2012			
lient Id.:	sam	ріе #33 V SAN		\/EL_r	ad brown		De	pth (m):	0.00	-3.00			
escripti		I OAN				1							
				Cam	bridge	Metho	d - Effe	ctive St	ress Pa	ath			
	²⁰⁰⁰ [—––	
	-												
	1800												
	1600												
	1000					/							
cPa	1400												
5'3) k	-				· /								
α' ¹ - 0	1200				+ +								
d = b	1000												
	1000												
	800 -												
	-			/									
	600 -												
	-												
	400					1							
	200			/									
	-												
	1 0 0	20	<u> </u>	<u> </u>	00 8	00	1000	1200	1400	1600	1800	2000	
					n –4	σ' ± ?-	')/ 2 I-TI	9					
					h =(<u>0</u> 1+20	3 <i>)13</i> KP	a					
nple Type: nple/s suppli	Single I ed by the clie	Individual S ent	pecimen (-19	mm) remould	ded to a targe	et of 98% c	f Standard	Maximum Dry	Density				



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		TRIAXIAL T Test Metho	EST REPOR	RT
Client:	Tetra Tech Australia F	Pty Ltd	Report No.:	12080184 - CU
Project:	Christmas Creek		Test Date:	6/08/2012
			Report Date:	21/08/2012
Client Id.:	Sample #33		Depth (m):	0.00-3.00
Descriptio	n: SILTY SANDY GRAV	EL - red brown		
	CLIENT:	Tetra Tech Aus	tralia Pty Ltd	
	PROJECT:	Christmas Cree	ek	AFTER TEST
	LAB SAMPLE No.	12080184		DATE M AQ IA
1 Sector	BOREHOLE:	Sample #33		DEPTH: 0.00-3.00
		Shipic nee		DEI 111. 0.00-5.00
Sample Type:	Single Individual Specimen (-19mm) remoulded to a target of 98%	of Standard Maximum Dry	Density
Sample/s supplied	d by the client		Note: Graph not to scale	
	This Document is iss accreditation requirement ISO/IEC 17025. The resu measurements included	ued in accordance with NATA's nts. Accredited for compliance with ults of the tests, calibrations, and/or I in this document are traceable to	Autho	nised Signatory A Russell



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			TR	Test	L TE	ST REP(AS1289.6.4.2	ORT				
Client	:	Tetra Tech Aus	tralia Pty Ltd			Report No	o.: 120)80184 - C	U		
Projec	ct:	Christmas Cree	łk			Test Dat	te: 6/0	8/2012 08/2012			
Client	ld.:	Sample #33				Depth (n	n): 0.0	0-3.00			
Descri	iption	SILTY SANDY	GRAVEL - red	d brown		\	1				
			Volume	v's Time	(Log Scal	e)					
	969										
Volume (mls)	965	. 150 — — — — — — — — — — — — — — — — — — —	+	·						t50	
	961 —			V.							
	959	t 100 — — — — — — — —								t100	
	957	0.1		1	Time (mins)	10		100	1(
					Cv: Mv: k:	303.47 0.042 3.91E-09	m²/yea m²/MN m/s	r			
Sample Ty Sample/s s	vpe: supplied	Single Individual Specim by the client	en (-19mm) remoulde	d to a target	of 98% of Si Note	tandard Maximum e: Graph not to sca	Dry Density ale				



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lient Tetra Tech Australia P	Pty Ltd	Report No.	12080179-SD
Project Christmas Creek		Test Date	21/08/2012
		Report Dat	e 22/08/2012
Sample No.		12080179	-
Client ID		Sample #2	
Depth (m)		0.00-3.00	-
Slake Durability (2nd cycle) (%)		36.1	-
Slake Durability (1st cycle) (%)		38.0	-
Water Used		Тар	-
Temperature (°C)		21.1	-
Appearance of fragments retained in the dru	ım	Moderate Deterioration	-
Appearance of fragments passing through the	ne drum	Fragments & Fines	-
Sample No.		-	-
Client ID		-	-
Depth (m)		-	-
Slake Durability (2nd cycle) (%)		-	-
Slake Durability (1st cycle) (%)		-	-
Water Used		-	-
Temperature (°C)		-	-
Appearance of fragments retained in the dru	im	-	-
Appearance of fragments passing through the	ne drum	-	-
TES/REMARKS: Sample remoulded to 98% mple/s supplied by the client This document is issued in accordance with NATA's accreditation requirements. Accredited for complianc ISO/IES 17025. The results of the tests, calibrations, measurements included in this document are traceab	MMDD @ 100% (ce with , and/or ole to	OMC Authorised Signatory	Page 1 of 1 REI
Australian/National Standards.	$\overline{\nu}$		Laboratory No.





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				Test Method	AIIUNJ AS 1289 5 1 1		PUR	1	
lient		Tetratech F	Pty Ltd	i cot metriou.		Report No.		12060523	-MDD
rojec	ct	Christmas	Creek			Test Date		13/07/201	2
						Report Date		17/07/201	2
lient	ID	#2				Depth (m		0.0-3.0	
)escr	iption	-							
	2.700]
	0.050								
	2.650								
	2.600								
	2.550								
	2.500 -								
) (E	2.450								
ty (t/m									
Densit	2.400								
Dry	2.350 -		4				•		
	2.300								
	2.250								
	2.200					10.0 11.0			
	4.0	5.0	<u>۵</u> .0	Moistu	9.0 Ire Content (9	10.0 11.0	12.0	13.0	
Ma	aximum Dr	y Density (t/m³)	2.53	Optimum	Moisture Cor	ntent (%)		9.5	
Мо	oisture Co	ntent (%)	3.3	Percentag	e of Oversize	e/Sieve Size (mm)		0/19	
ES/RE	MARKS:	This is a com	puter generate	ed plot so estim	ates may sho	w some minor variation	ons		
nple/s	supplied by	from the result	ults summarise	ed.	-			Page 1 of 1	REP31
Th	nis document	s issued in accordan	ce with NATA's		Authoris	ed Signatory			
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m	easurements	included in this docu	ment are traceabl	e to	C H				TECHNICAL COMPETENCE





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		MOIS	TUR	E/DEN		Y REL	ATION	SHI	PTES	ST RE	POR	Т	
Client		Tetrate	ch Pty	/ Ltd	10	st method	<u>: A3 1269 5.</u>	1.1	Report	t No.		12060527	-MDD
Project		Christm	nas Ci	reek					Test D	ate		13/07/201	2
		#1							<u>Report</u>	nth (m)		0.00.2.0	2
	ion	#4							De	pun (m)		0.00-3.0	
		-											
	2.400												
	2.350							_					
	2.300												
								•					
(t/m³)	2.250					•							
nsity			•								•		
Dry De	2.200												
	2.150							_					
	2.100												
	9.0	10.0	11.	0 12.	.0	13.0	14.0	15.0	16.0	17.0	18	.0 19.0	
						WOISI	ire conten	(/0)					
Maxii	mum Dry	Density (t/	′m³)	2.27	(Optimum	Moisture C	Content	t (%)			15.0	
Moist	ture Cont	ent (%)		9.9	F	Percentag	e of Overs	ize/Sie	ve Size ((mm)		0/19	
ES/REMA	RKS:	This is a	compu	iter genera	ated pla	ot so estin	nates mav s	show so	ome mino	or variation	าร		
nnle/s sur	onlied by t	from the	result	s summari	ised.		- , -					Page 1 of 1	REP313
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accre ISO/IE	ditation requ ES 17025.	irements. Ac	credited	for compliants, calibration	nce with is, and/oi	r.	S	12	IN	~ <i></i>			
meas Austra	urements in alian/Nation	cluded in this al Standards.	docume	nt are tracea	able to		G. 1	Hami	lton				TECHNICAL

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		MOI	STUR	RE/DEN	SITY R			IIP TE	ST REPC	ORT		
Clien	ıt	Tetra	atech Pt	ty Ltd		1100. AS 120	5 5.1.1	Repor	t No.	1	2060529	-MDD
Proje	ect	Chris	stmas C	Creek				Test D	Date	1	3/07/201	2
								Repor	t Date	1	7/07/201	2
Clien	t ID	#8						De	epth (m)	C	0.00-3.0	
Desc	ription	-										
	2.700											
	2.650											
	2.600											
								•				
	2.550											
									•			
+/m 3)	2.500											
city /												
	2.450											
	5 2.400											
	2.350											
	2.300	5.0 6.	0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	
					Мо	oisture Con	itent (%))				
	<i>l</i> aximum	Dry Density	/ (t/m³)	2.59	Optim	um Moistu	re Conte	ent (%)			11.5	
N	loisture (Content (%)		6.7	Perce	ntage of Ov	/ersize/\$	Sieve Size	(mm)		0/19	
	EMADKe	Thic i		uter generat	ed plot so c	stimates m	avenav	some min	or variations			
	s supplied	from	the resul	ts summaris	ed.		ay 0110W				Page 1 of 1	REDator
pie/s		ent is issued in	accordance	e with NATA's		A	horise	d Signat	ory		raye i Ui I	
i	accreditation	requirements.	Accredite	d for compliance	e with and/or	Aut (ury		I	
l	measureme Australian/N	nts included in t	this docum	ent are traceab	le to		G. Har	nilton	2			
			tosts nor	formed apply	only to the or	ocific instrum	oont or or	mole at the	time of test unly	ace oth		ory No. 992





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liant		Totrotooh)+v +d	Test Method:	AS 1289 5.1.1				
lient		i etratech F	ry Lta			Report	No.	1206053	1-MDD
rojec	t	Christmas (Creek			Test Da	ate	12/07/20	12
						Report	Date	16/07/20	12
lient	ID	#9				Dep	oth (m)	0.00-3.0	
escri	ption	-							
	2.800 -			1	-	-			
	2.750								
	2.700								
	2.650				×	1			
	2.600								
	0.550				1		•		
(t/m ³)	2.550 -								
nsity	2.500								
ry De	2.450			×					
	2.400								
	2.350								
	2.300 4.0	5.0	6.0	7.0	8.0	9.0 1	0.0 11.	.0 12.0	
				Moistu	re Content (%)			
Ma		v Density (t/m ³)	2.67	Optimum N	loisture Co	ntent (%)		9.5	
				-					
Мо	isture Cor	itent (%)	7.1	Percentage	e of Oversiz	e/Sieve Size (mm)	0/19	
ES/REM	MARKS:	This is a com	puter generate	ed plot so estima	ates may sho	w some minor	variations		
nple/s s	supplied by	from the resu the client	Ilts summarise	ed.				Page 1 of	1 REP3
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aco ISC	creditation red D/IES 17025.	uirements. Accredit The results of the te	ed for compliance sts, calibrations,	e with and/or	SI	セア	÷		
me	asurements i	ncluded in this docur	nent are traceabl	e to	C II	~			COMPETENCE

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		MOISTUR	E/DEN	SITY RE	LATION	SHIP TI	EST REP	OR	Γ	
lient		Tetratech Pt	y Ltd	Test Meth	<u></u>	Rep	ort No.		12060533	-MDD
Project		Christmas C	reek			Test Rep	t Date ort Date		12/07/201 16/07/201	2 2
Client I	D	#13					Depth (m)		0.00-3.0	
Descrip	otion	-								
	2.500									7
	2.450									
	0.400									
	2.400									
	2.350									
	2.300						-			
J_3)	2.250									
sity (t/n	2.200									
y Dens	0.450	•								
	2.150									
	2.100									
	2.050									
	2.000		10.0	11.0	12.0	13.0	14.0	15.0	16.0	
	0.0	0.0	10.0	Moi	sture Content	(%)	14.0	10.0	10.0	
Мах	timum Dr	y Density (t/m³)	2.31	Optimu	n Moisture C	ontent (%)			13.5	
Moi	sture Cor	ntent (%)	11.1	Percent	age of Oversi	ze/Sieve Si	ze (mm)		0/19	
TES/REM	IARKS:	This is a comp	uter generat	ed plot so es	imates may sl	now some m	ninor variations			
mple/s si	upplied by	from the result the client	ts summaris	ed.					Page 1 of 1	REP31
This	document i reditation red	s issued in accordance guirements. Accredite	e with NATA's d for complianc	e with	Author	ised Sign	atory		I	
ISO mea	/IES 17025. Isurements i	The results of the tes ncluded in this docum	ts, calibrations, ent are traceab	and/or le to	<u> </u>		2			ACCREDITED FOR TECHNICAL COMPETENCE
Aus	ualian/Natio	nai Standards.	formed!						Laborato	ory No. 9





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		MOISTU	RE/DENS			HIP TEST RE	PORT	Г	
Client	t	Tetratech	Pty Ltd	Test Method	I. AG 1209 J.1.1	Report No.		12060535	-MDD
Projec	ct	Christmas	Creek		Test Date Report Date		7/12/2012 13/07/2012		
Client	t ID	#19				Depth (m)	0.00-3.0	
Descr	ription	0				• • •	,		
	2 500								7
	2.000								
	2.450								
	2.400								
	2.350								
(E m)	2.300	•					•		
sity (t	0.050								
y Den	2.250								
Ā	2.200								
	2.150								
	2.100								
	7	.0 8.0	9.0 10	0.0 11.0 Moist	12.0 ure Content (%	13.0 14.0 6)	15.0	16.0	
Ma	aximum	Dry Density (t/m ³)	2.37	Optimum	Moisture Con	tent (%)		12.0]
M	oisture C	Content (%)	8.7	Percentag	ge of Oversize	/Sieve Size (mm)		0/19	
DTES/RE	EMARKS:	This is a cor	nputer generate	ed plot so estir	nates may show	w some minor variation	ons		
ample/s	supplied	from the res	ults summarise	ed.				Page 1 of 1	REP31301
TI ac IS	his docume ccreditation SO/IES 170	ent is issued in accorda requirements. Accred 25. The results of the	nce with NATA's ited for compliance ests, calibrations, a	e with and/or	Authoris	ed Signatory		I	
m Ai	neasuremer lustralian/Na	nts included in this docu ational Standards.	iment are traceable	e to	G. Ha	milton		Laborato	TECHNICAL COMPETENCE





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ient		Tetratech Pty Ltd								Report No.		12060537-MDD		
roject		Christmas Creek								Test Date		12/07/2012		
									Report Date			16/07/2012		
lient ID		#21							De	pth (m)		0.00-3.0		
escriptio	n	-												
2.60	00													
2.55	50													
2.50	00													
								-						
2.45	50						1							
- 24										•				
(t/m ² , 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,														
ensit)	50													
Dry D														
2.30	00													
2.25	50													
2.20	00	7.0	8.0	9.0	10	0.0	11.0	12.0	13.0	14.0	15.0	16.0		
						Moistu	ure Conte	ent (%)						
Maximu	m Dry I	Density (t/m	³) 2.4	48	Opt	timum	Moisture	Conte	nt (%)			12.0		
Moistur	e Conte	ent (%)	8	.4	Per	centag	je of Ove	rsize/S	ieve Size	(mm)		0/19		
ES/REMARK	<u>S:</u>	This is a co	omputer ge	nerated	d plot s	so estin	nates may	show s	some minc	or variation	s			
ple/s suppli	ed by th	from the re	esults sum	marised	d.							Page 1 of 1	l REP3 [.]	
This docu	ument is i	ssued in accord	lance with N/	ATA's		-	Auth	orised	l Signato	ory				
accredita ISO/IES	tion requi 17025. T	rements. Accre he results of the	eaited for con e tests, calibr	ations, a	with nd/or		L.	11	ZL				V	

he results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details. Trilab Pty Ltd ABN 25 065 630 506





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		_			Test Met	hod: AS 1289	5.1.1				
Client		Tetrate	ech Pty	Ltd		Re	port No.		12060541-MDD		
Project		Christ	mas Cre	ek		Tes	Test Date		12/07/2012		
						Re	Report Date		16/07/2012		
Client I	D	#26					Depth (m)		0.00-3.0		
Descrip	otion	-									
	2.700										7
	2.650										
	2.600										
	0.550										
	2.550										
	2.500										
	2 450						<u> </u>				
(t/m ³	2.100										
ensity	2.400		/						•		
	2.350 —										
	2.300										
	2.250										
	2 200										
	6.0	7.0	0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	
					Mo	visture Cont	ent (%)				
Max	kimum Dr	y Density ((t/m³)	2.51	Optim	um Moistur	e Content (%)			10.0	
Moi	sture Cor	ntent (%)		10.2	Percei	ntage of Ove	ersize/Sieve S	Size (mm)		0/19	_
TES/REM	IARKS:	This is a	a compute	er genera	ted plot so e	estimates ma	v show some	minor variations	3		
mple/e e		from th	ne results	summaris	sed.					Dave 4 of 4	
Thie	s document i	s issued in ac	cordance w	th NATA'e		A 1141	orisod Sim	natory		raye i of 1	
acc	reditation red	quirements. A	Accredited for	r compliant	ce with and/or	Auti				I	
me	asurements i	included in thi	is document	are traceat	ple to			\sim			

he results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated. Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details. Trilab Pty Ltd ABN 25 065 630 506





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		MOIS	SIUR	E/DE	NS	Test Met	ELAII hod: AS 12	UNS 89 5.1.1		SI REP	URI			
lient		Tetra	tech Pt	y Ltd			Repo	ort No.		12060545-MDD				
roject		Christmas Creek								Test Date		12/07/2012		
										Report Date		16/07/2012		
lient l	D	#33							C	epth (m)		0.0-3.0		
escrip	otion	-												
	2.700						1						7	
	2.650													
	2.600 -				_			_						
	2.550													
	2.500				_			\swarrow			\mathbf{A}			
(t/m³)	2.450													
nsity	2.400													
ry Dei	2 350													
	2.000													
	2.300				+			_						
	2.250							_						
	2.200 - 3.0	4.0)	5.0	6.0		7.0	8.0	9.0	10.0	11.0	12.0		
						Мо	isture Co	ntent (%	%)					
Max	kimum Dr	y Density	(t/m ³)	2.56		Optim	um Moist	ure Con	tent (%)			9.5		
Moi	isture Cor	ntent (%)		6.2		Percer	ntage of C	versize	/Sieve Siz	e (mm)		0/19	_	
							-1							
ES/REM	<u>IARKS:</u>	This is from t	s a comp the resul ^s	uter gener ts summai	rated rised	plot so e	stimates r	nay sho	w some mi	nor variations				
nple/s s	upplied by	the client										Page 1 of 1	REP31	
This acc	s document i reditation red	s issued in a quirements.	accordance Accredite	e with NATA' d for complia	's Ince w	vith	Au	thoris	ed Signa ∖ I ⊾	tory		I	NATA	
ISC mea)/IES 17025. asurements i	The results ncluded in t	of the tes	ts, calibration ent are trace	ns, an able t	d/or o		21.	さい	2				
Aus	stralian/Natio	nal Standard	ds.					G. Ha	milton			Laborato	ory No 9	