REPORT

CONDABRI CENTRAL SCL ASSESSMENT

PREPARED FOR ORIGIN

August 2018

Stantec

This document has been prepared for the benefit of Origin. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

This disclaimer shall apply notwithstanding that the report may be made available to Department of Environment and Science (DES) and other persons for an application for permission or approval to fulfil a legal requirement.

QUALITY STATEMENT

PROJECT MANAGER	PROJECT TECHNICAL LEAD
Paul Flint	Dean Lanyon

PREPARED BY		
Dean Lanyon	.....	26/08/2018
CHECKED BY		
Kate Sinclair	.....	27/08/2018
REVIEWED BY		
Kate Sinclair	.....	27/08/2018
APPROVED FOR ISSUE BY		
Paul Flint	.....	27/08/2018

ADELAIDE
Suite 406, 147 Pirie Street, ADELAIDE, SA 5000
TEL +61 8 8223 2214

REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
A	27/8/18	Draft for comment	DML	KS	KS	PF

Origin

Condabri Central SCL Assessment

CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1. Introduction

Origin Energy Resources Limited (Origin) is the upstream operator of Australia Pacific LNG Pty Limited (Australia Pacific LNG) within the Condabri Development Area. Origin intends to construct an additional brine pond (Pond 7) within Condabri Central Area (Appendix A: Map 1) as part of their petroleum activities. The construction and operation of petroleum activities is located within a Strategic Cropping Area (SCA) where an exemption under the RPI Act does not apply. The infrastructure is proposed to be constructed and operated under Petroleum Lease (PL) 265 and the Condabri Development Area Environmental Authority (EA) EPPG00853013. However, a portion of the activity is expected to disturb an area of 5.36 ha within an Environmentally Sensitive Area (ESA) Primary Protection Zone (PPZ) (defined under the EA) that is mapped SCA (Figure 1). The proposed disturbance within the PPZ will be referred to as the 'subject area'.

Following advice received from the Department of Infrastructure Local Government and Planning (DILPG) that Origin are required to demonstrate that the subject area was not originally Strategic Cropping Land (SCL) Stantec Australia were engaged to undertake a SCL assessment of the subject Statutory Guideline 08/14. Against this background, a SCL analysis against criteria stated in Schedule 3, Part 2 of the Regional Planning Interest Regulation 2014 is required to demonstrate compliance with Required Outcome 1 of the Assessment Criteria which states:

"*The activity will not result in a material impact on strategic cropping land on a property in the strategic cropping area*".

The following documents the SCL assessment process undertaken in relation to the subject area and SCL status outcome.

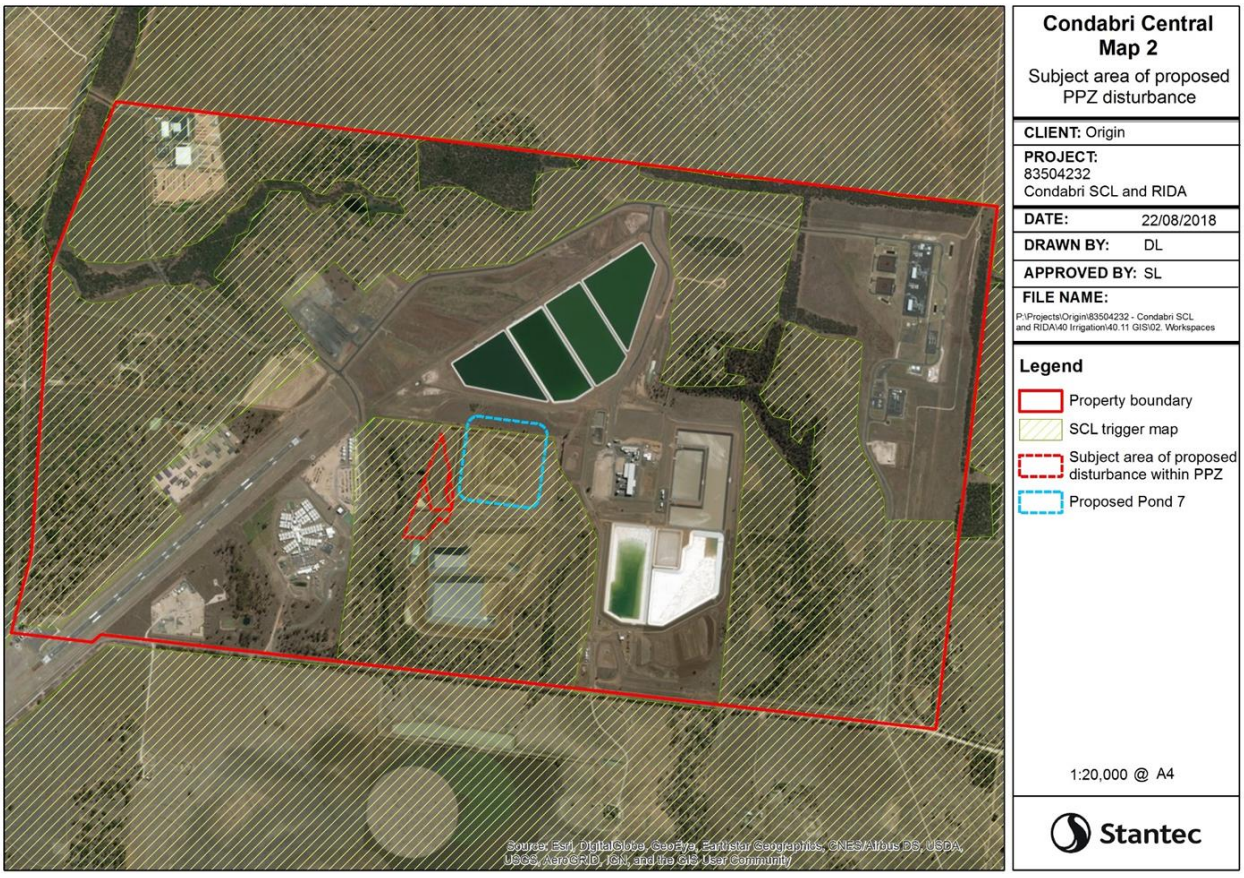


Figure 1: Pond 7 location and subject area of proposed disturbance within the PPZ and SCL trigger map

2. SCL Assessment Methodology

The process used for this SCL assessment was as follows:

- Review existing soil profile descriptions, data and mapped soil units;
- Undertake additional soil surveys, sampling and analysis as required to meet SCL assessment and mapping criteria associated with the subject area;
- Define soil mapping units based on all available soil and landscape observations; and
- Assess the SCL status for each mapped soil unit according to the SCL criteria.

2.1 Existing soil unit and mapping information

The Condabri Central area was previously surveyed by WorleyParsons in 2011 with the findings and soil unit maps presented in the Condabri Gas Field Development Area Soil Assessment and Management Plan (Australia Pacific LNG, 2014). The soil unit descriptions previously assigned within Condabri Central area are presented in Table 1. However, limited soil observation data existed for the soil units associated with the subject area. All soil sites were assessed using a mechanical core or hand auger. No soil profile pits were used in the previous assessment.

Only soil observation data that was accompanied with soil profile descriptions and/or soil profile chemistry was used in this report for SCL and soil map unit assessments. Observations that had no accompanying data or descriptions were excluded from this report. Available soil information previously acquired and used in this report is presented in Appendix B.

Table 1: Description of soil units of the Condabri Central area[1]

Soil Unit	ASC	Description
1.2	Tenosol	Uniform deep sands associated with stream channels and alluvial plains
2.1.1	Vertosol	Grey and brown cracking clays with shallow gilgai on elevated plains
2.1.2	Vertosol	Self-mulching, grey and brown cracking clays with moderately deep melonhole gilgai on elevated plains
2.2.1	Sodosol	Thin (<150mm), bleached sandy and loamy surface horizons overlying grey or brown, often mottled, clay subsoils on elevated plains
2.2.2	Sodosol	Moderately thick (>150mm), bleached sandy and loamy surface horizons overlying grey or brown, often mottled, clay subsoils on elevated plains

2.2 Additional soil survey information

Based on previous soil mapping information and minimum sampling requirements for SCL assessments, additional soil profile sampling was undertaken during March 2018 and again in July 2018 to clarify soil unit boundaries and soil profile attributes. The soil profile descriptions and check site were undertaken by Range Environmental Consultants. Soil sampling locations were initially based on the previous soil maps with additional check sites assessed to confirm soil unit boundaries. Due to the extent of landscape disturbance and infrastructure a free survey was not possible and check sites across some soil unit boundaries was not always possible.

Check sites were assessed using a hand auger while the detailed and analysis soil sites were assessed using open soil profile pits to at least 1000mm. Soil profile descriptions were undertaken in accordance with SCL assessment criteria and are provided in Appendix C. Soil samples down the soil profile were taken at selected locations within soil units associated with the subject area and submitted to ALS (NATA Accredited) Laboratory for analysis. Soil samples were specifically taken at a target depth of 300 and 600mm to align with the SCL assessment criteria. The results of this analysis are presented on Appendix D.

[1] Australia Pacific LNG (2014) Condabri Gas Field Development Area Soil Assessment and Management Plan, Q-4500-15-MP-1003

The additional soil and landscape observations, along with previous soil descriptions, where used to differentiate soil units based on the Australia Soil Classification (ASC). Once the soil units were established and the sampling criteria met for SCL assessment, each soil unit was assessed based on the overall SCL status of sampling points within each defined soil unit. A total of 46 sites were included in this SCL assessment with locations and observation type presented in Map 3 (Appendix A).

2.3 SCL assessment criteria

The Condabri Central Area is located in the Western Cropping zone of the strategic cropping area. Hence, for land to be considered SCL the soil and landscape attributes must comply with the threshold criteria outlined in Table 2 as defined in the RPI Act Statutory Guideline 08/14.

Table 2: Western cropping thresholds for SCL status

Criteria	Thresholds
Slope	Equal to or less than 3%
Rockiness	Equal to or less than 20% for rocks greater than 60mm in diameter
Gilgai	Less than 50% of land surface being gilgai of greater than 500mm in depth
Soil depth	Equal to or greater than 600mm
Soil wetness	Has favourable drainage
Soil pH	For rigid soils: the soil at 300mm and 600mm soil depth must be within the range if $pH_{1:5}$ 5.1 – 8.9 inclusive For non-rigid soils: the soil at 300mm and 600mm soil depth must be greater than $pH_{1:5}$ 5.0
Salinity	Chloride content is less than 800 mg/kg at 600mm soil depth
Soil water storage	Equal to or greater than 100mm to a soil depth or soil physico-chemical limitation of equal to or less than 1000mm

2.3.1 Slope, Rockiness and Gilgai

Due to the lack of information and the disturbed state of the Condabri Central area, the slope, rockiness and gilgai criteria are assumed to comply with SCL status for the purpose of this SCL assessment.

2.3.2 Soil depth and wetness

Soil depth was taken to be the depth to any reported hardpan, gravel layer, or weathered bedrock material. Soil wetness was taken to be the observation of gleyed and mottled layers and/or the occurrence of bleached A_2 horizons. However, due to the nature of the soil profile reporting no limitations to soil depth or wetness from previous soil surveys can be reported except in the case of a reported bleached A_2 horizon.

2.3.3 Soil pH and salinity

Soil pH and salinity were assessed at 300 and 600 mm target depth at selected locations. Soil pH was assessed at these selected depths for rigid and non-rigid soils. Non-rigid soils were taken as soils that exhibited the capacity to shrink and swell with vertical cracks extending at least 300mm below the soil surface. Soils were SCL compliant if pH was greater than 5.0 for non-rigid soils and between 5.1 and 8.9 for rigid soils. Further, soils were SCL compliant if the soil chloride content was below 800 mg/kg to a depth of 600mm below the soil surface. Based on available soil chemistry data and additional sampling a total of 20 soil profiles where assessed for salinity profile hazard.

2.3.4 Soil water storage

Soil water storage (SWS) was assessed based on the soil texture and associated soil water storage for each horizon according to Table A1.2 of the RPI Act Statutory Guideline 08/14. Soil texture was defined by using particle size distribution analysis and the Ternary soil texture chart according to Figure A1.6 of the RPI Act Statutory Guideline 08/14. Soil water storage of each soil profile was calculated by summing the soil water storage of each horizon down to 1000mm or the depth to a physical barrier or physio-chemical limitation. SWS of less than 85mm was assessed as not SCL.

Soil physio-chemical limitations were based on the following:

- Chloride content of more than 800 mg/kg,
- pH1:5 less than 5.0,
- For rigid soils, other than sandy loam or lighter or with a CEC less than 3 cmol+/kg, that have
    - pH1:5 greater than 8.9 or
    - ESP greater than 15 or
    - Ca:Mg ratio 0.1 or less.

Given that no gravimetric water contents were determined at 1.5MPa matric suction in order to use the PAWCER pedotransfer function, any SWS greater than 85mm was considered to comply with the SCL threshold criteria.

3. Soil unit mapping and SCL outcomes

Mapping of the Condabri site was conducted at a scale of 1:25,000 according to McKenzie et al (2008). Previously mapped soil units by WorleyParsons (Australia Pacific LNG 2014) that intersected with the subject area comprised of units 2.1.1 and 2.2.2. Soil mapping unit 2.1.1 was described as a grey and brown cracking clay Vertosol with shallow gilgai features, a shallow topsoil with increasing sodicity and salinity with depth. Soils in drainage lines were mapped as soil mapping unit 2.2.2. This soil unit was described as a Sodosol, a texture contrast soil, with a bleached sandy or sandy loam A horizon overlying a mottled grey and brown clay sodic subsoil that is often saline.

Whilst recent additional observations supported these broad soil units, a review of previous soil profile decriptions and associated ASC, along with the additional observations, suggests that the extent of soil unit 2.1.1 mapped is not supported. Much of the area that surrounds the subject area should be classified as a Sodosol (soil unit 2.2.2), not a vertosol as previously mapped.

An updated soil unit map was produced based on previous soil profile classifications and the additional soil observations taken as part of this SCL assessment. Soil units were differentiated based on ASC, imagery (where possible) and soil profile descriptions. The updated soil unit map is better supported by the ASC profile descriptions than the previous mapped units (Appendix A: Map 4).

Previous soil mapping units differentiated the small areas associated with drainage lines along the southern border of the property as soil unit 2.2.2. Each of these soil units were below 100 ha, hence, would not qualify for SCL status. Nevertheless, the soils within these original units were also found to be sodosols and, therefore, can be grouped with the surrounding soil unit as 2.2.2.

Whilst largely similar to previously described soil units by Worley Parson, the description of each soil unit is now given in Table 3. Compliance with the required number of check, detailed and analysed sites for three of the main soil units within the Condabri Central area is presented in Table 4. The subject area lies entirely within soil unit 2.2.2.

Table 3: Updated description of soil units reviewed as part of the SCL assessment

Soil Unit	ASC	Description
2.1.1	Dermosol/Vertosol	Grey and brown cracking clays with shallow gilgai on elevated plains
2.2.1	Sodosol - thin	Thin (<150mm), sandy loam to sandy clay loam surface horizons overlying grey or brown, often mottled, clay subsoils on elevated plains
2.2.2	Sodosol - thick	Moderately thick (>150mm), sandy loam to sandy clay loam surface horizons overlying grey or brown, often mottled, clay subsoils on elevated plains

Table 4: Site assessment types based for each soil unit

Soil Unit	ASC Class	Total Area	Check sites	Detailed sites	Analysed sites	Total sites	Density ha/site
1.2	Tenosol	82 ha	0	0	0	0	-
2.1.1	Dermosol/Vertosol	194 ha	8	4	3	15	12.9
2.1.2	Vertosol	38 ha	0	0	0	0	-
2.2.1	Sodosol – thin	373 ha	9	1	4	14	26.6
2.2.2	Sodosol – thick	378 ha	5	2	10	17	22.2

Of the 46 soil observations, 24 sites were assessed against SCL criteria based on the information available. Not all were able to be assessed against all the SCL criteria but a total of 18 sites were able to have their SCL status confirmed as follows:

Soil unit 2.1.1 3 SCL status confirmations

Soil unit 2.2.1 9 SCL status confirmations

Soil unit 2.2.2 5 SCL status confirmations

The assessment of the 24 sites against each of the SCL threshold criteria is presented in Table 5. For sites where the SCL threshold criteria was not met Table 6 details the supporting information why the non-SCL status is applicable.

The Dermosol/Vertosol soil unit 2.1.1 mostly complied with SCL status with only one sample location triggering non-SCL status due to high chloride levels. Given the majority of this soil unit has complied with SCL threshold criteria the status for soil unit 2.1.1 should be SCL. It is expected that the Vertosol soil unit 2.1.2 would be similar in SCL status of 2.1.1 although confirmation is not possible at this time.

In contrast, both Sodosol soil units 2.2.1 and 2.2.2 universally exceeded the SCL threshold criteria, mostly due to effective rooting depth restrictions associated with high pH, high levels of sodicity and occasionally high salinity. Given the observations within each of these soil units do not comply with SCL threshold criteria the status for soil units 2.2.1 and 2.2.2 should be non-SCL.

Although there is limited data in the western portion of the Condabri Central area, the Tenosol soil unit 1.2 is less than 100 ha, hence, does not comply with the minimum area requirements for SCL status as it borders the Sodosol soil unit 2.2.1.

Table 5: Assessment of soil observation and sampling locations against SCL criteria

Location	Soil unit	Depth	Wetness	pH	Salinity	SWS	SCL	SCL Status
COND22	2.1.1	✓	✓	✓		✓	✓?	SCL
COND23	2.1.1	✓	✓	✓		✓	✓?	
COND25	2.1.1	✓	✓	✓	×		×	
COND39	2.1.1	✓	✓			✓	✓?	
COND46	2.1.1			✓	✓			
PL17	2.1.1	✓	✓	✓	✓	✓	✓	
STA07	2.1.1	✓	✓	✓	✓	×	×	
STA08	2.1.1	✓	✓	✓	✓	✓	✓	
COND21	2.2.1	✓	×				×	Not SCL
COND37-A	2.2.1			×	✓	×	×	
COND41	2.2.1	✓	✓					
COND50	2.2.1	✓	✓	✓	×	×	×	
COND51	2.2.1	✓	✓	✓	✓		✓?	
COND52	2.2.1	✓	✓	✓	×	×	×	
COND53	2.2.1	✓	✓	×	✓	×	×	
COND54	2.2.1	✓	✓	×	✓	×	×	
COND55	2.2.1	✓	✓	✓	✓	×	×	
COND56	2.2.1	✓	✓	×	✓	×	×	
COND57	2.2.1	✓	✓	×	✓		×	
COND47	2.2.2	✓	✓	✓	×		×	Not SCL
STA01	2.2.2	✓	✓	×	✓	×	×	
STA02	2.2.2	✓	✓	✓	✓	×	×	
STA03	2.2.2	✓	✓	✓	×	×	×	
STA06	2.2.2	✓	✓	✓	✓	×	×	

Table 6: Description of the property triggering non-SCL status

Location	Soil unit	Property triggering SCL Exclusion
COND25	2.1.1	Chloride content of 1270 mg/kg at 300mm
STA07	2.1.1	Rigid soil pH > 8.9 at 300 & 600mm, ESP >15% at 290mm so SWS<85mm
COND21	2.2.1	Bleached A2 horizon indicated unfavourable drainage
COND37-A	2.2.1	Rigid soil pH > 8.9 at 600mm, ESP >15% at 150mm so SWS<85mm
COND50	2.2.1	Chloride content of 1049 mg/kg at 600mm
COND52	2.2.1	Chloride content of 950 mg/kg at 600mm, ESP >15 at 600mm so SWS<85mm
COND53	2.2.1	Rigid soil pH > 8.9 at 600mm, ESP >15% at 600mm so SWS<85mm
COND54	2.2.1	Rigid soil pH > 8.9 at 600mm, ESP >15% at 300mm so SWS<85mm
COND55	2.2.1	Rigid soil ESP >15% at 300mm so SWS<85mm
COND56	2.2.1	Rigid soil pH > 8.9 at 600mm, ESP >15% at 150mm so SWS<85mm
COND57	2.2.1	Rigid soil pH > 8.9 at 600mm
COND47	2.2.2	Chloride content of 920 mg/kg at 600mm
STA01	2.2.2	Rigid soil pH > 8.9 at 600mm, ESP >15% at 280mm so SWS<85mm
STA02	2.2.2	Rigid soil ESP >15% at 430mm so SWS<85mm
STA03	2.2.2	Chloride of 940 mg/kg at 600mm, Rigid soil ESP >15% at 200mm so SWS<85mm
STA06	2.2.2	Light soil profile SWS<85mm

4. Final SCL Status for Subject Area

The subject area falls entirely within the Sodosol soil unit 2.2.2 as shown in Figure 2. The assessment of soil profile information against the SCL threshold criteria suggests that the soil unit 2.2.2 should have a non-SCL status based on restricted soil depth associated with high soil pH, high sodicity and occasionally high salinity. This contravenes the SCL status provided by the SCL trigger map.

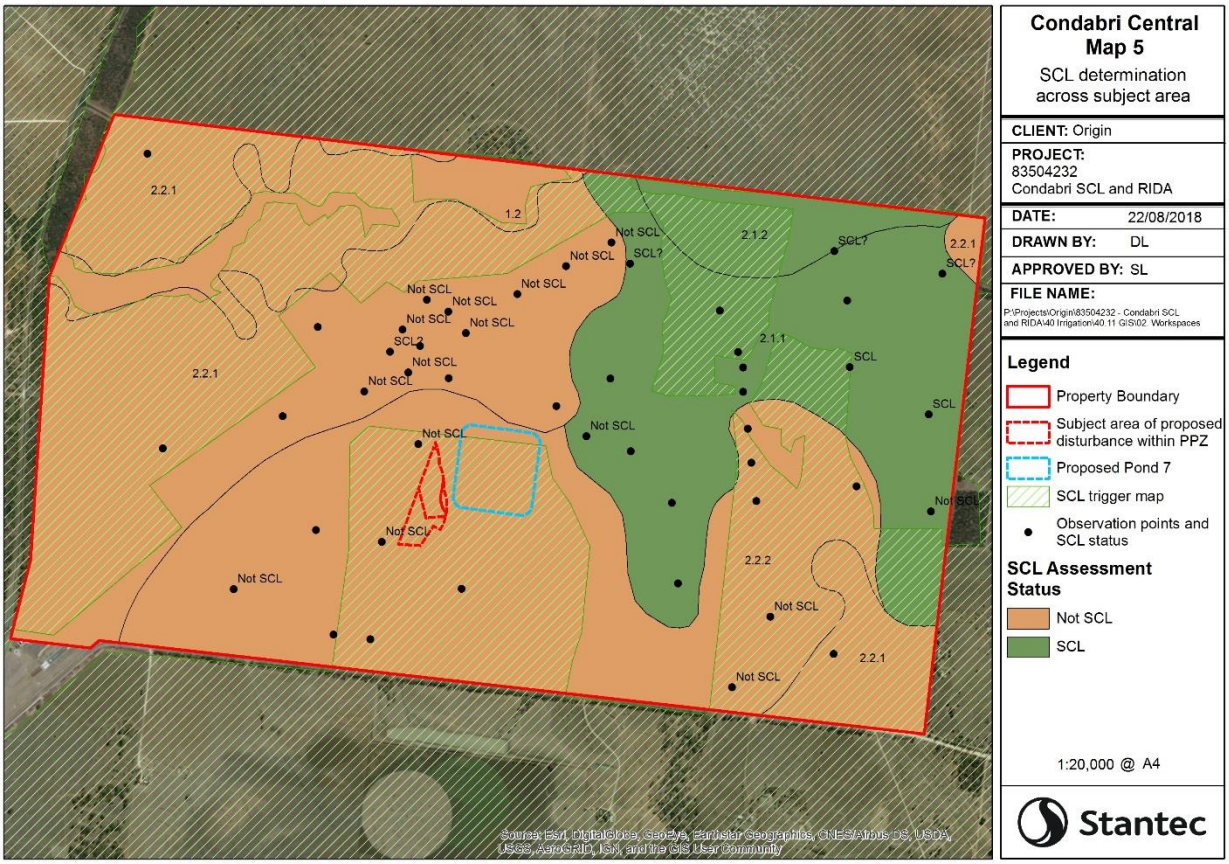


Figure 2: SCL status outcome in relation to the subject area, soil units and SCL trigger map

5. References

Australia Pacific LNG (2014) Condabri Gas Field Development Area Soil Assessment and Management Plan.

Isbell RF (1996) The Australian soil Classification, CSIRO Publishing, Collingwood, Vic

McKenzie NJ, Grundy MJ, Webster R, and Ringrose-Voase AJ (2008) Guidelines for Surveying Soil and Land Resources, 2nd Edition, CSIRO Publishing, Collingwood, Vic

Appendices

Appendix A Maps

Map 1. Property boundary

Map 2. Subject area of proposed disturbance within PPZ and extent of mapped SCL

Map 3. Soil observation locations, label and type

Map 4. ASC for each soil observations and associated soil units

Map 5. SCL determination across subject area

Condabri Central Map 1

Cadastral boundary
Lot 2 SP244055

CLIENT: Origin

PROJECT:
83504232
Condabri SCL and RIDA

DATE: 22/08/2018

DRAWN BY: DL

APPROVED BY: SL

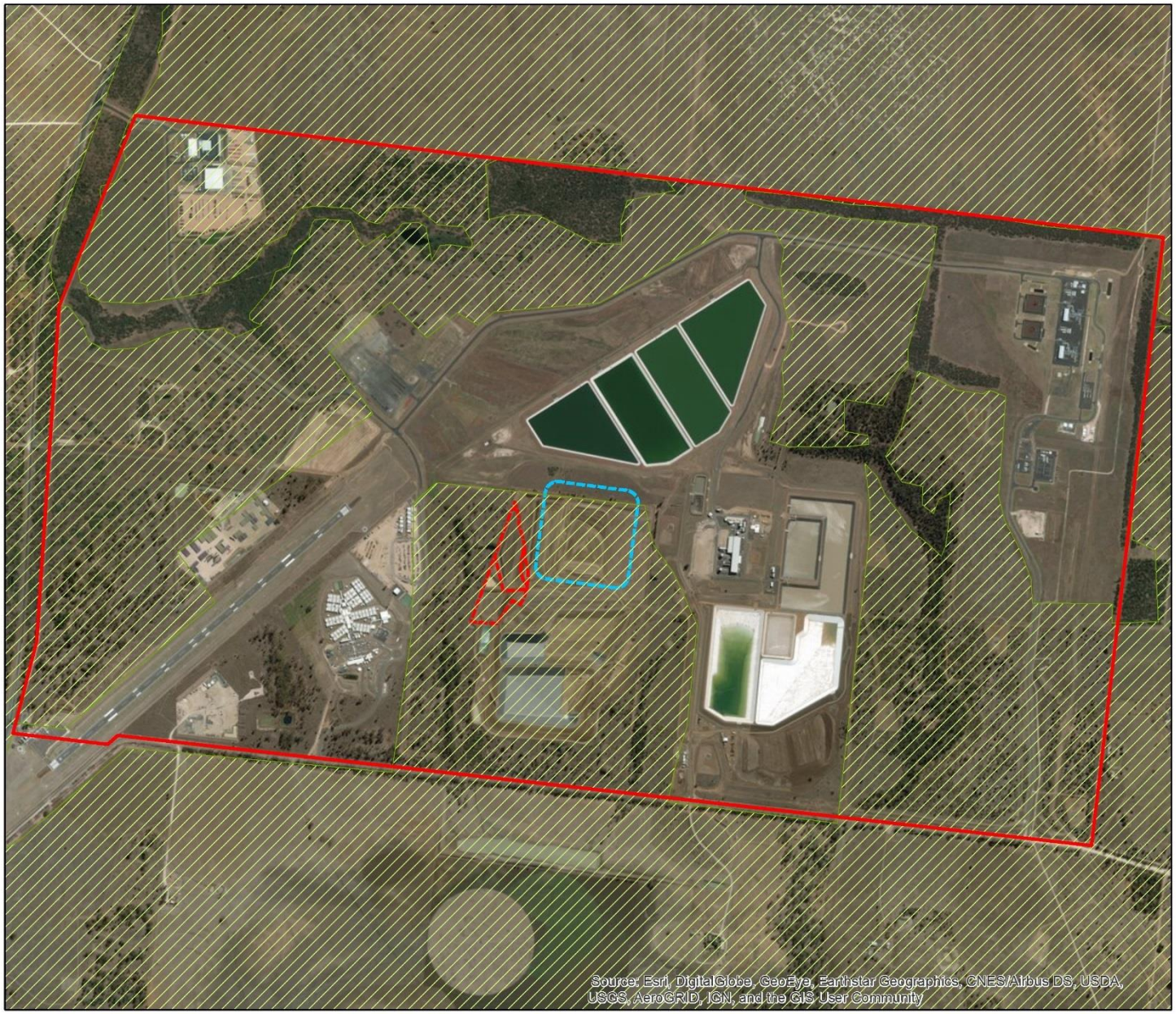
FILE NAME:
P:\Projects\Origin\83504232 - Condabri SCL and RIDA\40 Irrigation\40.11 GIS\02. Workspaces

Legend

Property boundary

1:30,000 @ A4

Stantec



Condabri Central Map 2

Subject area of proposed PPZ disturbance

CLIENT: Origin

PROJECT:
83504232
Condabri SCL and RIDA

DATE: 22/08/2018

DRAWN BY: DL

APPROVED BY: SL

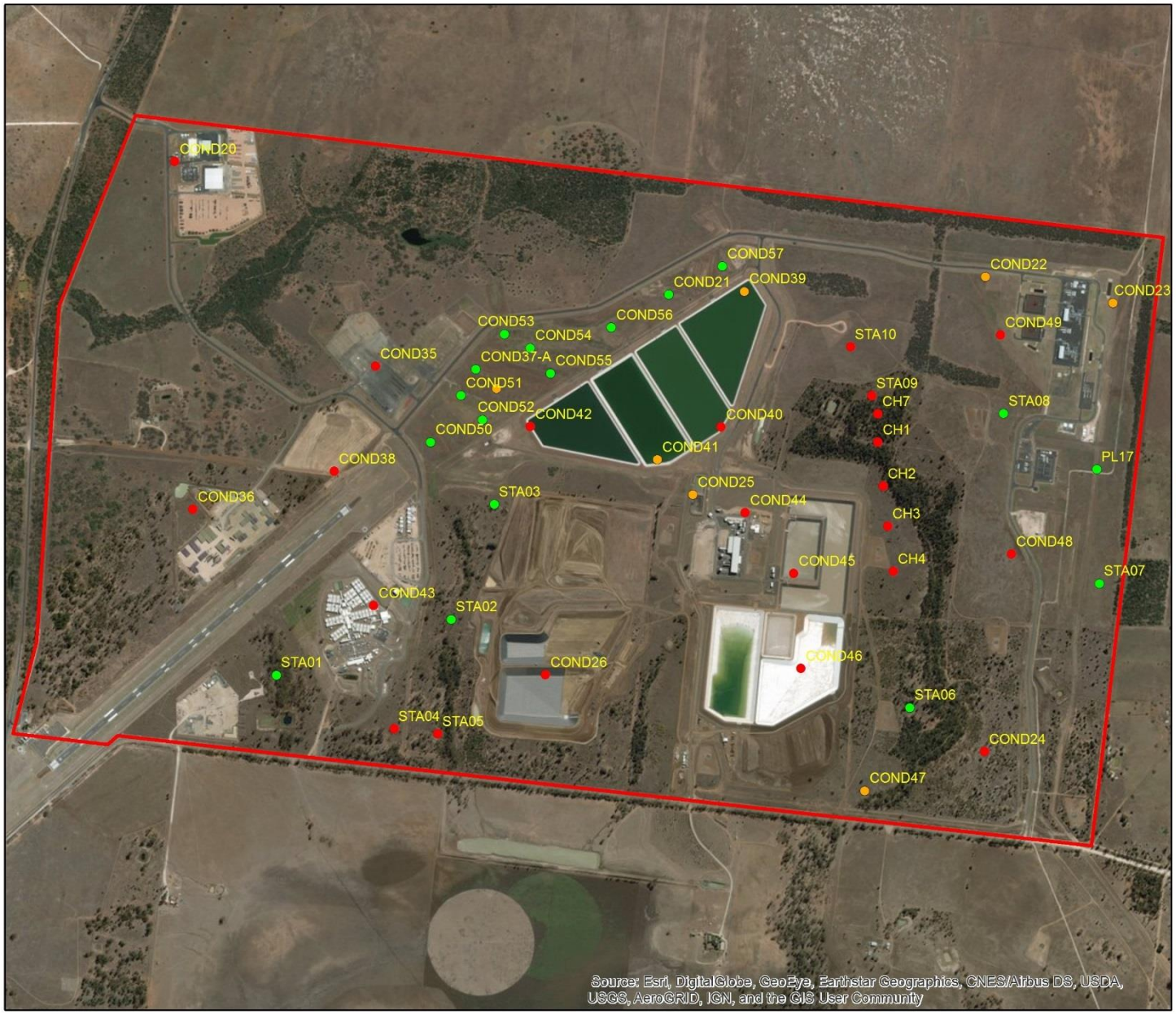
FILE NAME:
P:\Projects\Origin\83504232 - Condabri SCL and RIDA\40 Irrigation\40.11 GIS\02. Workspaces

Legend

- Property boundary
- SCL trigger map
- Subject area of proposed disturbance within PPZ
- Proposed Pond 7

1:20,000 @ A4

Stantec



Condabri Central Map 3

Sampling locations and sample type

CLIENT: Origin

PROJECT:
83504232
Condabri SCL and RIDA

DATE: 22/08/2018

DRAWN BY: DL

APPROVED BY: SL

FILE NAME:
P:\Projects\Origin\83504232 - Condabri SCL and RIDA\40 Irrigation\40.11 GIS\02. Workspaces

Legend

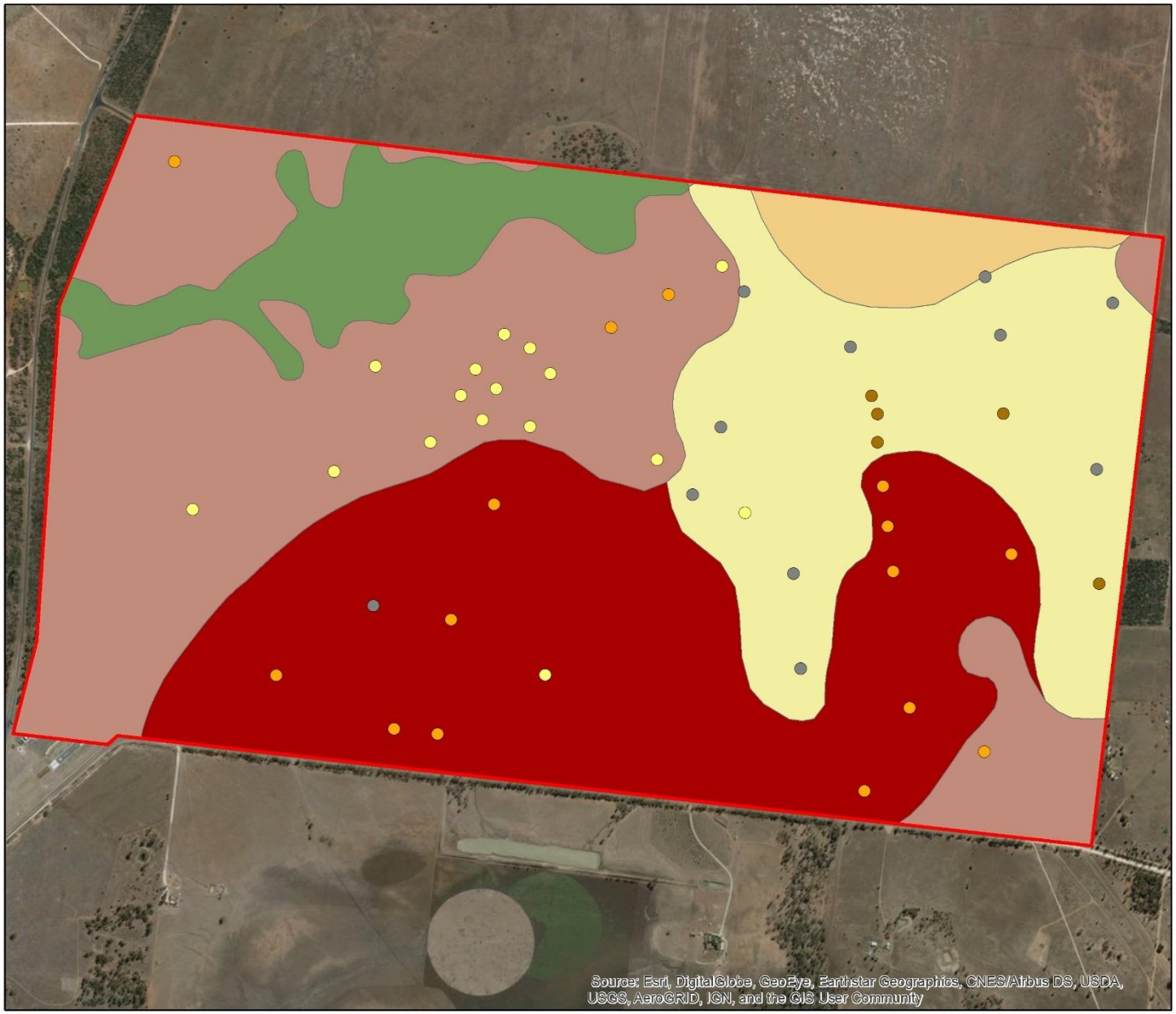
Property boundary

Type

- Analysis
- Detailed
- Check

1:20,000 @ A4

Stantec



Condabri Central Map 4

Soil Classification and Mapped Soil Units

CLIENT: Origin

PROJECT:
83504232
Condabri SCL and RIDA

DATE: 22/08/2018

DRAWN BY: DL

APPROVED BY: SL

FILE NAME:
P:\Projects\Origin\83504232 - Condabri SCL and RIDA\40 Irrigation\40.11 GIS\02. Workspaces

Legend

Mapped Area

Aust. Soil Classification

- Vertosol
- Dermosol
- Sodosol (A>15cm)
- Sodosol (A<15cm)

Mapped Soil Units

- 1.2
- 2.1.1
- 2.1.2
- 2.2.1
- 2.2.2

1:20,000 @ A4

Stantec

Condabri Central Map 5

SCL determination across subject area

CLIENT: Origin

PROJECT:
83504232
Condabri SCL and RIDA

DATE: 22/08/2018

DRAWN BY: DL

APPROVED BY: SL

FILE NAME:
P:\Projects\Origin\83504232 - Condabri SCL and RIDA\40 Irrigation\40.11 GIS\02. Workspaces

Legend

- Property Boundary
- Subject area of proposed disturbance within PPZ
- Proposed Pond 7
- SCL trigger map
- Observation points and SCL status

SCL Assessment Status

- Not SCL
- SCL

1:20,000 @ A4

Stantec

Appendix B Previous soil observations

Data supplied by Origin in December 2017 which included the following:

- Australia Pacific LNG (2014) Condabri Gas Field Development Area Soil Assessment and Management Plan, Q-4500-15-MP-1003
- Drafts and final Reports prepared for Australian Pacific LNG Upstream Project
- Excel data files supplied by Origin in December 2017

Extracted data has been collated and presented in the following pages.

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd
ABN 91 056 237 275
Mt. Glorious Road
Highvale, Brisbane, Australia, 4520
Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 09 SEPTEMBER 2011
CLIENT NAME Alex Kochneiff c/o Worley Parsons Pty Ltd
CLIENT ADDRESS 60 Albert Street Brisbane 4002
PROJECT NAME Condabri Facilities STPs
SAMPLING DATE NUMBER OF SAMPLES 29 SAMPLE TYPE:Soil
PACKAGING Plastic Bag ** SAMPLES DISPOSED ON 21/08/2012
DATE RECEIVED 22/08/2011 1:44:50 PM LAB REF. LR220811.641

YOUR PROJECT/JOB REFERENCE 301001-00448

METHODOLOGY: EC pH Cl as 1:5 air dried soil in water, 30 minute rolling shake, Cl by ion selective electrode. Na K Mg Ca Fe Al S as 1:20 soil dried soil in 1 N NH4Cl, 60 minute rolling shake, Na Mg Ca Fe Al S measured by ICP OES, K by AAS. CEC (cation exchange capacity) as the sum of extracted cations, SAR (sodium adsorption ratio) as Na/((Ca+Mg)/2)^0.5, %Na as Na% of CEC. (meq/100 =milli-equivalents/100 g soil)

SAMPLE ID m depth	EC dS/m	pH	Na meq/100	K meq/100	Ca meq/100	Mg meq/100	Fe mg/kg	Al mg/kg	Cl mg/kg	S mg/kg	CEC meq/100	SAR	% Na	Ca:Mg
COND15A 0.1-0.2	0.08	6.6	0.4	<0.1	2.6	3.2	13	3	65	3	6.3	0.21	5.6	0.8
COND15A 0.2-0.3	0.18	6.8	1.4	<0.1	0.9	8.4	4	3	195	16	10.9	0.66	13.0	0.1
COND15A 0.4-0.5	0.50	7.8	3.0	<0.1	1.1	11.9	1	3	551	35	16.1	1.17	18.5	<0.1
COND15A 0.5-0.6	0.48	8.0	3.0	0.1	1.0	12.4	1	3	499	28	16.5	1.15	18.0	<0.1
COND15A 0.7-0.8	0.66	8.6	4.6	0.2	0.9	19.5	1	3	700	36	25.3	1.44	18.2	<0.1
COND15A 0.9-1	0.63	8.4	5.4	0.2	1.2	23.4	4	7	701	24	30.2	1.54	17.8	<0.1
COND15A 1.2-1.3	0.46	8.3	5.6	0.2	1.0	25.1	1	2	500	19	31.9	1.55	17.5	<0.1
COND21 0.1-0.2	0.03	7.4	0.2	<0.1	3.4	1.5	3	5	46	7	5.3	0.15	4.4	2.2
COND21 0.2-0.3	0.13	8.3	1.5	<0.1	6.3	4.8	<1	3	70	16	12.7	0.63	11.7	1.3
COND21 0.4-0.5	0.31	9.1	2.7	<0.1	13.9	7.9	1	5	155	58	24.7	0.83	11.1	1.8
COND21 0.6-0.8	0.53	9.4	4.3	<0.1	16.2	8.5	<1	5	355	123	29.2	1.24	14.9	1.9
COND21 0.8-1	0.52	9.2	4.3	<0.1	8.8	7.7	1	4	376	96	20.9	1.51	20.7	1.1
COND21 1-1.1	0.59	9.4	4.7	<0.1	23.8	8.4	2	8	415	141	37.0	1.16	12.6	2.8
COND21 1.4-1.5	0.63	9.4	6.0	<0.1	15.8	10.4	2	7	499	110	32.3	1.65	18.5	1.5
COND21 1.9-2	0.52	7.5	5.9	<0.1	4.3	8.5	4	6	600	62	18.9	2.33	31.3	0.5
COND30A 0.3-0.4	0.64	7.7	5.0	<0.1	1.6	9.9	2	2	850	17	16.5	2.07	30.1	0.2
COND30A 0.4-0.6	0.65	8.1	5.7	<0.1	2.0	10.4	2	3	899	16	18.1	2.28	31.4	0.2
COND30A 0.6-0.8	0.74	7.3	4.4	<0.1	0.8	7.0	7	3	1101	14	12.3	2.20	35.6	0.1
COND30A 0.8-1	0.87	7.0	5.7	<0.1	0.5	7.8	16	3	1199	4	14.1	2.81	40.4	<0.1
COND30A 1-1.2	0.67	6.7	4.8	<0.1	1.0	6.5	24	6	1001	6	12.6	2.48	38.3	0.2
COND30A 1.6-1.8	0.79	6.1	5.8	<0.1	0.4	7.3	26	13	1099	2	13.9	2.97	42.0	<0.1
COND30A 1.8-2	0.60	6.0	4.2	<0.1	0.3	4.9	32	11	850	2	9.7	2.63	43.6	<0.1
COND37A 0.02-0.1	0.05	6.4	0.4	0.2	2.9	2.7	1	5	70	12	6.3	0.25	6.6	1.1
COND37A 0.2-0.3	0.44	8.5	3.5	<0.1	9.9	9.4	1	5	395	75	22.9	1.14	15.5	1.1
COND37A 0.4-0.5	0.50	8.6	3.2	0.1	33.1	9.3	2	11	405	151	45.8	0.69	6.9	3.6
COND37A 0.7-0.8	0.67	9.3	5.2	<0.1	34.6	10.9	1	10	600	191	50.9	1.10	10.3	3.2
COND37A 0.9-1	0.61	9.1	4.2	0.1	31.0	9.4	1	9	549	162	44.8	0.94	9.4	3.3
COND37A 1.5-1.6	0.61	8.5	5.6	<0.1	6.5	9.9	2	4	750	94	22.0	1.95	25.3	0.7
COND37A 1.9-2	0.66	7.3	6.5	<0.1	6.6	10.8	2	4	750	89	24.0	2.20	27.1	0.6

Signatory

For and behalf of Bio-Track Pty Ltd

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd
ABN 91 056 237 275
Mt. Glorious Road
Highvale, Brisbane, Australia, 4520
Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 28 SEPTEMBER 2011
CLIENT NAME Alex Kochneiff c/o Worley Parsons Pty Ltd
CLIENT ADDRESS 60 Albert Street Brisbane 4002
PROJECT NAME Condabri Facilities STPs
SAMPLING DATE NUMBER OF SAMPLES 5 SAMPLE TYPE:Soil
PACKAGING Plastic Bag ** SAMPLES DISPOSED ON 21/08/2012
DATE RECEIVED 22/08/2011 1:44:50 PM LAB REF. LR220811.642

YOUR PROJECT/JOB REFERENCE 301001-00448

METHODOLOGY: EC pH Cl as 1:5 air dried soil in water, 30 minute rolling shake, Cl by ion selective electrode. Na K Mg Ca Fe Al S as 1:20 soil dried soil in 1 N NH4Cl, 60 minute rolling shake, Na Mg Ca Fe Al S measured by ICP OES, K by AAS. CEC (cation exchange capacity) as the sum of extracted cations, SAR (sodium adsorption ratio) as Na/((Ca+Mg)/2)^0.5, %Na as Na% of CEC. (meq/100 =milli-equivalents/100 g soil)

SAMPLE ID m depth	EC dS/m	pH	Na meq/100	K meq/100	Ca meq/100	Mg meq/100	Fe mg/kg	Al mg/kg	Cl mg/kg	S mg/kg	CEC meq/100	SAR	% Na	Ca:Mg
COND15A 0-0.1	0.03	6.1	0.3	0.2	2.5	2.6	3	13	28	1	5.8	0.16	4.5	1.0
COND21 0-0.1	0.03	6.4	0.3	0.4	4.0	1.8	<1	<1	25	<1	6.5	0.19	5.1	2.2
COND37A 0-0.02	0.02	6.4	0.4	0.2	2.6	2.5	1	5	30	<1	5.7	0.26	7.4	1.0
DUP01 -	0.02	5.8	0.3	0.2	2.2	2.2	2	11	18	<1	5.0	0.17	5.1	1.0
COND30A 0-0.2	0.14	6.2	2.0	0.2	3.6	5.8	2	4	120	2	11.6	0.91	17.0	0.6

Signatory

For and behalf of Bio-Track Pty Ltd

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd
ABN 91 056 237 275
Mt. Glorious Road
Highvale, Brisbane, Australia, 4520
Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 09 SEPTEMBER 2011
CLIENT NAME Alex Kochneiff c/o Worley Parsons Pty Ltd
CLIENT ADDRESS 60 Albert Street Brisbane 4002
PROJECT NAME Condabri Facilities STPs
SAMPLING DATE NUMBER OF SAMPLES 58 SAMPLE TYPE:Soil
PACKAGING Plastic Bag ** SAMPLES DISPOSED ON 21/08/2012
DATE RECEIVED 22/08/2011 3:36:00 PM LAB REF. LR220811.668

YOUR PROJECT/JOB REFERENCE 301001-00448

METHODOLOGY: EC pH Cl as 1:5 air dried soil in water, 30 minute rolling shake, Cl by ion selective electrode. Na K Mg Ca Fe Al S as 1:20 soil dried soil in 1 N NH4Cl, 60 minute rolling shake, Na Mg Ca Fe Al S measured by ICP OES, K by AAS. CEC (cation exchange capacity) as the sum of extracted cations, SAR (sodium adsorption ratio) as Na/((Ca+Mg)/2)^0.5, %Na as Na% of CEC. (meq/100 =milli-equivalents/100 g soil)

SAMPLE ID m depth	EC dS/m	pH	Na meq/100	K meq/100	Ca meq/100	Mg meq/100	Fe mg/kg	Al mg/kg	Cl mg/kg	S mg/kg	CEC meq/100	SAR	% Na	Ca:Mg
COND50 0.25-0.35	0.52	7.5	3.9	0.1	24.1	9.9	3	4	651	36	38.1	0.94	10.1	2.4
COND50 0.5-0.6	0.68	7.2	7.4	0.1	8.0	12.6	2	6	949	23	28.2	2.32	26.4	0.6
COND50 0.6-0.7	0.79	7.6	7.1	0.1	17.1	12.6	4	7	1049	23	37.0	1.83	19.1	1.4
COND50 1-1.1	0.64	6.6	9.5	0.2	7.0	14.6	4	15	1199	4	31.5	2.89	30.2	0.5
COND50 1.4-1.5	0.67	5.8	9.1	0.1	7.3	14.6	2	10	1102	11	31.3	2.74	29.0	0.5
COND50 1.9-2	0.62	5.3	8.7	0.1	5.5	13.4	4	84	1049	<1	28.7	2.84	30.4	0.4
COND51 0.01-0.1	0.09	6.1	1.0	0.2	7.0	3.6	2	3	145	8	11.9	0.45	8.7	1.9
COND51 0.1-0.2	0.17	7.1	1.5	0.1	9.5	4.3	1	3	150	4	15.4	0.56	9.6	2.2
*COND51 0.1-0.25	0.44	8.5	4.2	<0.1	31.5	11.7	2	5	456	29	47.5	0.90	8.8	2.7
COND51 0.35-0.5	0.37	8.3	2.7	0.2	29.5	7.0	2	3	335	42	39.4	0.64	6.9	4.2
COND51 0.5-0.65	0.53	8.5	4.3	0.2	32.3	9.8	2	3	599	65	46.6	0.94	9.3	3.3
COND51 0.65-0.75	0.57	8.4	4.6	0.2	18.7	9.1	2	4	650	55	32.6	1.22	14.0	2.1
COND51 0.9-1	0.51	8.4	3.8	0.2	22.0	7.9	2	3	549	50	34.0	0.99	11.3	2.8
COND51 1.45-1.55	0.40	8.4	3.8	0.1	8.5	7.2	11	3	550	32	19.7	1.36	19.4	1.2
COND51 1.9-2	0.41	8.3	3.3	0.1	10.2	6.2	12	2	500	28	19.9	1.15	16.5	1.6
COND52 0.1-0.2	0.08	7.5	1.1	0.1	6.3	4.1	4	7	85	5	11.7	0.46	9.1	1.6
COND52 0.2-0.3	0.47	8.7	4.4	<0.1	31.5	9.9	2	5	499	37	46.0	0.98	9.7	3.2
COND52 0.4-0.5	0.59	8.8	5.4	0.1	31.8	10.4	1	3	601	69	47.7	1.18	11.4	3.1
COND52 0.65-0.75	0.81	7.8	7.6	<0.1	10.0	10.1	1	4	950	94	27.9	2.39	27.2	1.0
COND52 0.9-1	0.37	6.6	7.1	<0.1	5.6	8.8	11	19	599	77	21.8	2.65	32.6	0.6
COND52 1.4-1.5	0.54	5.1	8.1	<0.1	5.9	10.3	11	80	701	42	25.4	2.84	31.8	0.6
COND52 1.9-2	0.71	6.4	8.1	0.1	10.1	10.4	2	2	751	52	28.8	2.53	28.2	1.0
COND53 0.02-0.1	0.07	6.7	1.3	0.2	5.7	4.9	<1	1	105	1	12.0	0.55	10.6	1.2
COND53 0.2-0.3	0.42	8.5	5.5	0.1	18.9	14.5	<1	2	360	15	39.1	1.35	14.2	1.3
COND53 0.4-0.5	0.37	8.6	6.6	0.2	31.9	13.4	2	5	501	109	52.1	1.38	12.6	2.4
COND53 0.65-0.8	0.79	9.0	7.8	0.2	26.6	13.6	3	2	701	117	48.2	1.75	16.2	2.0
COND53 1-1.1	0.83	7.5	8.6	0.1	7.4	12.4	1	2	801	168	28.6	2.74	30.1	0.6
COND53 1.5-1.6	0.83	7.8	7.2	0.1	11.2	10.2	<1	2	650	123	28.9	2.21	25.0	1.1
COND53 1.9-2	0.56	5.3	9.4	0.1	4.7	11.9	1	146	650	76	27.7	3.25	33.8	0.4
COND54 0.1-0.2	0.04	5.9	0.8	<0.1	2.5	1.7	<1	3	85	3	5.2	0.58	16.4	1.5
COND54 0.2-0.3	0.09	7.1	2.6	0.2	4.8	6.8	<1	1	120	3	14.3	1.06	17.8	0.7

Signatory P. Schmitt

For and behalf of Bio-Track Pty Ltd

*Sample incorrectly labelled. Sample should be labelled COND50 0.1-0.25m

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd
ABN 91 056 237 275
Mt. Glorious Road
Highvale, Brisbane, Australia, 4520
Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 09 SEPTEMBER 2011
CLIENT NAME Alex Kochneiff c/o Worley Parsons Pty Ltd
CLIENT ADDRESS 60 Albert Street Brisbane 4002
PROJECT NAME Condabri Facilities STPs
SAMPLING DATE NUMBER OF SAMPLES 58 SAMPLE TYPE:Soil
PACKAGING Plastic Bag ** SAMPLES DISPOSED ON 21/08/2012
DATE RECEIVED 22/08/2011 3:36:00 PM LAB REF. LR220811.668

YOUR PROJECT/JOB REFERENCE 301001-00448

METHODOLOGY: EC pH Cl as 1:5 air dried soil in water, 30 minute rolling shake, Cl by ion selective electrode. Na K Mg Ca Fe Al S as 1:20 soil dried soil in 1 N NH4Cl, 60 minute rolling shake, Na Mg Ca Fe Al S measured by ICP OES, K by AAS. CEC (cation exchange capacity) as the sum of extracted cations, SAR (sodium adsorption ratio) as Na/((Ca+Mg)/2)^0.5, %Na as Na% of CEC. (meq/100 =milli-equivalents/100 g soil)

SAMPLE ID m depth	EC dS/m	pH	Na meq/100	K meq/100	Ca meq/100	Mg meq/100	Fe mg/kg	Al mg/kg	Cl mg/kg	S mg/kg	CEC meq/100	SAR	% Na	Ca:Mg
COND54 0.3-0.4	0.33	8.9	4.4	0.1	4.5	7.7	<1	1	330	24	16.6	1.77	26.2	0.6
COND54 0.4-0.5	0.16	8.5	3.6	0.1	4.6	8.0	2	2	195	8	16.3	1.44	22.0	0.6
COND54 0.5-0.6	0.53	9.3	5.8	0.1	18.3	9.7	1	2	485	50	33.9	1.55	17.1	1.9
COND54 0.9-1	0.69	9.0	6.7	0.1	25.0	9.2	<1	2	599	72	41.0	1.61	16.3	2.7
COND54 1.2-1.3	0.65	9.4	7.0	0.2	27.4	10.7	<1	3	600	63	45.3	1.61	15.5	2.6
COND54 1.9-2	0.59	9.3	7.1	0.1	5.5	10.1	<1	2	650	37	22.7	2.53	31.1	0.5
COND55 0.1-0.2	0.05	7.1	0.8	<0.1	3.4	2.5	<1	2	75	1	6.8	0.47	11.8	1.3
COND55 0.2-0.3	0.16	6.8	2.9	<0.1	4.3	4.9	<1	2	195	3	12.2	1.36	23.9	0.9
COND55 0.4-0.5	0.31	8.2	3.3	<0.1	6.5	5.7	1	2	230	15	15.6	1.35	21.3	1.1
COND55 0.6-0.7	0.35	8.8	4.4	<0.1	6.3	6.1	<1	2	330	23	16.9	1.76	25.9	1.0
COND55 0.8-0.9	0.53	9.3	7.1	0.1	13.0	9.9	<1	2	410	36	30.1	2.10	23.5	1.3
COND55 1.1-1.2	0.51	9.0	6.3	0.2	11.5	9.4	<1	2	351	39	27.4	1.96	23.1	1.2
COND55 1.4-1.5	0.46	8.9	6.2	0.2	7.0	8.4	<1	<1	349	34	21.8	2.23	28.4	0.8
COND55 1.9-2	0.46	8.9	6.3	0.1	8.5	8.7	1	2	410	30	23.6	2.15	26.6	1.0
COND56 0.3-0.4	0.34	8.9	4.1	0.1	7.4	7.0	<1	<1	255	30	18.5	1.52	21.9	1.1
COND56 0.5-0.6	0.51	9.2	8.1	0.2	5.8	10.0	<1	2	375	58	24.0	2.87	33.5	0.6
COND56 0.8-0.9	0.48	9.1	7.8	0.2	7.0	10.0	<1	2	345	57	25.0	2.69	31.3	0.7
COND56 1.1-1.2	0.44	9.1	8.0	0.2	6.5	9.9	1	2	365	43	24.6	2.78	32.4	0.7
COND56 1.5-1.65	0.54	9.5	7.4	0.1	17.5	10.2	<1	2	385	49	35.3	2.00	21.1	1.7
COND56 1.9-2	0.14	9.2	7.4	0.1	6.5	9.1	2	5	135	30	23.1	2.64	31.9	0.7
COND57 0.2-0.4	0.08	8.5	2.2	0.1	8.2	6.5	2	3	49	12	17.0	0.80	12.8	1.3
COND57 0.4-0.5	0.25	9.5	3.5	0.1	29.0	10.4	1	4	55	21	43.1	0.79	8.1	2.8
COND57 0.6-0.7	0.36	9.6	5.4	0.1	21.5	10.7	<1	3	90	28	37.7	1.34	14.3	2.0
COND57 0.8-0.9	0.38	9.7	7.3	0.1	18.9	12.0	1	3	110	28	38.3	1.86	19.0	1.6
COND57 1-1.1	0.44	9.6	7.4	0.1	13.1	10.1	<1	2	170	33	30.7	2.18	24.1	1.3
COND57 1.4-1.5	0.30	7.5	8.8	0.1	2.7	9.4	2	2	200	57	21.1	3.57	41.7	0.3
COND57 2-2.2	0.39	5.2	8.6	0.1	1.3	9.1	11	151	290	90	20.8	3.78	41.3	0.1

Signatory

For and behalf of Bio-Track Pty Ltd

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd
ABN 91 056 237 275
Mt. Glorious Road
Highvale, Brisbane, Australia, 4520
Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 28 SEPTEMBER 2011 Page 1 of 1 Report Pages.
CLIENT NAME Alex Kochneiff c/o Worley Parsons Pty Ltd
CLIENT ADDRESS 60 Albert Street Brisbane 4002
PROJECT NAME Condabri Facilities STPs YOUR PROJECT/JOB REFERENCE 301001-00448
SAMPLING DATE NUMBER OF SAMPLES 8 SAMPLE TYPE:Soil
PACKAGING Plastic Bag ** SAMPLES DISPOSED ON 21/08/2012
DATE RECEIVED 22/08/2011 3:36:00 PM LAB REF. LR220811.669

METHODOLOGY: EC pH Cl as 1:5 air dried soil in water, 30 minute rolling shake, Cl by ion selective electrode. Na K Mg Ca Fe Al S as 1:20 soil dried soil in 1 N NH4Cl, 60 minute rolling shake, Na Mg Ca Fe Al S measured by ICP OES, K by AAS. CEC (cation exchange capacity) as the sum of extracted cations, SAR (sodium adsorption ratio) as Na/((Ca+Mg)/2)^0.5, %Na as Na% of CEC. (meq/100 =milli-equivalents/100 g soil)

SAMPLE ID m depth	EC dS/m	pH	Na meq/100	K meq/100	Ca meq/100	Mg meq/100	Fe mg/kg	Al mg/kg	Cl mg/kg	S mg/kg	CEC meq/100	SAR	% Na	Ca:Mg
COND50 0-0.1	0.04	6.2	0.8	0.2	4.3	3.8	<1	1	75	<1	9.2	0.42	9.3	1.1
COND51 0-0.01	0.05	6.2	0.3	0.3	5.9	2.6	2	5	50	4	9.1	0.16	3.7	2.3
COND52 0-0.1	0.07	6.6	0.9	0.1	4.9	3.0	<1	2	70	<1	8.9	0.45	10.0	1.6
COND53 0-0.02	0.04	6.7	0.8	0.3	4.7	4.5	1	2	50	<1	10.3	0.36	7.6	1.0
COND54 0-0.1	0.02	6.5	0.5	0.2	2.9	1.5	<1	<1	32	<1	5.1	0.30	8.9	1.9
COND55 0-0.1	0.03	6.5	0.7	0.1	2.7	2.3	<1	4	46	<1	5.9	0.42	11.4	1.2
COND56 0-0.2	0.23	7.0	1.7	0.2	7.0	3.0	1	2	75	18	11.9	0.76	14.4	2.3
COND57 0-0.1	0.03	7.1	0.5	<0.1	3.6	1.8	1	2	44	<1	6.0	0.29	7.9	2.0

Signatory P. Eshuis For and behalf of Bio-Track Pty Ltd

Certificate of Analysis

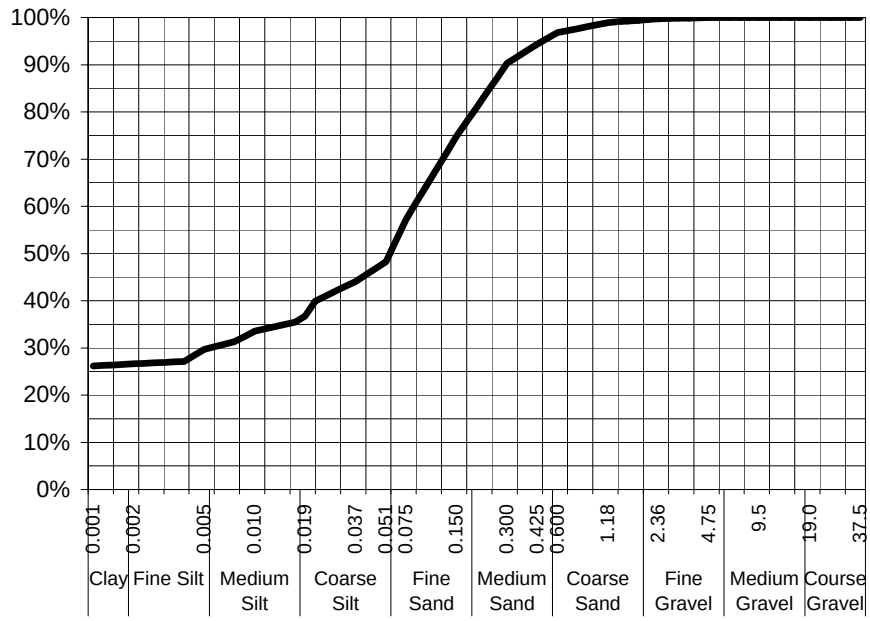
ALS Laboratory Group Pty Ltd
5 Rosegum Road
Warabrook, NSW 2304
pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Cameron Traill	**DATE REPORTED:**	13-Oct-2011
COMPANY:	Worley Parsons - Infrastructure MWE	**DATE RECEIVED:**	30-Sep-2011
ADDRESS:	Level 3, 60 Albert Street PO Box 15081, City East, Brisbane, Qld 4000	**REPORT NO:**	EB1120311-013 / PSD
PROJECT:	301001-00448	**SAMPLE ID:**	PL17/0.0-0.03m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	99%
0.600	97%
0.425	94%
0.300	90%
0.150	75%
0.075	57%
Particle Size (microns)	
51	48%
37	44%
19	37%
10	34%
5	30%
4	27%
1	26%

Samples analysed as received.

Median Particle Size (mm)	0.051

Sample Comments:

Analysed: 10-Oct-11

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: Silty clay and medium fine sand

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Hydrometer Type ASTM E100

Soil Particle Density 2.65 g/cm^3 Assumed

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Dianne Blane
Laboratory Supervisor, Newcastle
Authorised Signatory

Certificate of Analysis

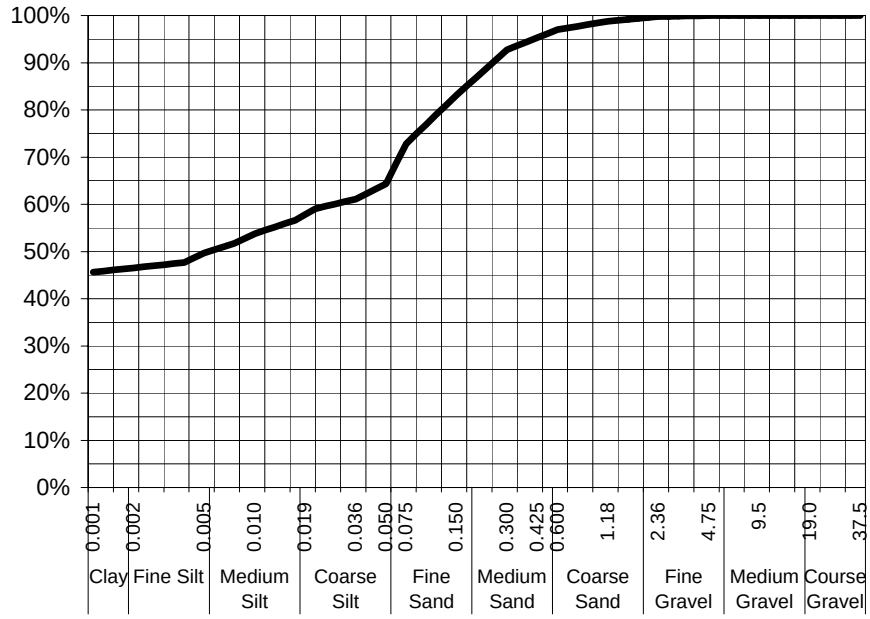
ALS Laboratory Group Pty Ltd
5 Rosegum Road
Warabrook, NSW 2304
pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Cameron Traill	**DATE REPORTED:**	13-Oct-2011
COMPANY:	Worley Parsons - Infrastructure MWE	**DATE RECEIVED:**	30-Sep-2011
ADDRESS:	Level 3, 60 Albert Street PO Box 15081, City East, Brisbane, Qld 4000	**REPORT NO:**	EB1120311-016 / PSD
PROJECT:	301001-00448	**SAMPLE ID:**	PL17/0.2-0.3m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	99%
0.600	97%
0.425	95%
0.300	93%
0.150	83%
0.075	73%
Particle Size (microns)	
50	64%
36	61%
19	58%
10	54%
5	50%
3	48%
1	46%

Samples analysed as received.

Median Particle Size (mm)	0.005

Sample Comments:

Analysed: 10-Oct-11

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: Silty clay and medium fine sand

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Hydrometer Type ASTM E100

Soil Particle Density 2.65 g/cm^3 Assumed

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Dianne Blane
Laboratory Supervisor, Newcastle
Authorised Signatory

Certificate of Analysis

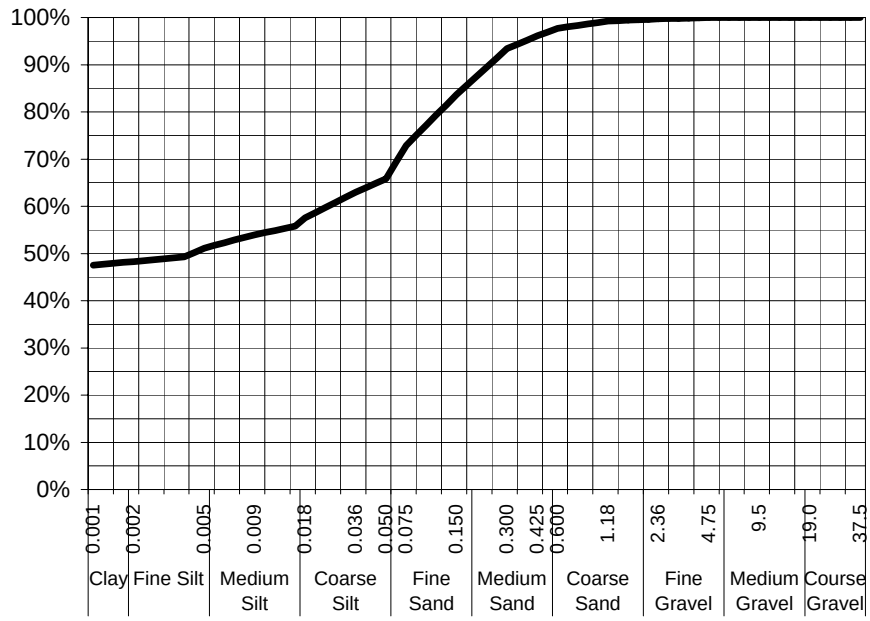
ALS Laboratory Group Pty Ltd
5 Rosegum Road
Warabrook, NSW 2304
pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Cameron Traill	**DATE REPORTED:**	13-Oct-2011
COMPANY:	Worley Parsons - Infrastructure MWE	**DATE RECEIVED:**	30-Sep-2011
ADDRESS:	Level 3, 60 Albert Street PO Box 15081, City East, Brisbane, Qld 4000	**REPORT NO:**	EB1120311-018 / PSD
PROJECT:	301001-00448	**SAMPLE ID:**	PL17/0.5-0.6m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	99%
0.600	98%
0.425	96%
0.300	93%
0.150	84%
0.075	73%
Particle Size (microns)	
50	66%
36	63%
18	58%
9	54%
5	51%
3	49%
1	48%

Samples analysed as received.

Median Particle Size (mm)	0.004

Sample Comments:

Analysed: 10-Oct-11

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: Silty clay and medium fine sand

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Hydrometer Type ASTM E100

Soil Particle Density 2.65 g/cm^3 Assumed

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Dianne Blane
Laboratory Supervisor, Newcastle
Authorised Signatory

Certificate of Analysis

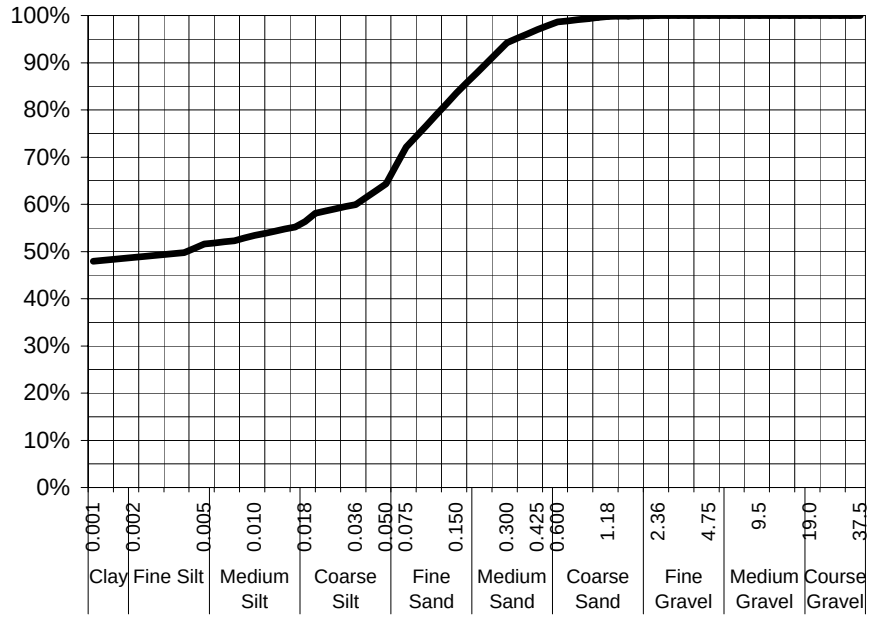
ALS Laboratory Group Pty Ltd
5 Rosegum Road
Warabrook, NSW 2304
pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Cameron Traill	**DATE REPORTED:**	13-Oct-2011
COMPANY:	Worley Parsons - Infrastructure MWE	**DATE RECEIVED:**	30-Sep-2011
ADDRESS:	Level 3, 60 Albert Street PO Box 15081, City East, Brisbane, Qld 4000	**REPORT NO:**	EB1120311-020 / PSD
PROJECT:	301001-00448	**SAMPLE ID:**	PL17/0.9-1.0m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	99%
0.425	97%
0.300	94%
0.150	84%
0.075	72%
Particle Size (microns)	
50	64%
36	60%
18	56%
10	53%
5	52%
3	50%
1	48%

Samples analysed as received.

Median Particle Size (mm)	0.004

Sample Comments:

Loss on Pretreatment NA

Sample Description: Silty clay and medium fine sand

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density 2.65 g/cm^3 Assumed

Analysed: 10-Oct-11

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Dianne Blane
Laboratory Supervisor, Newcastle
Authorised Signatory

Certificate of Analysis

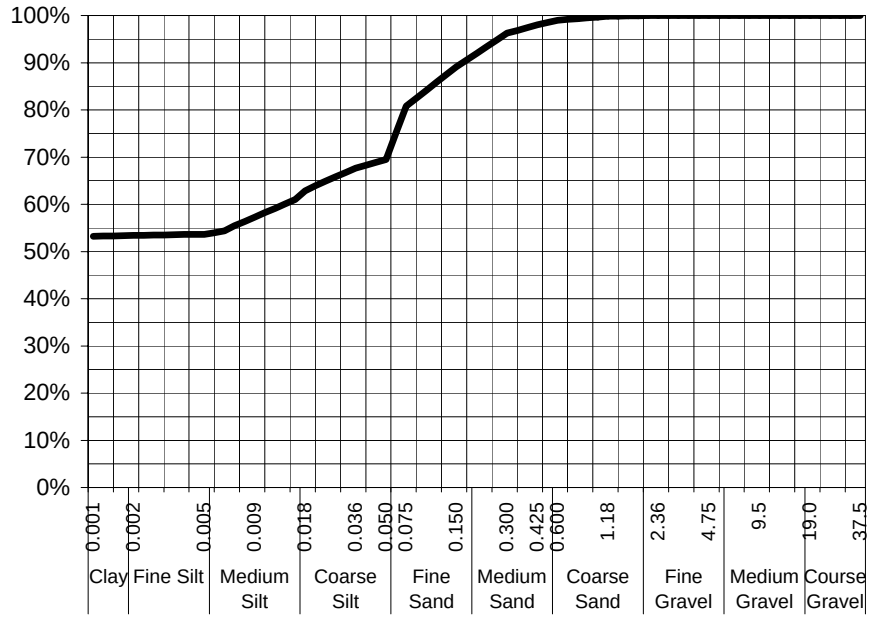
ALS Laboratory Group Pty Ltd
5 Rosegum Road
Warabrook, NSW 2304
pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Cameron Traill	**DATE REPORTED:**	13-Oct-2011
COMPANY:	Worley Parsons - Infrastructure MWE	**DATE RECEIVED:**	30-Sep-2011
ADDRESS:	Level 3, 60 Albert Street PO Box 15081, City East, Brisbane, Qld 4000	**REPORT NO:**	EB1120311-022 / PSD
PROJECT:	301001-00448	**SAMPLE ID:**	PL17/1.4-1.5m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	99%
0.425	98%
0.300	96%
0.150	89%
0.075	81%
Particle Size (microns)	
50	69%
36	68%
18	63%
9	57%
5	54%
3	54%
1	53%

Samples analysed as received.

Median Particle Size (mm)	#N/A

Sample Comments:

Loss on Pretreatment NA

Sample Description: Silty clay and medium fine sand

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density 2.65 g/cm^3 Assumed

Analysed: 10-Oct-11

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Dianne Blane
Laboratory Supervisor, Newcastle
Authorised Signatory

Certificate of Analysis

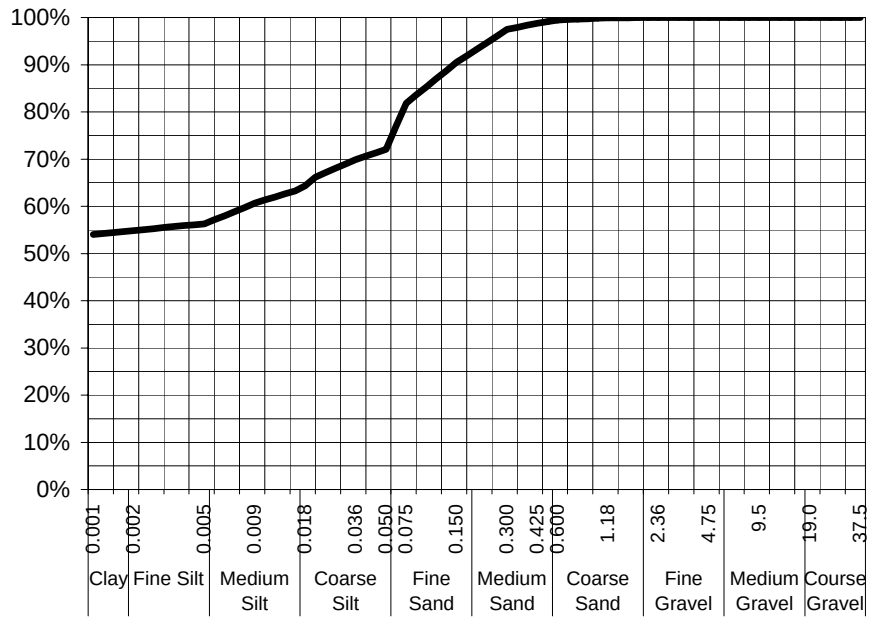
ALS Laboratory Group Pty Ltd
5 Rosegum Road
Warabrook, NSW 2304
pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Cameron Traill	**DATE REPORTED:**	13-Oct-2011
COMPANY:	Worley Parsons - Infrastructure MWE	**DATE RECEIVED:**	30-Sep-2011
ADDRESS:	Level 3, 60 Albert Street PO Box 15081, City East, Brisbane, Qld 4000	**REPORT NO:**	EB1120311-024 / PSD
PROJECT:	301001-00448	**SAMPLE ID:**	PL17/2.4-2.5m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	99%
0.425	99%
0.300	97%
0.150	90%
0.075	82%
Particle Size (microns)	
50	72%
36	70%
18	64%
9	61%
5	56%
3	56%
1	54%

Samples analysed as received.

Median Particle Size (mm)	#N/A

Sample Comments:

Analysed: 10-Oct-11

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: Silty clay and medium fine sand

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Hydrometer Type ASTM E100

Soil Particle Density 2.65 g/cm^3 Assumed

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Dianne Blane
Laboratory Supervisor, Newcastle
Authorised Signatory

CERTIFICATE OF ANALYSIS

Work Order	: **EB1120311**	Page	: 1 of 8
Client	: **WORLEY PARSONS - INFRASTRUCTURE MWE**	Laboratory	: Environmental Division Brisbane
Contact	: CAMERON TRAILL	Contact	: Martin Spencer
Address	: LEVEL 3, 60 ALBERT STREET PO BOX 15081 CITY EAST BRISBANE QLD, AUSTRALIA 4000	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: cameron.traill@worleyparsons.com	E-mail	: Martin.Spencer@alsglobal.com
Telephone	: +61 07 3239 7400	Telephone	: +61 7 3243 7125
Facsimile	: +61 07 3221 7791	Facsimile	: +61 7 3243 7218
Project	: 301001-00448	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 30-SEP-2011
Sampler	: Cameron Traill	Issue Date	: 13-OCT-2011
Site	: Main Pipeline		
		No. of samples received	: 24
Quote number	: EN/034/10	No. of samples analysed	: 14

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dianne Blane	Laboratory Supervisor	Newcastle
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: PL16/0.0-0.05m Client sampling date / time: 28-SEP-2011 15:00 EB1120311-001	Client sample ID: PL16/0.2-0.3m Client sampling date / time: 28-SEP-2011 15:00 EB1120311-003	Client sample ID: PL16/0.5-0.6m Client sampling date / time: 28-SEP-2011 15:00 EB1120311-006	Client sample ID: PL16/0.9-1.0m Client sampling date / time: 28-SEP-2011 15:00 EB1120311-008	Client sample ID: PL16/1.4-1.5m Client sampling date / time: 28-SEP-2011 15:00 EB1120311-010
EA150: Particle Sizing								
+75µm	----	1	%	42	22	17	24	29
+150µm	----	1	%	28	15	12	17	20
+300µm	----	1	%	14	8	6	8	10
+425µm	----	1	%	10	5	4	5	6
+600µm	----	1	%	6	3	2	2	3
+1180µm	----	1	%	2	<1	<1	<1	<1
+2.36mm	----	1	%	<1	<1	<1	<1	<1
+4.75mm	----	1	%	<1	<1	<1	<1	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.1	8.2	8.1	7.6	6.5
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	90	427	703	484	400
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	28.1	13.6	14.5	12.1	12.2
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	27	51	57	54	50
Silt (2-60 µm)	----	1	%	24	25	20	21	17
Sand (0.06-2.00 mm)	----	1	%	49	24	23	25	33
Gravel (>2mm)	----	1	%	<1	<1	<1	<1	<1
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
ED007: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	6.2	5.1	10.4	7.3	5.6
^ Exchangeable Magnesium	----	0.1	meq/100g	4.7	4.0	12.4	10.2	9.0
^ Exchangeable Potassium	----	0.1	meq/100g	0.5	0.4	0.1	0.1	0.1
^ Exchangeable Sodium	----	0.1	meq/100g	1.0	0.8	8.5	7.2	6.2
^ Cation Exchange Capacity	----	0.1	meq/100g	12.4	10.3	31.4	24.8	21.0
^ Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	<0.1	<0.1	<0.1
^ Exchangeable Sodium Percent	----	0.1	%	8.0	8.0	27.2	28.9	29.7
ED037: Alkalinity								
Total Alkalinity as CaCO3	----	1	mg/kg	117	242	164	70	39
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	117	242	164	70	39
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	<1	<1	<1	<1	<1
ED040S : Soluble Sulfate by ICPAES								

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: PL16/0.0-0.05m	PL16/0.2-0.3m	PL16/0.5-0.6m	PL16/0.9-1.0m	PL16/1.4-1.5m
				Client sampling date / time: 28-SEP-2011 15:00	28-SEP-2011 15:00	28-SEP-2011 15:00	28-SEP-2011 15:00	28-SEP-2011 15:00
				EB1120311-001	EB1120311-003	EB1120311-006	EB1120311-008	EB1120311-010
ED040S : Soluble Sulfate by ICPAES - Continued								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**30**	**140**	**200**	**30**	**20**
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	10	mg/kg	**100**	**570**	**1170**	**780**	**600**
ED091 : Calcium Chloride Extractable Boron								
Boron	7440-42-8	0.2	mg/kg	<0.2	----	----	----	----
ED092: DTPA Extractable Metals								
Copper	7440-50-8	1.00	mg/kg	**1.50**	----	----	----	----
Iron	7439-89-6	1.00	mg/kg	**87.0**	----	----	----	----
Manganese	7439-96-5	1.00	mg/kg	**125**	----	----	----	----
Zinc	7440-66-6	1.00	mg/kg	**6.06**	----	----	----	----
ED093S: Soluble Major Cations								
Calcium	7440-70-2	10	mg/kg	**20**	**90**	**30**	**70**	**80**
Magnesium	7439-95-4	10	mg/kg	**20**	**110**	**40**	**140**	**150**
Sodium	7440-23-5	10	mg/kg	**180**	**560**	**990**	**590**	**530**
Potassium	7440-09-7	10	mg/kg	**40**	**30**	<10	**30**	**40**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	**1340**	----	----	----	----
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Bicarbonate Ext. P (Colwell)	----	2	mg/kg	**50**	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**2.3**	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: PL16/1.9-2.0m Client sampling date / time: 28-SEP-2011 15:00 EB1120311-011	PL16/2.4-2.5m 28-SEP-2011 15:00 EB1120311-012	PL17/0.0-0.03m 26-SEP-2011 15:00 EB1120311-013	PL17/0.2-0.3m 26-SEP-2011 15:00 EB1120311-016	PL17/0.5-0.6m 26-SEP-2011 15:00 EB1120311-018
EA150: Particle Sizing								
+75µm	----	1	%	----	**37**	**43**	**27**	**27**
+150µm	----	1	%	----	**27**	**25**	**17**	**16**
+300µm	----	1	%	----	**13**	**10**	**7**	**7**
+425µm	----	1	%	----	**7**	**6**	**5**	**4**
+600µm	----	1	%	----	**3**	**3**	**3**	**2**
+1180µm	----	1	%	----	<1	**1**	**1**	<1
+2.36mm	----	1	%	----	<1	<1	<1	<1
+4.75mm	----	1	%	----	<1	<1	<1	<1
+9.5mm	----	1	%	----	<1	<1	<1	<1
+19.0mm	----	1	%	----	<1	<1	<1	<1
+37.5mm	----	1	%	----	<1	<1	<1	<1
+75.0mm	----	1	%	----	<1	<1	<1	<1
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**5.3**	**5.1**	**5.0**	**6.9**	**9.2**
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**341**	**314**	**35**	**242**	**466**
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**10.7**	**10.5**	**1.3**	**11.0**	**12.8**
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	**42**	**26**	**46**	**48**
Silt (2-60 µm)	----	1	%	----	**16**	**24**	**22**	**22**
Sand (0.06-2.00 mm)	----	1	%	----	**42**	**50**	**32**	**30**
Gravel (>2mm)	----	1	%	----	<1	<1	<1	<1
Cobbles (>6cm)	----	1	%	----	<1	<1	<1	<1
ED007: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	**4.8**	**3.6**	**8.0**	**29.7**	**29.0**
^ Exchangeable Magnesium	----	0.1	meq/100g	**8.8**	**6.5**	**4.5**	**11.6**	**13.4**
^ Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	**0.4**	**0.1**	<0.1
^ Exchangeable Sodium	----	0.1	meq/100g	**6.0**	**4.4**	**0.3**	**2.9**	**5.5**
^ Cation Exchange Capacity	----	0.1	meq/100g	**19.7**	**14.5**	**13.3**	**44.3**	**48.0**
^ Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	<0.1	<0.1	<0.1
^ Exchangeable Sodium Percent	----	0.1	%	**30.2**	**30.2**	**2.5**	**6.6**	**11.4**
ED037: Alkalinity								
Total Alkalinity as CaCO3	----	1	mg/kg	**31**	**31**	**117**	**672**	**594**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	**31**	**31**	**117**	**125**	**313**
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	<1	<1	<1	**547**	**281**
ED040S : Soluble Sulfate by ICPAES								

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: PL16/1.9-2.0m	PL16/2.4-2.5m	PL17/0.0-0.03m	PL17/0.2-0.3m	PL17/0.5-0.6m
Client sampling date / time				28-SEP-2011 15:00	28-SEP-2011 15:00	26-SEP-2011 15:00	26-SEP-2011 15:00	26-SEP-2011 15:00
				EB1120311-011	EB1120311-012	EB1120311-013	EB1120311-016	EB1120311-018
ED040S : Soluble Sulfate by ICPAES - Continued								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**20**	**20**	**20**	**160**	**410**
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	10	mg/kg	**580**	**500**	<10	**40**	**210**
ED091 : Calcium Chloride Extractable Boron								
Boron	7440-42-8	0.2	mg/kg	----	----	<0.2	----	----
ED092: DTPA Extractable Metals								
Copper	7440-50-8	1.00	mg/kg	----	----	<1.00	----	----
Iron	7439-89-6	1.00	mg/kg	----	----	**31.3**	----	----
Manganese	7439-96-5	1.00	mg/kg	----	----	**116**	----	----
Zinc	7440-66-6	1.00	mg/kg	----	----	<1.00	----	----
ED093S: Soluble Major Cations								
Calcium	7440-70-2	10	mg/kg	**20**	**20**	**10**	**50**	**40**
Magnesium	7439-95-4	10	mg/kg	**50**	**50**	**10**	**70**	**60**
Sodium	7440-23-5	10	mg/kg	**380**	**360**	**50**	**450**	**830**
Potassium	7440-09-7	10	mg/kg	**20**	**10**	**10**	**10**	**10**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	----	----	**820**	----	----
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Bicarbonate Ext. P (Colwell)	----	2	mg/kg	----	----	**8**	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	----	----	**1.5**	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	PL17/0.9-1.0m	PL17/1.4-1.5m	PL17/1.9-2.0m	PL17/2.4-2.5m	----
			Client sampling date / time	26-SEP-2011 15:00	26-SEP-2011 15:00	26-SEP-2011 15:00	26-SEP-2011 15:00	----
Compound	CAS Number	LOR	Unit	EB1120311-020	EB1120311-022	EB1120311-023	EB1120311-024	----
EA150: Particle Sizing								
+75µm	----	1	%	28	19	----	18	----
+150µm	----	1	%	16	11	----	10	----
+300µm	----	1	%	6	4	----	2	----
+425µm	----	1	%	3	2	----	1	----
+600µm	----	1	%	1	1	----	<1	----
+1180µm	----	1	%	<1	<1	----	<1	----
+2.36mm	----	1	%	<1	<1	----	<1	----
+4.75mm	----	1	%	<1	<1	----	<1	----
+9.5mm	----	1	%	<1	<1	----	<1	----
+19.0mm	----	1	%	<1	<1	----	<1	----
+37.5mm	----	1	%	<1	<1	----	<1	----
+75.0mm	----	1	%	<1	<1	----	<1	----
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.8	4.8	4.8	5.8	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	830	592	539	561	----
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	11.6	13.1	13.5	12.8	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	48	53	----	54	----
Silt (2-60 µm)	----	1	%	18	22	----	25	----
Sand (0.06-2.00 mm)	----	1	%	34	25	----	21	----
Gravel (>2mm)	----	1	%	<1	<1	----	<1	----
Cobbles (>6cm)	----	1	%	<1	<1	----	<1	----
ED007: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	8.0	6.0	5.4	4.9	----
^ Exchangeable Magnesium	----	0.1	meq/100g	11.3	12.4	11.7	11.8	----
^ Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	<0.1	<0.1	----
^ Exchangeable Sodium	----	0.1	meq/100g	7.4	8.3	7.9	8.0	----
^ Cation Exchange Capacity	----	0.1	meq/100g	26.7	26.8	25.0	24.7	----
^ Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	<0.1	<0.1	----
^ Exchangeable Sodium Percent	----	0.1	%	27.7	31.1	31.4	32.2	----
ED037: Alkalinity								
Total Alkalinity as CaCO3	----	1	mg/kg	39	16	16	180	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/kg	39	16	16	180	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/kg	<1	<1	<1	<1	----
ED040S : Soluble Sulfate by ICPAES								

Analytical Results

Sub-Matrix: SOIL				Client sample ID	PL17/0.9-1.0m	PL17/1.4-1.5m	PL17/1.9-2.0m	PL17/2.4-2.5m	----
				Client sampling date / time	26-SEP-2011 15:00	26-SEP-2011 15:00	26-SEP-2011 15:00	26-SEP-2011 15:00	----
Compound	CAS Number	LOR	Unit		EB1120311-020	EB1120311-022	EB1120311-023	EB1120311-024	----
ED040S : Soluble Sulfate by ICPAES - Continued									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**1370**	**720**	**510**	**580**	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	10	mg/kg		**640**	**580**	**560**	**510**	----
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg		**40**	**20**	**30**	**100**	----
Magnesium	7439-95-4	10	mg/kg		**70**	**40**	**80**	**300**	----
Sodium	7440-23-5	10	mg/kg		**1010**	**760**	**680**	**760**	----
Potassium	7440-09-7	10	mg/kg		**10**	<10	**10**	**30**	----

Golder Associates

BRISBANE LABORATORY

1/51 Secam Street, Mansfield QLD 4122
PO Box 2034 Mansfield DC QLD 4122
Phone:(07) 3343 3166 Fax:(07) 3849 4705
www.golder.com.au

TEST RESULTS

Client :	ALS Environmental Brisbane	Report No. :	R11610
Address :	32 Shand Street, Stafford	Job No. :	117634002/4
Project :	Delivered Samples	Date Received :	12/10/2011
Batch No. :	EB1120311	Sampled by :	Client

EMERSON CLASSIFICATION

Reg'n No.	Sample No.	Sample ID	Description	Emerson Classification Number
11305423	3	PL16/0.2-0.3	(CH) Silty CLAY, brown	3
11305424	6	PL16/0.5-0.6	(CH) Silty CLAY, dark brown	3
11305425	8	PL16/0.9-1.0	(CH) Silty CLAY, brown	3
11305426	10	PL16/1.4-1.5	(CH) Silty CLAY, brown	2
11305427	12	PL16/2.4-2.5	(CH) Silty CLAY, brown	3
11305428	16	PL17/0.2-0.3	(CH) Silty CLAY, brown	5
11305429	18	PL17/0.5-0.6	(CH) Silty CLAY, brown	3
11305430	20	PL17/0.9-1.0	(CH) Silty CLAY, brown	3
11305431	22	PL17/1.4-1.5	(CH) Silty CLAY, brown	3
11305432	24	PL17/2.4-2.5	(CH) Silty CLAY, brown	3

Remarks : Deionised water at 20 °C used in Emerson Class test.

Test Procedure : AS 1289 3.8.1

Prepared by MF Checked by CW

This document is issued in accordance with NATA's accreditation requirements.

NATA

28/10/11

Nick Farrer
Approved Signatory

Senior Technical Officer
NATA Accred. No. : 1961

QUALITY CONTROL REPORT

Work Order	: **EB1120311**	Page	: 1 of 7
Client	: **WORLEY PARSONS - INFRASTRUCTURE MWE**	Laboratory	: Environmental Division Brisbane
Contact	: CAMERON TRAILL	Contact	: Martin Spencer
Address	: LEVEL 3, 60 ALBERT STREET PO BOX 15081 CITY EAST BRISBANE QLD, AUSTRALIA 4000	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: cameron.traill@worleyparsons.com	E-mail	: Martin.Spencer@alsglobal.com
Telephone	: +61 07 3239 7400	Telephone	: +61 7 3243 7125
Facsimile	: +61 07 3221 7791	Facsimile	: +61 7 3243 7218
Project	: 301001-00448	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Main Pipeline		
C-O-C number	: ----	Date Samples Received	: 30-SEP-2011
Sampler	: Cameron Traill	Issue Date	: 13-OCT-2011
Order number	: ----		
		No. of samples received	: 24
Quote number	: EN/034/10	No. of samples analysed	: 14

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dianne Blane	Laboratory Supervisor	Newcastle
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 1985768)									
EB1120311-001	PL16/0.0-0.05m	EA002: pH Value	----	0.1	pH Unit	7.1	7.0	0.0	0% - 20%
EB1120311-018	PL17/0.5-0.6m	EA002: pH Value	----	0.1	pH Unit	9.2	9.2	0.0	0% - 20%
EA010: Conductivity (QC Lot: 1985770)									
EB1120311-001	PL16/0.0-0.05m	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	90	84	6.9	0% - 20%
EB1120311-018	PL17/0.5-0.6m	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	466	495	6.0	0% - 20%
EA055: Moisture Content (QC Lot: 1985832)									
EB1120310-007	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	16.9	17.2	1.4	0% - 50%
EB1120311-011	PL16/1.9-2.0m	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	10.7	10.4	2.7	0% - 50%
ED007: Exchangeable Cations (QC Lot: 1985831)									
EB1120310-001	Anonymous	ED007: Exchangeable Calcium	----	0.1	meq/100g	12.0	12.0	0.9	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	5.5	5.6	0.0	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.5	0.5	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.3	0.3	0.0	No Limit
		ED007: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
EB1120311-008	PL16/0.9-1.0m	ED007: Exchangeable Calcium	----	0.1	meq/100g	7.3	7.4	1.4	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	10.2	10.4	1.4	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	7.2	7.2	0.0	0% - 20%
		ED007: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
ED037: Alkalinity (QC Lot: 1985772)									
EB1120311-001	PL16/0.0-0.05m	ED037: Total Alkalinity as CaCO3	----	1	meq/kg	117	140	17.9	0% - 20%
EB1120311-018	PL17/0.5-0.6m	ED037: Total Alkalinity as CaCO3	----	1	meq/kg	594	594	0.0	0% - 20%
ED040S: Soluble Major Anions (QC Lot: 1985769)									
EB1120311-001	PL16/0.0-0.05m	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	30	40	0.0	No Limit
EB1120311-018	PL17/0.5-0.6m	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	410	420	0.0	0% - 20%
ED045G: Chloride Discrete analyser (QC Lot: 1985773)									
EB1120311-001	PL16/0.0-0.05m	ED045G: Chloride	16887-00-6	10	mg/kg	100	90	0.0	No Limit
EB1120311-018	PL17/0.5-0.6m	ED045G: Chloride	16887-00-6	10	mg/kg	210	230	11.5	0% - 20%
ED091 : Calcium Chloride Extractable Boron (QC Lot: 1985830)									
EB1120310-001	Anonymous	ED091: Boron	7440-42-8	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ED092: DTPA Extractable Metals (QC Lot: 1985761)									
EB1120310-001	Anonymous	ED092: Copper	7440-50-8	1.00	mg/kg	1.07	1.08	1.6	No Limit
		ED092: Iron	7439-89-6	1.00	mg/kg	84.7	85.6	1.0	0% - 20%
		ED092: Manganese	7439-96-5	1.00	mg/kg	174	178	2.6	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED092: DTPA Extractable Metals (QC Lot: 1985761) - continued									
EB1120310-001	Anonymous	ED092: Zinc	7440-66-6	1.00	mg/kg	<1.00	<1.00	0.0	No Limit
ED093S: Soluble Major Cations (QC Lot: 1985771)									
EB1120311-001	PL16/0.0-0.05m	ED093S: Calcium	7440-70-2	10	mg/kg	20	30	0.0	No Limit
		ED093S: Magnesium	7439-95-4	10	mg/kg	20	30	0.0	No Limit
		ED093S: Sodium	7440-23-5	10	mg/kg	180	180	0.0	0% - 50%
		ED093S: Potassium	7440-09-7	10	mg/kg	40	50	0.0	No Limit
EB1120311-018	PL17/0.5-0.6m	ED093S: Calcium	7440-70-2	10	mg/kg	40	30	0.0	No Limit
		ED093S: Magnesium	7439-95-4	10	mg/kg	60	40	37.0	No Limit
		ED093S: Sodium	7440-23-5	10	mg/kg	830	770	7.8	0% - 20%
		ED093S: Potassium	7440-09-7	10	mg/kg	10	<10	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 1985792)									
EB1120310-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	20	mg/kg	1510	1650	8.9	0% - 20%
EK080: Bicarbonate Extractable Phosphorus (Colwell) (QC Lot: 1986953)									
EB1120310-001	Anonymous	EK080: Bicarbonate Ext. P (Colwell)	----	2	mg/kg	<2	<2	0.0	No Limit
EP004: Organic Matter (QC Lot: 1986724)									
EB1120310-001	Anonymous	EP004: Organic Matter	----	0.5	%	4.4	4.3	3.2	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002 : pH (Soils) (QCLot: 1985768)								
EA002: pH Value	----	0.1	pH Unit	----	5.2 pH Unit	100	97	103
EA010: Conductivity (QCLot: 1985770)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	196 µS/cm	101	85	115
ED007: Exchangeable Cations (QCLot: 1985831)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	1.39 meq/100g	91.6	70	130
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	0.79 meq/100g	86.4	70	130
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.18 meq/100g	71.8	70	130
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.41 meq/100g	84.8	70	130
ED007: Cation Exchange Capacity	----	0.1	meq/100g	----	2.71 meq/100g	89.8	70	130
ED007: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	----
ED037: Alkalinity (QCLot: 1985772)								
ED037: Total Alkalinity as CaCO3	----	1	meq/kg	<1	500 meq/kg	98.4	85	115
ED040S: Soluble Major Anions (QCLot: 1985769)								
ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	238 mg/kg	104	77	125
ED045G: Chloride Discrete analyser (QCLot: 1985773)								
ED045G: Chloride	16887-00-6	10	mg/kg	<10	5000 mg/kg	107	81	125
ED091 : Calcium Chloride Extractable Boron (QCLot: 1985830)								
ED091: Boron	7440-42-8	0.2	mg/kg	<0.2	10 mg/kg	111	72.1	130
ED092: DTPA Extractable Metals (QCLot: 1985761)								
ED092: Copper	7440-50-8	1	mg/kg	<1.00	6.758 mg/kg	107	70	130
ED092: Iron	7439-89-6	1	mg/kg	<1.00	2.812 mg/kg	70.0	70	130
ED092: Manganese	7439-96-5	1	mg/kg	<1.00	1.214 mg/kg	112	70	130
ED092: Zinc	7440-66-6	1	mg/kg	<1.00	31.948 mg/kg	98.1	70	130
ED093S: Soluble Major Cations (QCLot: 1985771)								
ED093S: Calcium	7440-70-2	10	mg/kg	<10	----	----	----	----
ED093S: Magnesium	7439-95-4	10	mg/kg	<10	----	----	----	----
ED093S: Sodium	7440-23-5	10	mg/kg	<10	----	----	----	----
ED093S: Potassium	7440-09-7	10	mg/kg	<10	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1985792)								
EK061G: Total Kjeldahl Nitrogen as N	----	20	mg/kg	<20	534 mg/kg	85.8	70	118
EK080: Bicarbonate Extractable Phosphorus (Colwell) (QCLot: 1986953)								
EK080: Bicarbonate Ext. P (Colwell)	----	100	mg/kg	<100	----	----	----	----
EP004: Organic Matter (QCLot: 1986724)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP004: Organic Matter (QCLot: 1986724) - continued								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	97.4	85	115

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1985792)							
EB1120310-007	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	500 mg/kg	106	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB1120311**	Page	: 1 of 10
Client	: WORLEY PARSONS - INFRASTRUCTURE MWE	Laboratory	: Environmental Division Brisbane
Contact	: CAMERON TRAILL	Contact	: Martin Spencer
Address	: LEVEL 3, 60 ALBERT STREET PO BOX 15081 CITY EAST BRISBANE QLD, AUSTRALIA 4000	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: cameron.traill@worleyparsons.com	E-mail	: Martin.Spencer@alsglobal.com
Telephone	: +61 07 3239 7400	Telephone	: +61 7 3243 7125
Facsimile	: +61 07 3221 7791	Facsimile	: +61 7 3243 7218
Project	: 301001-00448	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Main Pipeline		
C-O-C number	: ----	Date Samples Received	: 30-SEP-2011
Sampler	: Cameron Traill	Issue Date	: 13-OCT-2011
Order number	: ----		
		No. of samples received	: 24
Quote number	: EN/034/10	No. of samples analysed	: 14

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

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/1.9-2.0m, PL17/2.4-2.5m	**26-SEP-2011**	**05-OCT-2011**	03-OCT-2011	×	**06-OCT-2011**	06-OCT-2011	✓
Snap Lock Bag PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/1.9-2.0m, PL16/2.4-2.5m	**28-SEP-2011**	**05-OCT-2011**	05-OCT-2011	✓	**06-OCT-2011**	06-OCT-2011	✓
EA010: Conductivity							
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/1.9-2.0m, PL17/2.4-2.5m	**26-SEP-2011**	**05-OCT-2011**	03-OCT-2011	×	**06-OCT-2011**	02-NOV-2011	✓
Snap Lock Bag PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/1.9-2.0m, PL16/2.4-2.5m	**28-SEP-2011**	**05-OCT-2011**	05-OCT-2011	✓	**06-OCT-2011**	02-NOV-2011	✓
EA055: Moisture Content							
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/1.9-2.0m, PL17/2.4-2.5m	**26-SEP-2011**	**----**	----	----	**05-OCT-2011**	10-OCT-2011	✓
Snap Lock Bag PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/1.9-2.0m, PL16/2.4-2.5m	**28-SEP-2011**	**----**	----	----	**05-OCT-2011**	12-OCT-2011	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA150: Particle Sizing							
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/2.4-2.5m	**26-SEP-2011**	**---**	24-MAR-2012	----	**12-OCT-2011**	24-MAR-2012	✓
Snap Lock Bag PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/2.4-2.5m	**28-SEP-2011**	**---**	26-MAR-2012	----	**12-OCT-2011**	26-MAR-2012	✓
EA150: Soil Classification based on Particle Size							
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/2.4-2.5m	**26-SEP-2011**	**---**	24-MAR-2012	----	**12-OCT-2011**	24-MAR-2012	✓
Snap Lock Bag PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/2.4-2.5m	**28-SEP-2011**	**---**	26-MAR-2012	----	**12-OCT-2011**	26-MAR-2012	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/1.9-2.0m, PL17/2.4-2.5m	**26-SEP-2011**	**06-OCT-2011**	24-MAR-2012	✓	**08-OCT-2011**	24-MAR-2012	✓
Soil Glass Jar - Unpreserved PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/1.9-2.0m, PL16/2.4-2.5m	**28-SEP-2011**	**06-OCT-2011**	26-MAR-2012	✓	**08-OCT-2011**	26-MAR-2012	✓
ED037: Alkalinity							
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/1.9-2.0m, PL17/2.4-2.5m	**26-SEP-2011**	**05-OCT-2011**	24-MAR-2012	✓	**06-OCT-2011**	24-MAR-2012	✓
Snap Lock Bag PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/1.9-2.0m, PL16/2.4-2.5m	**28-SEP-2011**	**05-OCT-2011**	26-MAR-2012	✓	**06-OCT-2011**	26-MAR-2012	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED040S : Soluble Sulfate by ICPAES							
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/1.9-2.0m, PL17/2.4-2.5m	**26-SEP-2011**	**05-OCT-2011**	03-OCT-2011	×	**06-OCT-2011**	02-NOV-2011	✓
Snap Lock Bag PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/1.9-2.0m, PL16/2.4-2.5m	**28-SEP-2011**	**05-OCT-2011**	05-OCT-2011	✓	**06-OCT-2011**	02-NOV-2011	✓
ED045G: Chloride Discrete analyser							
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/1.9-2.0m, PL17/2.4-2.5m	**26-SEP-2011**	**05-OCT-2011**	03-OCT-2011	×	**06-OCT-2011**	02-NOV-2011	✓
Snap Lock Bag PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/1.9-2.0m, PL16/2.4-2.5m	**28-SEP-2011**	**05-OCT-2011**	05-OCT-2011	✓	**06-OCT-2011**	02-NOV-2011	✓
ED091 : Calcium Chloride Extractable Boron							
Snap Lock Bag PL17/0.0-0.03m	**26-SEP-2011**	**06-OCT-2011**	24-MAR-2012	✓	**07-OCT-2011**	24-MAR-2012	✓
Snap Lock Bag PL16/0.0-0.05m	**28-SEP-2011**	**06-OCT-2011**	26-MAR-2012	✓	**07-OCT-2011**	26-MAR-2012	✓
ED092: DTPA Extractable Metals							
Snap Lock Bag PL17/0.0-0.03m	**26-SEP-2011**	**11-OCT-2011**	24-MAR-2012	✓	**12-OCT-2011**	24-MAR-2012	✓
Snap Lock Bag PL16/0.0-0.05m	**28-SEP-2011**	**11-OCT-2011**	26-MAR-2012	✓	**12-OCT-2011**	26-MAR-2012	✓
ED093S: Soluble Major Cations							
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/1.9-2.0m, PL17/2.4-2.5m	**26-SEP-2011**	**05-OCT-2011**	24-MAR-2012	✓	**06-OCT-2011**	24-MAR-2012	✓
Snap Lock Bag PL16/0.0-0.05m, PL16/0.2-0.3m, PL16/0.5-0.6m, PL16/0.9-1.0m, PL16/1.4-1.5m, PL16/1.9-2.0m, PL16/2.4-2.5m	**28-SEP-2011**	**05-OCT-2011**	26-MAR-2012	✓	**06-OCT-2011**	26-MAR-2012	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Snap Lock Bag PL17/0.0-0.03m	**26-SEP-2011**	**06-OCT-2011**	24-MAR-2012	✓	**07-OCT-2011**	24-MAR-2012	✓
Snap Lock Bag PL16/0.0-0.05m	**28-SEP-2011**	**06-OCT-2011**	26-MAR-2012	✓	**07-OCT-2011**	26-MAR-2012	✓
EK080: Bicarbonate Extractable Phosphorus (Colwell)							
Snap Lock Bag PL17/0.0-0.03m	**26-SEP-2011**	**----**	----	----	**06-OCT-2011**	24-MAR-2012	✓
Snap Lock Bag PL16/0.0-0.05m	**28-SEP-2011**	**----**	----	----	**06-OCT-2011**	26-MAR-2012	✓
EP004: Organic Matter							
Snap Lock Bag PL17/0.0-0.03m	**26-SEP-2011**	**07-OCT-2011**	03-OCT-2011	×	**07-OCT-2011**	04-NOV-2011	✓
Snap Lock Bag PL16/0.0-0.05m	**28-SEP-2011**	**07-OCT-2011**	05-OCT-2011	×	**07-OCT-2011**	04-NOV-2011	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity in Soil	ED037	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Bicarbonate Extractable P (Colwell)	EK080	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Calcium Chloride Extractable Boron	ED091	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Cations - soluble by ICP-AES	ED093S	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride Soluble By Discrete Analyser	ED045G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
DTPA Extractable Metals	ED092	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Electrical Conductivity (1:5)	EA010	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Exchangeable Cations	ED007	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Soluble	ED040S	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Moisture Content	EA055-103	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organic Matter	EP004	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TKN as N By Discrete Analyser	EK061G	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity in Soil	ED037	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Calcium Chloride Extractable Boron	ED091	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride Soluble By Discrete Analyser	ED045G	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
DTPA Extractable Metals	ED092	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Electrical Conductivity (1:5)	EA010	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Exchangeable Cations	ED007	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Soluble	ED040S	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organic Matter	EP004	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TKN as N By Discrete Analyser	EK061G	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Alkalinity in Soil	ED037	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Bicarbonate Extractable P (Colwell)	EK080	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Calcium Chloride Extractable Boron	ED091	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Cations - soluble by ICP-AES	ED093S	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride Soluble By Discrete Analyser	ED045G	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
DTPA Extractable Metals	ED092	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Electrical Conductivity (1:5)	EA010	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Exchangeable Cations	ED007	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Soluble	ED040S	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organic Matter	EP004	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TKN as N By Discrete Analyser	EK061G	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
TKN as N By Discrete Analyser	EK061G	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	(APHA 21st ed., 4500H+) pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (1999) Schedule B(3) (Method 103)
Electrical Conductivity (1:5)	EA010	SOIL	(APHA 21st ed., 2510) Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (1999) Schedule B(3) (Method 104)
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2010 Draft) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Particle Size Analysis (Sieving)	EA150	SOIL	Particle Size Analysis by Sieving according to AS1289.3.6.1 - 1995
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Exchangeable Cations	ED007	SOIL	Rayment & Higginson (1992) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (1999) Schedule B(3) (Method 301)
Alkalinity in Soil	ED037	SOIL	APHA 21st ed., 2320 B Alkalinity is determined and reported on a 1:5 soil/water leach.
Major Anions - Soluble	ED040S	SOIL	In-house. Soluble Anions are determined off a 1:5 soil / water extract by ICPAES.
Chloride Soluble By Discrete Analyser	ED045G	SOIL	The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition 4500-Cl- E.
Calcium Chloride Extractable Boron	ED091	SOIL	Rayment & Higginson (1992) method 12C2. Soil is extracted with hot 0.01M CaCl2 solution at a 1:2 ratio. Extracts can be run on ICP.
DTPA Extractable Metals	ED092	SOIL	Rayment and Higginson 12A1
Cations - soluble by ICP-AES	ED093S	SOIL	APHA 21st ed., 3120; USEPA SW 846 - 6010 (ICPAES) Water extracts of the soil are analyzed for major cations by ICPAES. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
TKN as N By Discrete Analyser	EK061G	SOIL	APHA 21st ed., 4500-Norg-D Soil samples are digested using Kjeldahl digestion followed by determination by Discrete Analyser.
Bicarbonate Extractable P (Colwell)	EK080	SOIL	Rayment & Higginson (1992) Method 9B1 Phosphorus is extracted from the soil using 0.5M NaHCO3 at a 1:100 soil:solution ratio and determined by FIA.
Emerson Aggregate Testing	EME-SOL	SOIL	Emerson Aggregate Testing per AS1289.3.8.1 performed by Subcontrator Laboratory.
Organic Matter	EP004	SOIL	AS1289.4.1.1 - 1997., Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (1999) Schedule B(3) (Method 105)

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
Hot Water CaCl2 Extraction for Boron	ED091PR	SOIL	Rayment & Higginson (1992) method 12C2. Soil is extracted with hot 0.01M CaCl2 solution at a 1:2 ratio. Extracts can be run on ICP.
DTPA Extraction for Cu, Zn, Mn, Fe (2 hour leach)	ED092PR	SOIL	Rayment & Higginson (1992) Method 12A1 2 hour end over end tumbler extraction with 0.005M DTPA at a ratio of 1:2. Extracts can be run by ICP for metals.
TKN/TP Digestion	EK061/EK067	SOIL	APHA 21st ed., 4500 Norg- D; APHA 21st ed., 4500 P - H. Macro Kjeldahl digestion.

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	AS1289.4.1.1 - 1997., Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (1999) Schedule B(3) (Method 105)

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **SOIL**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002 : pH (Soils)							
Snap Lock Bag							
PL17/0.0-0.03m,	PL17/0.2-0.3m,	05-OCT-2011	03-OCT-2011	**2**	----	----	----
PL17/0.5-0.6m,	PL17/0.9-1.0m,						
PL17/1.4-1.5m,	PL17/1.9-2.0m,						
PL17/2.4-2.5m							
EA010: Conductivity							
Snap Lock Bag							
PL17/0.0-0.03m,	PL17/0.2-0.3m,	05-OCT-2011	03-OCT-2011	**2**	----	----	----
PL17/0.5-0.6m,	PL17/0.9-1.0m,						
PL17/1.4-1.5m,	PL17/1.9-2.0m,						
PL17/2.4-2.5m							
ED040S : Soluble Sulfate by ICPAES							
Snap Lock Bag							
PL17/0.0-0.03m,	PL17/0.2-0.3m,	05-OCT-2011	03-OCT-2011	**2**	----	----	----
PL17/0.5-0.6m,	PL17/0.9-1.0m,						
PL17/1.4-1.5m,	PL17/1.9-2.0m,						
PL17/2.4-2.5m							
ED045G: Chloride Discrete analyser							

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
ED045G: Chloride Discrete analyser - Analysis Holding Time Compliance						
Snap Lock Bag PL17/0.0-0.03m, PL17/0.2-0.3m, PL17/0.5-0.6m, PL17/0.9-1.0m, PL17/1.4-1.5m, PL17/1.9-2.0m, PL17/2.4-2.5m	05-OCT-2011	03-OCT-2011	**2**	----	----	----
EP004: Organic Matter						
Snap Lock Bag PL17/0.0-0.03m	07-OCT-2011	03-OCT-2011	**4**	----	----	----
Snap Lock Bag PL16/0.0-0.05m	07-OCT-2011	05-OCT-2011	**2**	----	----	----

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EB1120311**		
Client	: **WORLEY PARSONS - INFRASTRUCTURE MWE**	Laboratory	: Environmental Division Brisbane
Contact	: CAMERON TRAILL	Contact	: Martin Spencer
Address	: LEVEL 3, 60 ALBERT STREET PO BOX 15081 CITY EAST BRISBANE QLD, AUSTRALIA 4000	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: cameron.traill@worleyparsons.com	E-mail	: Martin.Spencer@alsglobal.com
Telephone	: +61 07 3239 7400	Telephone	: +61 7 3243 7125
Facsimile	: +61 07 3221 7791	Facsimile	: +61 7 3243 7218
Project	: 301001-00448	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: ES2010WORPAR0241 (EN/034/10)
Site	: Main Pipeline		
Sampler	: Cameron Traill	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 30-SEP-2011	Issue Date	: 05-OCT-2011 11:30
Client Requested Due Date	: 11-OCT-2011	Scheduled Reporting Date	: **11-OCT-2011**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 21.9°C
No. of coolers/boxes	: 1 MEDIUM	No. of samples received	: 24
Security Seal	: Intact.	No. of samples analysed	: 14

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Matt Goodwin.
- Analytical work for this work order will be conducted at ALS Brisbane and ALS Newcastle.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	(On Hold) SOIL No analysis requested	SOIL - EA002 pH (1:5)	SOIL - EA010 (solids): Electrical Conductivity (1:5) Electrical Conductivity (1:5)	SOIL - EA150H Particle Sizing by Hydrometer	SOIL - ED007 CEC / Exchangeable Cations (ED007)	SOIL - ED037 Alkalinity in Soil	SOIL - ED091 Calcium Chloride Extractable Boron	SOIL - ED092 DTPA Extractable Metals
EB1120311-001	28-SEP-2011 15:00	PL16/0.0-0.05m		✓	✓	✓	✓	✓	✓	✓
EB1120311-002	28-SEP-2011 15:00	PL16/0.1-0.2m	✓							
EB1120311-003	28-SEP-2011 15:00	PL16/0.2-0.3m		✓	✓	✓	✓	✓		
EB1120311-004	28-SEP-2011 15:00	PL16/0.3-0.4m	✓							
EB1120311-005	28-SEP-2011 15:00	PL16/0.4-0.5m	✓							
EB1120311-006	28-SEP-2011 15:00	PL16/0.5-0.6m		✓	✓	✓	✓	✓		
EB1120311-007	28-SEP-2011 15:00	PL16/0.7-0.8m	✓							
EB1120311-008	28-SEP-2011 15:00	PL16/0.9-1.0m		✓	✓	✓	✓	✓		
EB1120311-009	28-SEP-2011 15:00	PL16/1.1-1.2m	✓							
EB1120311-010	28-SEP-2011 15:00	PL16/1.4-1.5m		✓	✓	✓	✓	✓		
EB1120311-011	28-SEP-2011 15:00	PL16/1.9-2.0m		✓	✓		✓	✓		
EB1120311-012	28-SEP-2011 15:00	PL16/2.4-2.5m		✓	✓	✓	✓	✓		
EB1120311-013	26-SEP-2011 15:00	PL17/0.0-0.03m		✓	✓	✓	✓	✓	✓	✓
EB1120311-014	26-SEP-2011 15:00	PL17/0.03-0.1m	✓							
EB1120311-015	26-SEP-2011 15:00	PL17/0.1-0.2m	✓							
EB1120311-016	26-SEP-2011 15:00	PL17/0.2-0.3m		✓	✓	✓	✓	✓		
EB1120311-017	26-SEP-2011 15:00	PL17/0.3-0.4m	✓							
EB1120311-018	26-SEP-2011 15:00	PL17/0.5-0.6m		✓	✓	✓	✓	✓		
EB1120311-019	26-SEP-2011 15:00	PL17/0.7-0.8m	✓							
EB1120311-020	26-SEP-2011 15:00	PL17/0.9-1.0m		✓	✓	✓	✓	✓		
EB1120311-021	26-SEP-2011 15:00	PL17/1.1-1.2m	✓							
EB1120311-022	26-SEP-2011 15:00	PL17/1.4-1.5m		✓	✓	✓	✓	✓		
EB1120311-023	26-SEP-2011 15:00	PL17/1.9-2.0m		✓	✓		✓	✓		
EB1120311-024	26-SEP-2011 15:00	PL17/2.4-2.5m		✓	✓	✓	✓	✓		

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EK061G (Solids) Total Kjeldahl Nitrogen as N (TKN) By Discrete Analyser	SOIL - EK080 Bicarbonate Extractable P (Colwell)	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - NT-1S Major Cations (Ca, Mg, Na, K)	SOIL - NT-2S Major Anions (Cl, SO4)
EB1120311-001	28-SEP-2011 15:00	PL16/0.0-0.05m	✓	✓	✓	✓	✓
EB1120311-003	28-SEP-2011 15:00	PL16/0.2-0.3m				✓	✓
EB1120311-006	28-SEP-2011 15:00	PL16/0.5-0.6m				✓	✓
EB1120311-008	28-SEP-2011 15:00	PL16/0.9-1.0m				✓	✓
EB1120311-010	28-SEP-2011 15:00	PL16/1.4-1.5m				✓	✓
EB1120311-011	28-SEP-2011 15:00	PL16/1.9-2.0m				✓	✓
EB1120311-012	28-SEP-2011 15:00	PL16/2.4-2.5m				✓	✓
EB1120311-013	26-SEP-2011 15:00	PL17/0.0-0.03m	✓	✓	✓	✓	✓
EB1120311-016	26-SEP-2011 15:00	PL17/0.2-0.3m				✓	✓
EB1120311-018	26-SEP-2011 15:00	PL17/0.5-0.6m				✓	✓
EB1120311-020	26-SEP-2011 15:00	PL17/0.9-1.0m				✓	✓
EB1120311-022	26-SEP-2011 15:00	PL17/1.4-1.5m				✓	✓
EB1120311-023	26-SEP-2011 15:00	PL17/1.9-2.0m				✓	✓
EB1120311-024	26-SEP-2011 15:00	PL17/2.4-2.5m				✓	✓

Requested Deliverables

CAMERON TRAILL

- *AU Certificate of Analysis - NATA (COA)	Email	cameron.traill@worleyparsons.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	cameron.traill@worleyparsons.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	cameron.traill@worleyparsons.com
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	cameron.traill@worleyparsons.com
- Attachment - Report (SUBCO)	Email	cameron.traill@worleyparsons.com
- Chain of Custody (CoC) (COC)	Email	cameron.traill@worleyparsons.com
- EDI Format - ENMRG (ENMRG)	Email	cameron.traill@worleyparsons.com
- EDI Format - EQUIS V5 Generic (EQUIS_V5)	Email	cameron.traill@worleyparsons.com
- EDI Format - ESDAT (ESDAT)	Email	cameron.traill@worleyparsons.com
- EDI Format - XTab (XTAB)	Email	cameron.traill@worleyparsons.com

INVOICES

- A4 - AU Tax Invoice (INV)	Email	accounts.payable@worleyparsons.com

CHAIN OF CUSTODY DOCUMENTATION

ALS

CLIENT: WorleyParsons	SAMPLER: Cameron Traill
ADDRESS / OFFICE: 60 Albert St, Brisbane City	MOBILE: 0403837811
PROJECT MANAGER (PM): Cameron Traill	PHONE 54756405
PROJECT ID: 301001-00448	EMAIL REPORT TO: cameron.traill@worleyparsons.com **(EXCEL format and PDF)**
SITE: Main Pipeline P.O. NO.:	EMAIL INVOICE TO: Accounts payable
RESULTS REQUIRED (Date): (7 day TAT) QUOTE NO.:	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION														
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	TKN / ~~Reactive~~ COLWELL P (topsoils)	PSD (all)	pH / Electrical Conductivity (all)	**NT1S** - CEC (Ca, Mg, K, Na) [all] +AL	Anions: Major (Cl, SO4, Alkalinity) [all]	Emersion Dispersion (subsoils)	%C (WALKLEY-BLACK)	MICRO-NUTRIENTS (B, Cu, Fe, Mn, Zn)	ESP				**HOLD**
1	PL16 / 0.0-0.05m	S	28/9/11				✓	✓	✓	✓	✓		✓	✓	✓				
2	PL16 / 0.1-0.2m	S	28/9/11																x
3	PL16 / 0.2-0.3m	S	28/9/11					✓	✓	✓	✓				✓				~~x~~
4	PL16 / 0.3-0.4m	S	28/9/11																x
5	PL16 / 0.4-0.5m	S	28/9/11																x
6	PL16 / 0.5-0.6m	S	28/9/11					✓	✓	✓	✓				✓				~~x~~
7	PL16 / 0.7-0.8m	S	28/9/11																x
8	PL16 / 0.9-1.0m	S	28/9/11					✓	✓	✓	✓				✓				
9	PL16 / 1.1-1.2m	S	28/9/11																x
10	PL16 / 1.4-1.5m	S	28/9/11					✓	✓	✓	✓				✓				~~x~~
11	PL16 / 1.9-2.0m	S	28/9/11						✓	✓	✓				✓				
12	PL16 / 2.4-2.5m	S	28/9/11					✓	✓	✓	✓				✓				

Environmental Division
Brisbane
Work Order
EB1120311

Telephone : +61-7-3243 7222

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name: Cameron Traill	Date: 29/09/2011	Name: James	Date: 30/9	Con' Note No:
Of: WorleyParsons	Time:	Of: ALS	Time: 10:00	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS

IN OF CUSTODY DOCUMENTATION

ALS

ENT: WorleyParsons

ADDRESS / OFFICE: 60 Albert St, Brisbane City

PROJECT MANAGER (PM): Cameron Traill

PROJECT ID: 301001-00448

SITE: Main Pipeline P.O. NO.:

RESULTS REQUIRED (**Date**): (7 day TAT) QUOTE NO.:

SAMPLER: Cameron Traill

MOBILE: 0403837811

PHONE 54756405

EMAIL REPORT TO: cameron.traill@worleyparsons.com **(EXCEL format and PDF)**

EMAIL INVOICE TO: Accounts payable

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		Caldwell TKN / ~~Reactive~~ P (topsoils)	PSD (all)	pH / Electricial Conductivity (all)	**NT1S** - CEC (Ca, Mg, K, Na) [all] +AL	Anions: Major (Cl, SO4, Alkalinity) [all]	Emersion Dispersion (subsoils)	%C (Walkley-Black)	MICRO-NUTRIENTS (B, Cu, Fe, Mn, Zn)	ESP				HOLD	Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles														
13	PL17/0.0-0.03m	S	26/9/11				✓	✓	✓	✓	✓		✓	✓	✓					
14	PL17/0.03-0.1m	S	26/9/11																x	
15	PL17/0.1-0.2m	S	26/9/11																x	
16	PL17/0.2-0.3m	S	26/9/11					✓	✓	✓	✓				✓					
17	PL17/0.3-0.4m	S	26/9/11					✓	✓	✓	✓				✓				X	
18	PL17/0.5-0.6m	S	26/9/11					✓	✓	✓	✓				✓					
19	PL17/0.7-0.8m	S	26/9/11																X	
20	PL17/0.9-1.0m	S	26/9/11					✓	✓	✓	✓				✓					
21	PL17/1.1-1.2m	S	26/9/11																X	
22	PL17/1.4-1.5m	S	26/9/11					✓	✓	✓	✓				✓					
23	PL17/1.9-2.0m	S	26/9/11						✓	✓	✓				✓					
24	PL17/2.4-2.5m	S	26/9/11					✓	✓	✓	✓				✓					

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name: Cameron Traill	Date: 29/09/2011	Name: James	Date: 30/9	Con' Note No:
Of: WorleyParsons	Time:	Of: ALS	Time: 1000	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

Laboratory assessment data for selected soil sample sites within the Condabri development area

General Information			*Field Classification*		*Analytical Data*																						*Detailed Classification*		
Soil Sample Location	**Soil Sample Site**	**Sample Depth (m)**	**Soil Group**	**Classification (ASC)**	**Particle Size**				**pH**	**EC**	**Moisture Content**	**Exchangeable Cations**				**CEC**	**Alkalinity**			**Sulphate**	**Chloride**	**Soluble Major Cations**				**TKN**	**Reactive P**	**Exchangeable Sodium Percent (ESP)***	**Emerson Dispersion**	**Soil Group**	**Description**	**Classification (ASC)**
					Gravel (>2 mm)	**Sand (0.06 - 2 mm)**	**Silt (2-60 µm)**	**Clay (<2 µm)**				**Ca**	**Mg**	**K**	**Na**		**Total**	**Bicarbonate**	**Carbonate**			**Ca**	**Mg**	**Na**	**K**							
Units			-	-					*pH units*	*µS/cm*	*%*	*meq/100g*	*meq/100g*	*meq/100g*	*meq/100g*	*meq/100g*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*%*		-	-	-
Laboratory Detection Level			-	-					*0.1*	*10*	*1.0*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*1*	*1*	*10*	*10*	*10*	*10*	*10*	*10*	*20*	*0.1*	-		-	-	-
Condabri North	COND14	0.0-0.1	2d(ii)	**SODOSOL**	1	71	11	17	6.1	103	13.4	0.9	1.1	<0.1	0.9	3.0	23	23	<1	20	20	<10	<10	120	<10	470	<0.1	30.000	-	2d(ii)	Texture contrast soil, moderately deep, loamy sand over sandy clay loam, neutral to alkaline subsoil	**SODOSOL**
		1.1-1.2			1	50	16	33	7.7	342	10.6	<0.1	6.7	<0.1	4.0	10.9	211	211	<1	40	40	<10	30	350	<10	-	-	36.697	1			
Condabri North	COND15	0.0-0.1	2d(ii)	**SODOSOL**	4	66	15	15	6.4	15	6.6	1.4	2.6	<0.1	0.3	4.3	82	82	<1	<10	60	<10	20	20	<10	540	2	6.977	-	2d(ii)	Texture contrast soil, moderately deep, loamy sand over sandy clay loam, neutral to alkaline subsoil	**SODOSOL**
		0.9-1.0			<1	59	10	31	8.7	391	8.2	0.2	11.8	0.1	4.4	16.5	703	680	23	70	1080	<10	60	340	10	-	-	26.667	2			
Condabri Central	COND21	0.0-0.1	2c(ii)	**SODOSOL**	1	71	10	18	7.0	10	8.3	3.4	1.8	0.4	0.1	5.7	98	98	<1	<10	<10	<10	<10	10	<10	520	0.4	1.754	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**
		1.1-1.2			1	56	10	33	9.6	519	10.8	8.1	7.6	<0.1	6.4	22.2	1050	539	515	160	270	<10	<10	590	<10	-	-	28.829	2			
Condabri Central	COND23	0.0-0.05	5b(m)	**VERTOSOL**	1	47	17	35	7.6	128	25.4	13.3	5.7	0.4	0.9	20.3	351	351	<1	20	40	30	10	110	10	750	0.6	4.433	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**
		1.1-1.2			<1	30	18	52	5.4	771	17.0	4.5	10.1	<0.1	7.8	22.5	47	47	<1	190	1080	<10	<10	770	<10	-	-	34.667	1			
Condabri Central	COND25	0.3-0.4	5b	**VERTOSOL**	<1	28	19	53	8.3	654	14.5	13.2	12.6	<0.1	7.4	33.3	785	621	164	90	1270	<10	<10	740	<10	550	1.3	22.222	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**
		0.9-1.0			<1	35	25	40	5.1	470	10.5	3.6	7.1	<0.1	5.5	16.3	47	47	<1	<10	660	<10	<10	470	<10	-	-	33.742	1			
Condabri South	COND28	0.0-0.1	2d(ii)	**SODOSOL**	<1	40	37	23	6.5	26	9.4	3.3	3.1	0.5	0.6	7.6	47	47	<1	<10	80	<10	<10	30	<10	1240	2.4	7.895	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**
		0.6-0.65			<1	28	36	26	5.0	452	12.0	0.2	5.6	<0.1	5.1	10.9	35	35	<1	200	1390	<10	50	460	20	-	-	46.789	1			
Condabri South	COND34	0.0-0.1	5b(m)	**VERTOSOL**	1	36	25	38	5.7	156	16.3	5.2	6.7	0.4	1.4	13.7	47	47	<1	70	160	<10	<10	140	<10	1290	3.8	10.219	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**
		0.7-0.8			<1	46	28	26	5.4	592	6.6	0.4	3.3	<0.1	4.8	8.5	47	47	<1	100	1260	10	90	610	40	-	-	56.471	1			
Condabri Central	COND39	0.0-0.1	5b(m)	**VERTOSOL**	<1	58	13	29	7.9	27	13.6	7.8	5.3	0.5	1.0	14.5	257	257	<1	<10	<50	20	30	20	20	800	1.6	6.897	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**SODOSOL**
		1.1-1.2			<1	41	17	42	5.0	512	13.7	4.1	7.9	<0.1	6.6	18.6	47	47	<1	10	690	<10	<10	510	<10	-	-	35.484	1			
Condabri Central	COND41	0.0-0.1	2c(ii)	**SODOSOL**	<1	55	25	20	6.7	16	8.2	4.0	3.0	0.2	0.4	7.6	98	98	<1	<10	0.2	<10	10	20	<10	740	0.2	5.263	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**
		1.1-1.2			<1	44	17	39	6.4	576	10.3	2.6	6.9	<0.1	6.4	16.0	269	269	<1	120	580	<10	20	550	<10	-	-	40.000	1			
		DUP			<1	56	24	20	7.1	17	8.0	3.9	3.0	0.2	0.4	7.6	129	129	<1	<10	<0.5	<10	10	20	<10	840	<0.5	5.263	-			
Condabri Central	COND46	0.0-0.1	5b(m)	**VERTOSOL**	1	59	9	31	7.6	108	16.0	34.8	3.5	<0.1	0.2	38.6	445	445	<1	<10	<10	90	10	20	<10	1020	<0.1	0.518	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**
		0.6-0.65			<1	42	20	38	9.2	217	16.8	33.1	9.0	<0.1	2.8	44.9	1100	914	187	<10	<10	<10	<10	260	<10	-	-	6.236	2			
Condabri Central	COND47	0.0-0.1	2c(ii)	**SODOSOL**	<1	68	14	18	6.8	35	10.5	3.8	2.1	0.2	0.3	6.5	117	117	<1	<10	20	<10	<10	30	<10	450	0.2	4.615	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**
		1.0-1.1			<1	37	21	42	8.6	663	13.5	7.8	12.3	<0.1	8.3	28.4	316	316	<1	170	920	<10	<10	740	<10	-	-	29.225	2			
Condabri Central	COND50				Soil laboratory analysis data to be reported following completion of field and laboratory analysis																											
Condabri Central	COND51				Soil laboratory analysis data to be reported following completion of field and laboratory analysis																											
Condabri Central	COND52				Soil laboratory analysis data to be reported following completion of field and laboratory analysis																											
Condabri Central	COND53				Soil laboratory analysis data to be reported following completion of field and laboratory analysis																											
Condabri Central	COND54				Soil laboratory analysis data to be reported following completion of field and laboratory analysis																											
Condabri Central	COND55				Soil laboratory analysis data to be reported following completion of field and laboratory analysis																											
Condabri Central	COND56				Soil laboratory analysis data to be reported following completion of field and laboratory analysis																											
Condabri Central	COND57				Soil laboratory analysis data to be reported following completion of field and laboratory analysis																											

Note: The analytical procedures used by the Environmental Division of ALS have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Desktop and field assessment data for selected soil sample sites within the Condabri development area

General Information										*Existing (Desktop) Classification*			*Field Soil Information*																	*Field Classification*			*Landscape Information*							
Soil Sample Location	Soil Sample Site	Soil Sample Type	GPS Coordinates of Site		Existing Erosion	Drainage			Vegetation	Existing Landuse	Proposed Infrastructure	Mapped Soil Group	Description	Classification (ASC)	Horizon	Depth (mBGL)	Munsell Colour		pH	Texture	Structure	Consistency			Coarse Fragments		Rooting			Horizon notes	Soil Group	Description	Classification (ASC)	Terrain Class	Predominant Slope		Slope Position		Aspect		Watertable	Comments
			Lat	Long	1 2 3	R	W P	MW VP	I								ID	Description				Strength	Stickiness	Plasticity	Size	Quantity	Size	Quantity	Orient.				1 2 3	1 2 3 4 5 6		F L	C D	U	M	N S E W		
Condabri Central	Cond20	B	-26.789244	150.168219	1	P			Grassland	Grazing	Permanent ops camp	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.1	5YR3/4	Dark reddish brown	6.0	SL	pedal	Slightly firm	Non	Non	-	-	Fine	Moderate	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1		C		-	-	Photo 28-29 Samples: 0.0-0.1m 0.3-0.35m 0.6-0.65m 1.1-1.2m
															A2	0.1-0.2	5YR4/3	reddish brown	7.0	HC	pedal	Moderately firm	Slightly	Slightly	-	-	Fine	Small	-	manganese										
															B21	0.2-0.3	5YR4/6	Yellowish red	8.5	HC	pedal	Very firm	Moderately	Moderately	-	-	-	-	-	carbonate										
															C	0.3-0.6	5YR6/4	Light reddish brown	9.0	SC	pedal	Slightly firm	Non	Non	-	-	-	-	-	carbonate, grey mottles										
Condabri Central	Cond21	D	-26.794461	150.187982	1	I			Sorghum	Cropping	Stockpile area & STP irrigation	5b	Brown / grey / dark cracking clays derived from sediments	**VERTOSOLS**	A1	0.0-0.1	10YR3/2	Very dark greyish brown	6.0	LSCL	apedal	Weak	Very	Slightly	-	-	Fine	Medium	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1		U		-	-	Photos 49-63 Samples: 0.0-0.1m 0.3-0.4m 0.6-0.7m 1.1-1.2m
															A2SB	0.1-0.25	10YR4/2	Dark greyish brown	6.5	LSCL	apedal	Weak	Very	Slightly	-	-	Fine	Small	-	-										
															B2	0.25-0.45	10YR3/4	Dark yellowish brown	8.0	SC	pedal	Very firm	Very	Very	-	-	-	-	-	carbonate										
															B3	0.45-1.2	10YR6/1 (mottle 10YR5/3)	Grey (brown)	8.5	SC	pedal	Very firm	Very	Very	-	-	-	-	-	carbonate										
Condabri Central	Cond22	D	-26.794056	150.200739	1	I			Sorghum	Cropping	STP effluent disposal area	5b	Brown / grey / dark cracking clays derived from sediments	**VERTOSOLS**	A1	0.0-0.5	10YR4/2	Dark greyish brown	8.0	MC	pedal	Moderately weak	Slightly	Very	-	-	Fine	Medium	-	Well-structured, self mulching	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**	1	1		U		-	-	Photos 2-10 Samples: 0.0-0.05m 0.3-0.4m 0.6-0.7m 1.1-1.2m
															B21	0.05-0.7	10YR5/2	Greyish brown	8.0	HC	pedal	Moderately firm	Slightly	Very	-	-	Fine	Small	-	carbonate										
															B22	0.7-1.2	10YR5/2	Greyish brown	7.0	HC	pedal	Very firm	Very	Very	-	-	-	-	-	-										
Condabri Central	Cond23	D	-26.795126	150.205818	1	I			Oats	Cropping	Pond	5b	Brown / grey / dark cracking clays derived from sediments	**VERTOSOLS**	A1	0.0-0.05	7.5YR3/2	Dark brown	7.5	LC	pedal	Weak	Moderately	Slightly	-	-	Fine	Small	-	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**	1	1		U		-	-	Photos 64-68 Samples: 0.0-0.05m 0.3-0.35m 0.6-0.7m 1.1-1.2m
															B1	0.05-0.15	7.5YR3/3	Dark brown	8.0	MC	pedal	Weak	Moderately	Slightly	-	-	Very fine	Small	-	carbonate										
															B2	0.15-1.2	7.5YR4/3	Brown	5.5	MHC	pedal	Very firm	Very	Very	-	-	-	-	-	-										
Condabri Central	Cond24	B	-26.811278	150.200251	1	P			Grass	Grazing	Laydown	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1/A2	0.0-0.2	7.5YR3/2	Dark brown	6.5	LSCL	apedal	Weak	Non	Slightly	-	-	Fine	Medium	-	manganese nodules	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1		F		-	-	Photos 89-96 Samples: 0.0-0.15m 0.3-0.4m 0.6-0.65m
															B21	0.2-0.65	7.5YR4/3	Brown	7.5	SC	pedal	Moderately firm	Moderately	Very	-	-	Very fine	Small	-	manganese nodules										
Condabri Central	Cond25	D	-26.801734	150.188777	1	P			Grass	Grazing	Pond	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.1	7.5YR3/2	Dark brown	6.0	LC	Pedal	Loose	Slightly	Non	-	-	Very fine to fine	Medium	-	-	5b	Dark brown cracking clay derived from sediments	**VERTOSOL**	1	1		M		-	-	Photos 10-18 Samples: 0.0-0.1m 0.3-0.4m 0.6-0.7m 0.9-1.0m
															B21	0.1-0.6	7.5YR3/2 (7.5YR4/4 mottling)	Dark brown (brown)	8.0	MC	Pedal	Moderately firm	Very	Highly	-	-	-	-	-	carbonate										
															D	0.6-1.2	7.5YR5/4	Brown	5.5	LMC	Pedal	Moderately strong	Very	Highly	-	-	-	-	-	grey mottles										
Condabri Central	Cond26	B	-26.808132	150.182671	1	P			Grass	Grazing	Stockpile area	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.15	7.5YR4/4	Brown	6.0	LSCL	apedal	Moderately weak	Non	Non	-	-	Fine	-	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1		F		-	-	Photos 1-4 Samples: 0.0-0.15m 0.3-0.4m 0.6-0.65m
															B21	0.15-0.4	7.5YR3/4	Dark brown	8.5	HC	pedal	Moderately firm	Slightly	Highly	-	-	-	-	-	yellow mottles, carbonate										
															B22	0.4-0.65	5YR3/4	Dark reddish brown	8.5	HC	pedal	Moderately firm	Slightly	Highly	-	-	-	-	-	yellow mottles, carbonate										
Condabri Central	Cond35	B	-26.796815	150.176114	1	P			Grass	Grazing	Construction camp	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.05	7.5YR3/3	Dark brown	6.0	CL	pedal	Slightly firm	Slightly	Slightly	-	-	Fine	Medium	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1		M		-	-	Photos 34-35 Samples: 0.0-0.05m 0.3-0.35m 0.6-0.65m
															B21	0.05-0.15	7.5YR4/3	Brown	7.0	HC	pedal	Moderately firm	Moderately	Moderately	-	-	Fine	Small	-	yellow mottles										
															B22	0.15-0.65	7.5YR4/4	Brown	8.0	MCS	pedal	Moderately firm	Moderately	Moderately	-	-	-	-	-	yellow mottles, carbonate										
Condabri Central	Cond36	B	-26.80184	150.168661	1	P			Grass	Grazing	Gathering village	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.1	7.5YR3/3	Dark brown	7.0	SL	pedal	Weak	Non	Non	-	-	Fine	Medium	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1		U		-	-	Photos 30-31 Samples: 0.0-0.1m 0.3-0.35m 0.6-0.65m
															B21	0.1-0.4	7.5YR4/2	Brown	8.0	HC	pedal	Moderately firm	Moderately	Moderately	-	-	Fine	Small	-	yellow mottles, carbonate										
															B22	0.4-0.65	7.5YR4/4	Brown	8.0	HC	pedal	Moderately firm	Moderately	Moderately	-	-	-	-	-	yellow mottles, carbonate										
Condabri Central	Cond37	D	-26.797734	150.180937	1	P			Grass	Grazing	Stockpile area & STP irrigation	5b	Brown / grey / dark cracking clays derived from sediments	**VERTOSOLS**	A1	0.0-0.05	7.5YR3/2	Dark brown	6.0	CL	pedal	Slightly firm	Slightly	Slightly	-	-	Fine	Medium	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1		C		-	-	Photos 66-68 0.0-0.1m 0.3-0.35m 0.6-0.65m
															B21	0.05-0.2	7.5YR4/3	Brown	8.0	MC	pedal	Moderately firm	Moderately	Moderately	-	-	Fine	Small	-	yellow mottles, carbonate										
															B22	0.2-1.2	7.5YR4/4	Brown	8.5	MC	pedal	Moderately firm	Moderately	Moderately	-	-	-	-	-	yellow mottles, carbonate										
Condabri Central	Cond38	B	-26.800588	150.174364	1	P			Grass	Grazing	Pond	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.05	7.5YR3/2	Dark brown	6.5	CL	pedal	Weak	Non	Slightly	-	-	Fine	Medium	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1		C		-	-	Photos 32-33 Samples: 0.0-0.1m 0.3-0.35m 0.6-0.65m
															B21	0.05-0.15	7.5YR4/2	Brown	7.0	MC	pedal	Moderately firm	Slightly	Moderately	-	-	Fine	Small	-	carbonate										
															B22	0.15-0.65	7.5YR4/4	Brown	8.0	MC	pedal	Moderately firm	Slightly	Moderately	-	-	-	-	-	carbonate										
Condabri Central	Cond39	D	-26.794404	150.191024	1	I			Sorghum	Cropping	Brine pond	5b	Brown / grey / dark cracking clays derived from sediments	**VERTOSOLS**	A1	0.0-0.1	10YR2/1	Black	6.5	LC	pedal	Slightly firm	Slightly	Highly	-	-	Fine	Small	-	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**	1	1		U		-	-	Photos 39-48 Samples: 0.0-0.1m 0.3-0.4m 0.6-0.7m 1.1-1.2m
															B21	0.1-0.4	10YR3/2	Very dark greyish brown	8.0	LMC	pedal	Moderately firm	Very	Highly	-	-	Very fine	Small	-	carbonate										
															B22	0.4-1.2	10YR4/2	Dark greyish brown	5.0	HC	pedal	Very firm	Very	Highly	-	-	-	-	-	grey mottle, carbonate										

Condabri Central	Cond40	B	-26.799278	150.189951	1	P	Grass	Grazing	Brine pond	5b	Brown / grey / dark cracking clays derived from sediments	**VERTOSOLS**	A1	0.0-0.1	10YR3/1	Very dark grey	7.0	LC	pedal	Slightly firm	Slightly	Slightly	-	-	Fine	Medium	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1	L	-	-	Photos 28-35 Samples: 0.0-0.1m 0.3-0.4m
													B21	0.1-0.6	10YR4/3	Brown	8.0	MHC	pedal	Slightly firm	Slightly	Moderately	-	-	-	-	-	-									
Condabri Central	Cond41	D	-26.80043	150.187385	1	P	Grass	Grazing	Brine pond	5b	Brown / grey / dark cracking clays derived from sediments	**VERTOSOLS**	A1	0.0-0.1	7.5YR3/2	Dark brown	6.5	SCL	pedal	Moderately firm	Very	Highly	-	-	Fine	Medium	-	Hard-setting	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1	L	-	-	Photos 20-28 Samples: 0.0-0.1m 0.3-0.4m 0.6-0.7m 1.1-1.2m
													B21	0.1-0.4	7.5YR4/2 (7.5YR5/3 mottling)	Brown (brown)	8.0	MC	pedal	Moderately firm	Moderately	Highly	-	-	-	-	-	Mottled									
													B22	0.4-0.6	7.5YR5/3	Brown	8.0	MC	pedal	Moderately firm	Very	Highly	-	-	-	-	-	carbonate									
													B23	0.6-1.2	7.5YR5/2	Brown	8.0	MC	pedal	Moderately firm	Very	Highly	-	-	-	-	-	carbonate									
Condabri Central	Cond42	B	-26.799128	150.182301	1	I	Grass	Grazing	Brine pond	5b	Brown / grey / dark cracking clays derived from sediments	**VERTOSOLS**	A1	0.0-0.15	7.5YR3/3	Dark brown	6.5	SCL	pedal	Moderately firm	Slightly	Moderately	-	-	Fine	Medium	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1	U	-	-	Photos 84-88 Samples: 0.0-0.15m 0.3-0.4m 0.6-0.65m
													B21	0.15-0.4	7.5YR3/3	Dark brown	8.0	hC	pedal	Moderately firm	Moderately	Highly	-	-	Fine	Small	-	carbonate									
													B22	0.4-0.65	7.5YR4/3	Brown	8.5	mC	pedal	Very firm	Moderately	Highly	-	-	-	-	-	carbonate									
Condabri Central	Cond43	B	-26.805495	150.17584	1	I	Grass	Grazing	Construction camp	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.1	7.5YR2.5/2	Very dark brown	6.5	LC	pedal	Weak	Slightly	Moderately	-	-	Fine	Medium	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1	M	-	-	Photos 79-83 Samples: 0.0-0.1m 0.3-0.4m 0.6-0.65m
													B21	0.1-0.3	7.5YR3/3	Dark brown	8.5	MC	pedal	Very firm	Moderately	Highly	-	-	Fine	Small	-	carbonate									
													B22	0.3-0.65	7.5YR3/4	Dark brown	8.5	MC	pedal	Very firm	Moderately	Highly	-	-	-	-	-	carbonate									
Condabri Central	Cond44	B	-26.802422	150.190866	1	P	Grass	Grazing	Pond	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.1	10YR3/3	Dark brown	6.5	SCL	pedal	Weak	Slightly	Non	-	-	-	-	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	1	M	-	-	Photos 4-9 Samples: 0.0-0.1m 0.3-0.4m 0.6-0.65m
													B21	0.1-0.2	10YR3/1	Very dark grey	8.0	MHC	pedal	Very firm	Moderately	Moderately	-	-	-	-	-	carbonate									
													B22	0.2-0.65	10YR4/1	Dark grey	8.5	MHC	pedal	Very firm	Slightly	Highly	-	-	-	-	-	carbonate									
Condabri Central	Cond45	B	-26.804677	150.192749	1	P	Sorghum	Cropping	Pond	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.05	10YR2/2	Very dark brown	7.0	LC	pedal	Slightly firm	Moderately	Non	-	-	Fine	-	-	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**	1	1	M	-	-	Photos 40-44 Samples: 0.0-0.05m 0.3-0.35m 0.6-0.65m
													B21	0.05-0.65	10YR4/2	Dark greyish brown	8.5	MHC	pedal	Moderately firm	Slightly	Moderately	-	-	Fine	-	-	-									
Condabri Central	Cond46	B	-26.808097	150.19297	1	P	Grass	Grazing	Pond	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.1	10YR3/3	Dark brown	7.5	LC	pedal	Slightly firm	Non	Moderately	-	-	Fine	-	-	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**	1	1	L	-	-	Photos 45-50 Samples: 0.0-0.1m 0.3-0.35m 0.6-0.65m
													B21	0.1-0.65	10YR5/2	Greyish brown	8.5	MHC	pedal	Very stiff	Slightly	Highly	-	-	-	-	-	carbonate									
													B22	0.65	10YR6/2	Light brownish grey	8.5	MHC	pedal	Very stiff	Slightly	Highly	-	-	-	-	-	carbonate									
Condabri Central	Cond47	D	-26.81259	150.195409	1	P	Grass / woodland	Grazing	Background vegetation	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.2	10YR4/2	Dark greyish brown	6.5	LSCL	pedal	Moderately weak	Slightly	Moderately	-	-	Fine	Minor	-	-	2c(ii)	Texture contrast soil, shallow, mainly loamy surface, neutral to alkaline subsoil	**SODOSOL**	1	2	F	-	-	Photos 51-57 Samples: 0.0-0.2m 0.3-0.35m 0.6-0.65m 1.0-1.1m Creek
													B21	0.2-0.4	10YR5/2	Greyish brown	8.0	MHC	pedal	Slightly firm	Slightly	Highly	-	-	-	-	-	-									
													B22	0.4-0.9	10YR5/2	Greyish brown	8.5	MHC	pedal	Very stiff	Slightly	Highly	-	-	-	-	-	carbonate									
													D	0.9-1.2	10YR5/1	Grey	7.0	MHC	pedal	Very stiff	Slightly	Highly	-	-	-	-	-	carbonate									
Condabri Central	Cond48	B	-26.80413	150.201524	1	P	Oats	Cropping	Laydown	2c	Shallow texture contrast soil, mainly loamy surface, (i) neutral to acid subsoil or (ii) neutral to alkaline subsoil	**(i) CHROMOSOLS / KUROSOLS (ii) SODOSOLS**	A1	0.0-0.2	10YR2/2	Very dark brown	7.5	SCL	pedal	Moderately firm	Slightly	Slightly	-	-	Fine	Medium	-	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**	1	1	L	-	-	Photos 74-78 Samples: 0.0-0.1m 0.3-0.4m 0.6-0.7m
													B21	0.2-0.4	10YR/3/3	Dark brown	8.0	MHC	pedal	Very firm	Moderately	Very	-	-	-	-	-	carbonate									
													B22	0.4-0.7	10YR5/3	Brown	8.5	MHC	pedal	Very firm	Very	Very	-	-	-	-	-	carbonate									
Condabri Central	Cond49	B	-26.796184	150.20128	1	P	Sorghum	Cropping	Pond	5b	Brown / grey / dark cracking clays derived from sediments	**VERTOSOLS**	A1	0.0-0.03	7.5YR3/2	Dark brown	7.0	LC	pedal	Moderately firm	Moderately	Very	-	-	Fine	Medium	-	-	5b(m)	Dark grey brown cracking clay (melonhole clays)	**VERTOSOL**	1	1	U	-	-	Photos 69-73 Samples: 0.0-0.03m 0.3-0.4m 0.6-0.65m
													B21	0.03-0.4	7.5YR4/2	Brown	7.5	MHC	pedal	Very firm	Slightly	Very	-	-	Fine	Small	-	carbonate									
													B22	0.4-0.65	7.5YR4/3	Brown	8.0	MHC	pedal	Very firm	Slightly	Very	-	-	-	-	-	carbonate									

Condabri Gas Field Infrastructure Sites Soil Assessment Data

Desktop and field assessment data for selected soil sample sites within the APLNG Upstream development area

General Information											*Field Soil Information*								*Field Classification*		*Landscape Information*
Soil Sample Location	**Soil Sample Site**	**Soil Sample Type**	**GPS Coordinate**		**Existing Erosion**			**Drainage**	**Geology**	**Vegetation**	**Existing Landuse**	**Proposed Infrastructure**	**Horizon**	**Depth (mBGL)**	**Munsell Colour**		**pH**	**Texture**	**Structure**	**Comments**	**Soil Mapping Unit**	**Classification (ASC)**	
			Lat	*Long*	*1*	*2*	*3*	*R W MW I P VP*							**ID**	**Description**							
Condabri Central	COND50	MPT2.0	-26.7996	150.1782333	1			P	Qpc	Buffel grass	Grazing	STP irrigation area / wastewater disposal area	A1/A2e	0.0 - 0.1	7.5YR3/4	Dark brown	6.5	FSCL			2.2.1	**SODOSOL (SO)**	Photos: 641 - 664 Sample: 0.0-0.1m, 0.1-0.25m, 0.25-0.35m, 0.5-0.6m, 0.6-0.7m, 1.0-1.1m, 1.4-1.5m, 1.9-2.0m
													B21	0.1 - 0.25	7.5YR2.5/2	Very dark brown	7.0	FSHC	-				
													B22	0.25 - 0.6	7.5YR3/3 with 7.5YR4/1 mottle	Dark brown with dark gray mottle	8.0	SMHC	-	Brown/orange fine sand and manganese nodules at 0.25m.			
													B23	0.6 - 1.0	7.5YR4/1 with 7.5YR3/3 mottle	Dark gray with dark brown mottle	6.0	FSMHC	-				
													B24	1.0 - 2.0	7.5YR4/1	Dark gray	5.0	MHC	-				
Condabri Central	COND56	MPT2.0	-26.79561667	150.18565	1			I	Qpc		Grazing	STP irrigation area / wastewater disposal area	A1	0.0 - 0.2	7.5YR4/3	Brown	6.0	FSCL		Hard setting - medium coarse fragments, patchy vege cover	2.2.1	**SODOSOL (SO)**	Photos: 481 - 500 Sample: 0.0-0.2m, 0.3-0.4m, 0.5-0.6m, 0.8-0.9m, 1.1-1.2m, 1.5-1.65m, 1.9-2.0m
													A2j	0.2 - 0.3	7.5YR4/2(m)	Brown	6.0	FSCL					
													B21	0.3 - 0.8	7.5YR3/3 with 7.5YR4/2 mottle	Dark brown with brown mottle	8.5	FSMC	-	Manganese nodules, carbonate, quartz and orange/brown (7.5YR 5/8) fine sand present. Extremely hard.			
													B22	0.8 - 2.0	7.5YR4/2	Brown	8.0	FSMC	-	Becoming moist. Greasy.			
Condabri Lateral	PL16	MPT2.0	-26.77288333	150.2110833	1			P	Qpc	Cropping - Ploughed	Cropping	Gathering pipeline	A1	0.0-0.05	10YR3/1	Very dark gray	6.5	LMC	-	-	2.1.1	**VERTOSOL (VE)**	
													B21k	0.05-0.75	10YR4/1	Dark gray	8	MC	-	-			
													B22	0.75-1.05	10YR4/1 with 10YR6/2 mottle	Dark gray with Light brownish gray	6.5	MC	-	-			
													B23	1.05-1.4	10YR5/1 with 10YR6/2 mottle	Gray with Light brownish gray mottle	5.5	MHC	-	-			
													B24	1.4-1.7	10YR5/2 with 2.5YR4/6 mottle	Grayish brown with red mottle	5.5	MHC	-	-			
													B25	1.7-2.5	10YR6/2 with 2.5YR4/6 mottle	Light brownish gray with red mottle	4.5	MC	-	-			
Condabri Lateral	PL17	MPT2.0	-26.80138333	150.2050167	1			P	Qpc	Oats	Cropping	Pipeline	A1	0.0-0.03	10YR2/2	Black	6.5	ZCL	-	-	2.1.1	**VERTOSOL (VE)**	
													B21	0.03-0.1	10YR3/2	Very dark grayish brown	6	FSLC	-	-			
													B22	0.1-0.25	10YR4/2	Dark grayish brown	8.5	MC	-	Carbonate			
													B23	0.25-0.8	10YR4/3	Brown	8.5	MHC	-	Carbonate			
													B24	0.8-1.2	10YR5/3	Brown	7	LMCFS	-	-			
													B25	1.2-2.5	10YR5/3	Brown	4.5	MHC	-	-			

Appendix C Additional Soil Profile Assessments

Soil profile descriptions and landscape observations were undertaken by Sam Donald from Range Environmental. Sam's CV is also included below.

SAMUEL DONALD

Environmental Scientist

Bachelor of Environmental Science (Hons), University of Queensland

SUMMARY OF EXPERIENCE

Sam is a senior environmental scientist at Range Environmental Consultants with seven (7) years environmental consulting experience gained in the power, rail, oil and gas, mining and extractive industries, and urban development industries.

Sam has specialist technical skills and experience in disciplines including soil surveys and soil management, agricultural impact assessments, SCL/BSAL criteria assessments, land rehabilitation, erosion and sediment control. Sam's role as a field team leader reflect his demonstrated skills in these disciplines. Project examples are below that demonstrate Sam's capabilities which range from technical assessments of land and soil physical and chemical properties and life of project soil management planning for major resource projects.

Sam is a current member of the Australian Society of Soil Science.

SELECTED PROJECT EXPERIENCE

- **Strategic Cropping Land Assessment – Origin Energy, 2018:** Strategic cropping land assessment for proposed new water storage infrastructure at Origin Energy's Condabri Gas Field. Works included a field survey and assessment against the validation criteria.
- **Baseline Soil Assessment for Infrastructure Projects – Queensland Gas Company, 2012 – 2015 :** Samuel was project manager and field team leader for projects pertaining to the preparation of soil management plans and SCL validation assessments for up to 50 major coal seam gas infrastructure sites (including linear infrastructure) in the Surat and Bowen basins. Desktop and field investigations were undertaken to map and describe existing soil types and provide practical management guidance for construction, operation and rehabilitation phases. Samuel managed each project from inception to finalisation.
- **Baseline Soil Assessments for Various Infrastructure Projects – Santos, 2013 :** Samuel was the field team leader for baseline soil surveys and management planning for the Comet Ridge to Wallumbilla Pipeline Loop Project (120 km pipeline) and Eastern Flank Electrification Project. Sam was responsible for undertaking the desktop, field and reporting requirements for the investigations. Sam developed a conceptual site model that mapped and described existing soil types across each project footprint and provided practical management guidance for construction, operation and rehabilitation phases.
- **Land and Soil Assessments for Various Projects, Santos NSW, 2011 and 2013 :** Samuel undertook desktop, field and reporting requirements for the preparation of Agricultural Impact Statements (AIS) and Biophysical Strategic Agricultural Land (BSAL) assessments for CSG activities in the north-western New South Wales region. Sam undertook desktop assessments and field investigation (including hand augering) to determine whether proposed activities presented a risk to the agriculture industry or if land meets the BSAL criteria. Results were utilised in the project approvals process.
- **Project Wide SCL Validation Assessment for LNG Projects - QGC, 2014:** Desktop assessment of Strategic Cropping Land (SCL) of the full acreage of the QCLNG project (over 3 million hectares assessed) using rapid and cost effective terrain analysis and cropping history assessment methods. This was the largest SCL assessment conducted in Queensland.
- **SCL Assessment for Comet Ridge to Wallumbilla Pipeline Loop – Santos, 2012 :** Samuel led a zonal criteria validation assessment for trigger mapped SCL across the Comet Ridge to Wallumbilla Pipeline (CRWP) Loop project (120 km). Slope analysis was performed to identify exclusion areas which exceeded the slope threshold. The remaining seven (7) zonal criteria were assessed in the field.

Unique Profile Number	STA01		
Described by	Sam Donald		
Date	15/03/2018		
Nature of exposure	Pit		
LOCATION			
Datum	GDA 94		
Zone	56		
Latitude	-26.80795395		
Longitude	150.1718568		
SITE DESCRIPTION			
Geology	Kumbarilla beds		
Landform Pattern	Alluvial plain		
Element	Levee		
Permeability	Moderately permeable		
Microrelief	Zero or none		
Microrelief Component	No record		
Drainage	Imperfectly drained		
Slope	< 1%		
Rock Outcrops	No bedrock exposed		
Surface Coarse Fragments	No coarse fragments		
Surface Condition	Hard setting with surface crusting		
Disturbances	Sporadic grazing and slashing		
Vegetation	Poplar box and cypress pine with a groundcover of native and		
Groundcover	90%		
ASC Classification	Sodosol		
PROFILE MORPHOLOGY			

Horizon	Depth (m)	Description	Samples collected
A1	0.0 to 0.28	Very dark brown (7.5YR2.5/2) dry, firm; sandy clay loam; no coarse fragments; polyhedral moderate <2-20 mm structure; no mottles or segregations; common fine to coarse <1->5mm roots; sharp to	STA01-1 (0-0.15m) STA01-2 (0.15-0.28m)
A2	0.28 to 0.5	Dark brown (7.5YR3/4) moderately moist, very firm; light clay; no coarse fragments; polyhedral moderate <2-20 mm structure; no mottles or segregations; common fine to coarse <1->5mm roots; clear to	STA01-3 (0.28-0.5m) STA01-300 (0.3m)
B2	0.5 to 0.73	Brown (7.5YR4/3) moderately moist, strong; light clay; no coarse fragments; massive structure; common 10-20% medium 2-6mm calcareous nodules, common 10-20% medium 2-6mm ferruginous nodules; many 20-50% medium 5-15mm distinct reddish yellow (7.5YR6/6) mottles; clear to	STA01-4 (0.5-0.73m) STA01-600 (0.6m)
B22	0.73 to 1	Brown (7.5YR5/3) dry, very strong; light clay; no coarse fragments; massive structure; many 20-50% medium 2-6mm calcareous nodules, common 10-20% medium 2-6mm ferruginous nodules; many 20-50% medium 5-15mm distinct yellowish red (5YR4/6) mottles.	STA01-5 (0.73-1m)

Unique Profile Number	STA02
Described by	Sam Donald
Date	15/03/2018
Nature of exposure	Pit
LOCATION	
Datum	GDA 94
Zone	56
Latitude	-26.80607618
Longitude	150.178954
SITE DESCRIPTION	
Geology	Kumbarilla beds
Landform Pattern	Alluvial plain
Element	Levee
Permeability	Moderately permeable
Microrelief	Zero or none
Microrelief Component	No record
Drainage	Imperfectly drained
Slope	1-2%
Rock Outcrops	No bedrock exposed
Surface Coarse Fragments	No coarse fragments
Surface Condition	Firm with cryptogam surface
Disturbances	Sporadic grazing and slashing
Vegetation	Poplar box with a groundcover of native and introduced (buffel grass)
Groundcover	90%
ASC Classification	Sodosol

PROFILE MORPHOLOGY

Horizon	Depth (m)	Description	Samples collected
A1	0.0 to 0.32	Dark brown (7.5YR3/2) moderately moist, weak; sandy clay loam; no coarse fragments; polyhedral weak 2-5 mm structure; no mottles or segregations; common fine 1-2mm roots; clear to	STA02-1 (0-0.15m) STA02-2 (0.15-0.32m) STA02-300 (0.3m)
A2	0.32 to 0.43	Brown (7.5YR4/2) wet, loose; clayey sand; no coarse fragments; single grain structure; no mottles or segregations; common fine 1-2mm roots; abrupt to	STA02-3 (0.32-0.43)
B2	0.43 to 0.55	Gray (7.5YR5/1) moderately moist, strong; clay loam, sandy; no coarse fragments; massive structure; common 10-20% coarse 6-20mm ferruginous nodules; many 20-50% coarse 15-30mm distinct yellowish red (5YR5/8) mottles; clear to	STA02-4 (0.43-0.55m)
B22	0.55 to 1	Gray (7.5YR5/1) dry, very strong; clay loam, sandy; no coarse fragments; massive structure; many 20-50% medium 2-6mm calcareous nodules, common 10-20% coarse 6-20mm ferruginous nodules; many 20-50% coarse 15-30mm distinct yellowish red (5YR5/8) mottles.	STA02-5 (0.55-0.8m) STA02-6 (0.8-1m) STA02-600 (0.6m)

Unique Profile Number	STA03
Described by	Sam Donald
Date	15/03/2018
Nature of exposure	Pit
LOCATION	
Datum	GDA 94
Zone	56
Latitude	-26.80194875
Longitude	150.1807963
SITE DESCRIPTION	
Geology	Kumbarilla beds
Landform Pattern	Alluvial plain
Element	Levee
Permeability	Slowly permeable
Microrelief	Zero or none
Microrelief Component	No record
Drainage	Poorly drained
Slope	< 1%
Rock Outcrops	No bedrock exposed
Surface Coarse Fragments	No coarse fragments
Surface Condition	Hard setting with surface crusting
Disturbances	Sporadic grazing and slashing
Vegetation	Poplar box with a groundcover of native and introduced (buffel grass)
Groundcover	70%

ASC Classification	Sodosol		
PROFILE MORPHOLOGY			
Horizon	**Depth (m)**	**Description**	**Samples collected**
A1	0.0 to 0.17	Dark brown (7.5YR3/2) dry, weak; clay loam, sandy; no coarse fragments; polyhedral weak <5-20 mm structure; no mottles or segregations; common fine to coarse <1->5mm roots; abrupt to	STA03-1 (0-0.17m)
A2	0.17 to 0.2	Grey (7.5YR5/1) dry, weak; clay loam, sandy; no coarse fragments; single grain; no mottles or segregations; very fine to fine <1-2mm common roots; abrupt to	STA01-2 (0.17-0.2m)
B2	0.2 to 0.45	Dark grey (10YR4/1) Moderately moist, strong; light clay; no coarse fragments; polyhedral weak <5-20 mm structure; no mottles or segregations; few very fine to fine <1-2mm roots; clear to	STA03-3 (0.2-0.45m) STA03-300 (0.3m)
B22	0.45 to 1	Dark greyish brown (10YR4/2) dry, very strong; light medium clay; no coarse fragments; massive structure; no mottles or segregations.	STA03-4 (0.45-0.75m) STA03-5 (0.75-1m) STA03-600 (0.6m)

Unique Profile Number	STA06
Described by	Sam Donald
Date	15/03/2018
Nature of exposure	Pit
LOCATION	
Datum	GDA 94
Zone	56
Latitude	-26.80963287
Longitude	150.197353
SITE DESCRIPTION	
Geology	Kumbarilla beds
Landform Pattern	Alluvial plain
Element	Levee
Permeability	Very slowly permeable
Microrelief	Zero or none
Microrelief Component	No record
Drainage	Poorly drained
Slope	<1%
Rock Outcrops	No bedrock exposed
Surface Coarse Fragments	No coarse fragments
Surface Condition	Soft
Disturbances	Sporadic grazing and slashing
Vegetation	Poplar box with a groundcover of native and introduced (buffel grass)
Groundcover	70%
ASC Classification	Sodosol

PROFILE MORPHOLOGY

Horizon	Depth (m)	Description	Samples collected
A11	0.0 to 0.5	Very dark grayish brown (10YR3/2) dry, loose; clayey sand; no coarse fragments; single grain structure; no mottles or segregations; common fine to coarse 1->5mm roots; diffuse to	STA06-1 (0-0.25m) STA06-2 (0.25-0.5m) STA06-300 (0.3m)
A12	0.5 to 0.8	Brown (10YR4/3) moist, loose; clayey sand; common 10-20% medium pebbles 6-20mm rounded; single grain structure; no mottles or segregations; common fine to coarse 1->5mm roots; clear to	STA06-3 (0.5-0.8m) STA06-600 (0.6m)
A2	0.8 to 0.9	Gray (10YR6/1) wet, loose; clayey sand; many 20-50% medium pebbles 6-20mm rounded; single grain structure; no mottles or segregations; few fine to coarse 1->5mm roots; abrupt to	STA06-4 (0.8-0.9m)
B2	0.9 to 1	Gray (10YR5/1) wet, very firm; sandy clay loam; few 2-10% small pebbles 2-6mm rounded; massive structure; no segregations; many 20-50% very coarse >30mm distinct yellowish brown (10YR5/8) mottles.	STA06-5 (0.9-1m)

Unique Profile Number	STA07
Described by	Sam Donald
Date	15/03/2018
Nature of exposure	Pit
LOCATION	
Datum	GDA 94
Zone	56
Latitude	-26.80529509
Longitude	150.205104
SITE DESCRIPTION	
Geology	Kumbarilla beds
Landform Pattern	Alluvial plain
Element	Levee
Permeability	Moderately permeable
Microrelief	Zero or none
Microrelief Component	No record
Drainage	Moderately well drained
Slope	1-2%
Rock Outcrops	No bedrock exposed
Surface Coarse Fragments	No coarse fragments
Surface Condition	hard setting, surface crust, cracks <5m
Disturbances	Sporadic grazing and slashing
Vegetation	Cactus with a groundcover of native and introduced (buffel grass) grasses
Groundcover	95%

ASC Classification	Dermosol

PROFILE MORPHOLOGY

Horizon	Depth (m)	Description	Samples collected
A1	0.0 to 0.18	Very dark gray (7.5YR3/1) dry, firm; silty clay loam; no coarse fragments; polyhedral strong 5-10 mm structure; no mottles or segregations; common fine 1-2mm roots; clear to	STA07-1 (0-0.18m)
A2	0.18 to 0.21	Dark brown (7.5YR3/2) dry, weak; clay loam, sandy; no coarse fragments; polyhedral weak 2-5mm structure; no mottles or segregations; common fine 1-2mm roots; abrupt to	STA07-2 (0.18-0.21m)
B2	0.21 to 0.45	Very dark gray (7.5YR3/1) moist, firm; light clay; no coarse fragments; polyhedral strong 20-100 mm structure; no mottles or segregations; few fine 1-2mm roots; gradual to	STA07-3 (0.21-0.45m) STA07-300 (0.3m)
B22	0.45 to 1	Brown (10YR4/3) moderately moist, very strong; light medium clay; no coarse fragments; massive structure; common 10-20% coarse 6-20mm calcareous fragments, common 10-20% medium 2-6mm ferruginous nodules; no mottles.	STA07-4 (0.45-0.75m) STA07-5 (0.75-1m) TSA07-600 (0.6m)

Unique Profile Number	STA08
Described by	Sam Donald
Date	15/03/2018
Nature of exposure	Pit
LOCATION	
Datum	GDA 94
Zone	56
Latitude	-26.79907826
Longitude	150.2013971
SITE DESCRIPTION	
Geology	Kumbarilla beds
Landform Pattern	Alluvial plain
Element	Levee
Permeability	Moderately permeable
Microrelief	Zero or none
Microrelief Component	No record
Drainage	Moderately well drained
Slope	<1%
Rock Outcrops	No bedrock exposed
Surface Coarse Fragments	No coarse fragments
Surface Condition	hard setting, surface crust, cracks <5m
Disturbances	Sporadic grazing and slashing
Vegetation	Groundcover of native and introduced (buffel grass) grasses
Groundcover	85%
ASC Classification	Dermosol

PROFILE MORPHOLOGY

Horizon	Depth (m)	Description	Samples collected
A1	0.0 to 0.29	Dark brown (7.5YR3/2) moist, firm; light clay; no coarse fragments; polyhedral strong 2-5 mm structure; no mottles or segregations; common fine 1-2mm roots; gradual to	STA08-1 (0-0.15m) STA08-2 (0.15-0.29m)
B2	0.29 to 0.59	Brown (7.5YR4/2) moist, firm; light medium clay; no coarse fragments; polyhedral strong 2-5 mm structure; common 10-20% medium to coarse 2-20mm calcareous nodules and fragments; no mottles; common fine 1-2mm roots; gradual to	STA08-3 (0.29-0.45m) STA08-4 (0.45-0.59m) STA08-300 (0.3m)
B22	0.59 to 0.1	Dark grayish brown (10YR4/2) moderately moist, very strong; light medium clay; no coarse fragments; polyhedral strong 2-5 mm structure; common 10-20% medium to coarse 2-20mm calcareous nodules and fragments; no mottles; common fine 1-2mm roots.	STA08-5 (0.59-0.8m) STA08-6 (0.8-1m) STA08-600 (0.6m)

Unique Profile Number	STA04	PHOTOGRAPH
Described by	Sam Donald	 
Date	14/03/2018	
Nature of exposure	Hand auger	
LOCATION		
Datum	GDA 94	
Zone	56	
Latitude	-26.80998704	
Longitude	150.1765523	
ATTRIBUTES		
Surface soil texture	Weak structured sandy clay loam	
Subsoil texture	Strong light to light medium clay	
Comment	Texture contrast soil	
Suggested ASC Classification	Sodosol	

Unique Profile Number	STA05	PHOTOGRAPH
Described by	Sam Donald	 
Date	14/03/2018	
Nature of exposure	Hand auger	
LOCATION		
Datum	GDA 94	
Zone	56	
Latitude	-26.81021501	
Longitude	150.1783035	
ATTRIBUTES		
Surface soil texture	weak structured sandy clay loam	
Subsoil texture	Strong light to light medium clay, yellowish brown mottling	
Comment	Texture contrast soil with potential bleached horizon	
Suggested ASC Classification	Sodosol	

Unique Profile Number	STA09	PHOTOGRAPH
Described by	Sam Donald	
Date	14/03/2018	
Nature of exposure	Hand auger	
LOCATION		
Datum	GDA 94	
Zone	56	
Latitude	-26.79831976	
Longitude	150.1960992	
ATTRIBUTES		
Surface soil texture	Strong silty clay loam	
Subsoil texture	Strong light to light medium clay	
Comment	Not a texture contrast soil, no evidence of poor drainage (mottling or coloured soil), well structured throughout profile	
Suggested ASC Classification	Dermosol	

Unique Profile Number	STA010	PHOTOGRAPH
Described by	Sam Donald	
Date	14/03/2018	
Nature of exposure	Hand auger	
LOCATION		
Datum	GDA 94	
Zone	56	
Latitude	-26.79654341	
Longitude	150.1952835	
ATTRIBUTES		
Surface condition	cracks 0.2-0.6mm	
Surface soil texture	Strong silty clay loam	
Subsoil texture	Strong light to light medium clay	
Comment	Not a texture contrast soil, no evidence of poor drainage (mottling or coloured soil), well structured throughout profile	
Suggested ASC Classification	Vertosol/Dermosol	

Unique Profile Number	CH1	PHOTOGRAPH
Described by	Lucas Talbot	 
Date	19/07/2018	
Nature of exposure	Hand auger	
LOCATION		
Datum	GDA 94	
Zone	56	
Latitude	-26.800022	
Longitude	150.196284	
ATTRIBUTES		
Surface soil texture	Clay loam (0-120mm)	
Subsoil texture	Strong light to light medium clay	
Comment	Not a texture contrast soil, no evidence of poor drainage (mottling or coloured soil), well structured throughout profile	
Suggested ASC Classification	Dermosol	

Unique Profile Number	CH2	PHOTOGRAPH
Described by	Lucas Talbot	 
Date	19/07/2018	
Nature of exposure	Hand auger	
LOCATION		
Datum	GDA 94	
Zone	56	
Latitude	-26.801554	
Longitude	150.19649	
ATTRIBUTES		
Surface soil texture	Sandy clay loam (0-130 mm)	
Subsoil texture	Strong light to light medium clay	
Comment	Not a texture contrast soil, no evidence of poor drainage (mottling or coloured soil), well structured throughout profile	
Suggested ASC Classification	Dermosol	

Unique Profile Number	CH3	PHOTOGRAPH
Described by	Lucas Talbot	
Date	19/07/2018	
Nature of exposure	Hand auger	
LOCATION		
Datum	GDA 94	
Zone	56	
Latitude	-26.802995	
Longitude	150.196637	
ATTRIBUTES		
Surface soil texture	Sandy loam (0-200 mm)	
Subsoil texture	Strong light to light medium clay	
Comment	Texture contrast soil, mottled, possible bleached horizon	
Suggested ASC Classification	Sodosol	

Unique Profile Number	CH4	PHOTOGRAPH
Described by	Lucas Talbot	
Date	19/07/2018	
Nature of exposure	Hand auger	
LOCATION		
Datum	GDA 94	
Zone	56	
Latitude	-26.804613	
Longitude	150.196829	
ATTRIBUTES		
Surface soil texture	sandy loam (0-300 mm)	
Subsoil texture	Strong light to light medium clay	
Comment	Texture contrast soil, mottled, possible bleached horizon	
Suggested ASC Classification	Sodosol	

Unique Profile Number	CH7	PHOTOGRAPH
Described by	Lucas Talbot	
Date	19/07/2018	
Nature of exposure	Hand auger	
LOCATION		
Datum	GDA 94	
Zone	56	
Latitude	-26.798957	
Longitude	150.196324	
ATTRIBUTES		
Surface soil texture	Sandy clay loam (0-90mm)	
Subsoil texture	Strong light to light medium clay	
Comment	Not a texture contrast soil, no evidence of poor drainage (mottling or coloured soil), well structured throughout profile	
Suggested ASC Classification	Dermosol	

Appendix D Soil Laboratory Analysis COC

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1808040**	Page	: 1 of 15
Client	: **RANGE ENVIRONMENTAL CONSULTANTS**	Laboratory	: Environmental Division Brisbane
Contact	: SAMUEL DONALD	Contact	: Customer Services EB
Address	: 266 MARGARET ST TOOWOOMBA QLD 4350	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: J000030	Date Samples Received	: 28-Mar-2018 15:25
Order number	: J000030	Date Analysis Commenced	: 29-Mar-2018
C-O-C number	: ----	Issue Date	: 17-Apr-2018 12:08
Sampler	: SAMUEL DONALD		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 44		
No. of samples analysed	: 34		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- The pH testing using method 4A1 in Rayment & Lyons (2011).
- ED006 Exchangeable Cations (Magnesium/Potassium Ratio): Results could not be calculated for some samples as the required Magnesium or Potassium analytes were less than reportable limits.
- ED007 (Exchangeable Cations): Magnesium/Potassium ratio could not be determined as both the Magnesium and Potassium results were less than reportable limits for some samples
- ED006 (Exchangeable Cations on Alkaline Soils): Samples EB1808040-003 (STA01-3) and EB1808040-039 (STA08-3) shows poor duplicate results due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	STA01-1	STA01-3	STA01-4	STA01-300	STA01-600
			Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	EB1808040-001	EB1808040-003	EB1808040-004	EB1808040-006	EB1808040-007
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	6.4	8.5	9.2	7.2	9.2
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	28	100	368	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	1.2	2.5	2.5	----	2.2
EA150: Particle Sizing								
+75µm	----	1	%	66	51	60	----	----
+150µm	----	1	%	50	40	48	----	----
+300µm	----	1	%	22	18	25	----	----
+425µm	----	1	%	13	11	16	----	----
+600µm	----	1	%	8	7	11	----	----
+1180µm	----	1	%	4	3	6	----	----
+2.36mm	----	1	%	<1	<1	3	----	----
+4.75mm	----	1	%	<1	<1	1	----	----
+9.5mm	----	1	%	<1	<1	<1	----	----
+19.0mm	----	1	%	<1	<1	<1	----	----
+37.5mm	----	1	%	<1	<1	<1	----	----
+75.0mm	----	1	%	<1	<1	<1	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	16	33	25	----	----
Silt (2-60 µm)	----	1	%	17	15	13	----	----
Sand (0.06-2.00 mm)	----	1	%	65	51	58	----	----
Gravel (>2mm)	----	1	%	2	1	4	----	----
Cobbles (>6cm)	----	1	%	<1	<1	<1	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.37	2.49	2.42	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	2.0	1.2	----	----
Exchangeable Magnesium	----	0.2	meq/100g	----	2.5	1.8	----	----
Exchangeable Potassium	----	0.2	meq/100g	----	<0.2	<0.2	----	----
Exchangeable Sodium	----	0.2	meq/100g	----	0.8	0.8	----	----
Cation Exchange Capacity	----	0.2	meq/100g	----	5.3	3.7	----	----
Exchangeable Sodium Percent	----	0.2	%	----	15.3	20.2	----	----
ED007: Exchangeable Cations								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	STA01-1	STA01-3	STA01-4	STA01-300	STA01-600
				Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit		EB1808040-001	EB1808040-003	EB1808040-004	EB1808040-006	EB1808040-007
					Result	Result	Result	Result	Result
ED007: Exchangeable Cations - Continued									
Exchangeable Calcium	----	0.1	meq/100g		**5.2**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		**2.8**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		**0.4**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		<0.1	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		**8.6**	----	----	----	----
Exchangeable Aluminium	----	0.1	meq/100g		<0.1	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%		**1.0**	----	----	----	----
Magnesium/Potassium Ratio	----	0.1	-		**6.5**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		<10	**60**	**220**	----	**160**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	STA02-1	STA02-3	STA02-4	STA02-5	STA02-300
			Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	EB1808040-008	EB1808040-010	EB1808040-011	EB1808040-012	EB1808040-014
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	6.0	6.9	7.6	8.9	6.3
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	12	8	52	162	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	<1.0	<1.0	1.9	1.7	----
EA150: Particle Sizing								
+75µm	----	1	%	73	79	60	57	----
+150µm	----	1	%	64	70	53	48	----
+300µm	----	1	%	43	50	39	31	----
+425µm	----	1	%	31	40	31	23	----
+600µm	----	1	%	20	30	24	15	----
+1180µm	----	1	%	7	17	12	6	----
+2.36mm	----	1	%	2	9	5	2	----
+4.75mm	----	1	%	<1	2	1	<1	----
+9.5mm	----	1	%	<1	<1	<1	<1	----
+19.0mm	----	1	%	<1	<1	<1	<1	----
+37.5mm	----	1	%	<1	<1	<1	<1	----
+75.0mm	----	1	%	<1	<1	<1	<1	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	13	9	27	27	----
Silt (2-60 µm)	----	1	%	13	10	12	12	----
Sand (0.06-2.00 mm)	----	1	%	71	70	54	57	----
Gravel (>2mm)	----	1	%	3	11	7	4	----
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.70	2.53	2.47	2.39	----
ED005: Exchange Acidity								
Exchange Acidity	----	0.1	meq/100g	<0.1	----	----	----	----
Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	----	1.2	0.9	----
Exchangeable Magnesium	----	0.2	meq/100g	----	----	1.8	1.4	----
Exchangeable Potassium	----	0.2	meq/100g	----	----	<0.2	<0.2	----
Exchangeable Sodium	----	0.2	meq/100g	----	----	0.8	0.8	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	STA02-1	STA02-3	STA02-4	STA02-5	STA02-300
				Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit		EB1808040-008	EB1808040-010	EB1808040-011	EB1808040-012	EB1808040-014
					Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued									
Cation Exchange Capacity	----	0.2	meq/100g		**----**	**----**	**3.8**	**3.1**	**----**
Exchangeable Sodium Percent	----	0.2	%		**----**	**----**	**22.0**	**26.0**	**----**
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		**3.4**	**1.1**	**----**	**----**	**----**
Exchangeable Magnesium	----	0.1	meq/100g		**1.4**	**0.7**	**----**	**----**	**----**
Exchangeable Potassium	----	0.1	meq/100g		**0.1**	<0.1	**----**	**----**	**----**
Exchangeable Sodium	----	0.1	meq/100g		<0.1	**0.1**	**----**	**----**	**----**
Cation Exchange Capacity	----	0.1	meq/100g		**5.0**	**1.9**	**----**	**----**	**----**
Exchangeable Aluminium	----	0.1	meq/100g		**----**	<0.1	**----**	**----**	**----**
Exchangeable Sodium Percent	----	0.1	%		**0.9**	**6.2**	**----**	**----**	**----**
Magnesium/Potassium Ratio	----	0.1	-		**9.3**	**----**	**----**	**----**	**----**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		<10	<10	**10**	**120**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	STA02-600	STA03-1	STA03-2	STA03-3	STA03-4
			Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	EB1808040-015	EB1808040-016	EB1808040-017	EB1808040-018	EB1808040-019
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.6	5.6	6.2	8.5	8.6
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	15	21	355	823
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	1.6	1.4	1.0	3.4	4.0
EA150: Particle Sizing								
+75µm	----	1	%	----	55	55	29	30
+150µm	----	1	%	----	38	39	22	23
+300µm	----	1	%	----	15	15	10	10
+425µm	----	1	%	----	9	9	6	7
+600µm	----	1	%	----	5	5	3	5
+1180µm	----	1	%	----	2	2	<1	2
+2.36mm	----	1	%	----	<1	<1	<1	2
+4.75mm	----	1	%	----	<1	<1	<1	<1
+9.5mm	----	1	%	----	<1	<1	<1	<1
+19.0mm	----	1	%	----	<1	<1	<1	<1
+37.5mm	----	1	%	----	<1	<1	<1	<1
+75.0mm	----	1	%	----	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	21	18	50	50
Silt (2-60 µm)	----	1	%	----	23	26	20	19
Sand (0.06-2.00 mm)	----	1	%	----	55	55	30	29
Gravel (>2mm)	----	1	%	----	1	1	<1	2
Cobbles (>6cm)	----	1	%	----	<1	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	2.36	2.38	2.55	2.54
ED005: Exchange Acidity								
Exchange Acidity	----	0.1	meq/100g	----	0.3	----	----	----
Exchangeable Aluminium	----	0.1	meq/100g	----	0.2	----	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	----	----	2.7	2.8
Exchangeable Magnesium	----	0.2	meq/100g	----	----	----	2.7	3.1
Exchangeable Potassium	----	0.2	meq/100g	----	----	----	<0.2	<0.2
Exchangeable Sodium	----	0.2	meq/100g	----	----	----	1.3	1.8

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	STA02-600	STA03-1	STA03-2	STA03-3	STA03-4
				Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit		EB1808040-015	EB1808040-016	EB1808040-017	EB1808040-018	EB1808040-019
					Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued									
Cation Exchange Capacity	----	0.2	meq/100g		----	----	----	6.7	7.7
Exchangeable Sodium Percent	----	0.2	%		----	----	----	19.0	23.3
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	3.3	2.5	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	2.4	2.0	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	0.2	<0.1	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	0.2	0.5	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	6.4	5.1	----	----
Exchangeable Aluminium	----	0.1	meq/100g		----	----	<0.1	----	----
Exchangeable Sodium Percent	----	0.1	%		----	2.9	10.3	----	----
Magnesium/Potassium Ratio	----	0.1	-		----	12.2	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		60	<10	10	440	1110

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	STA03-300	STA03-600	STA06-1	STA06-3	STA06-4
			Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	EB1808040-021	EB1808040-022	EB1808040-023	EB1808040-025	EB1808040-026
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.9	8.9	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	3.7	----	----	----
EA150: Particle Sizing								
+75µm	----	1	%	----	----	80	78	86
+150µm	----	1	%	----	----	69	66	77
+300µm	----	1	%	----	----	49	45	60
+425µm	----	1	%	----	----	40	36	54
+600µm	----	1	%	----	----	30	27	48
+1180µm	----	1	%	----	----	12	13	36
+2.36mm	----	1	%	----	----	1	3	23
+4.75mm	----	1	%	----	----	<1	<1	17
+9.5mm	----	1	%	----	----	<1	<1	<1
+19.0mm	----	1	%	----	----	<1	<1	<1
+37.5mm	----	1	%	----	----	<1	<1	<1
+75.0mm	----	1	%	----	----	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	----	10	14	4
Silt (2-60 µm)	----	1	%	----	----	8	6	9
Sand (0.06-2.00 mm)	----	1	%	----	----	77	74	60
Gravel (>2mm)	----	1	%	----	----	5	6	27
Cobbles (>6cm)	----	1	%	----	----	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	----	2.54	2.58	2.53
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	----	940	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	STA06-5	STA06-300	STA06-600	STA07-1	STA07-2
			Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	EB1808040-027	EB1808040-028	EB1808040-029	EB1808040-030	EB1808040-031
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	----	7.4	7.2	7.2	8.0
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	----	----	40	30
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	<1.0	2.2	<1.0
EA150: Particle Sizing								
+75µm	----	1	%	76	----	----	54	61
+150µm	----	1	%	68	----	----	37	42
+300µm	----	1	%	52	----	----	12	16
+425µm	----	1	%	46	----	----	6	10
+600µm	----	1	%	39	----	----	4	7
+1180µm	----	1	%	27	----	----	1	3
+2.36mm	----	1	%	14	----	----	<1	<1
+4.75mm	----	1	%	7	----	----	<1	<1
+9.5mm	----	1	%	<1	----	----	<1	<1
+19.0mm	----	1	%	<1	----	----	<1	<1
+37.5mm	----	1	%	<1	----	----	<1	<1
+75.0mm	----	1	%	<1	----	----	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	13	----	----	28	16
Silt (2-60 µm)	----	1	%	8	----	----	18	22
Sand (0.06-2.00 mm)	----	1	%	61	----	----	53	61
Gravel (>2mm)	----	1	%	18	----	----	1	1
Cobbles (>6cm)	----	1	%	<1	----	----	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.45	----	----	2.57	2.48
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	----	----	----	1.1
Exchangeable Magnesium	----	0.2	meq/100g	----	----	----	----	0.9
Exchangeable Potassium	----	0.2	meq/100g	----	----	----	----	<0.2
Exchangeable Sodium	----	0.2	meq/100g	----	----	----	----	<0.2
Cation Exchange Capacity	----	0.2	meq/100g	----	----	----	----	2.0
Exchangeable Sodium Percent	----	0.2	%	----	----	----	----	<0.2
ED007: Exchangeable Cations								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	STA06-5	STA06-300	STA06-600	STA07-1	STA07-2
				Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit		EB1808040-027	EB1808040-028	EB1808040-029	EB1808040-030	EB1808040-031
					Result	Result	Result	Result	Result
ED007: Exchangeable Cations - Continued									
Exchangeable Calcium	----	0.1	meq/100g		----	----	----	**9.8**	----
Exchangeable Magnesium	----	0.1	meq/100g		----	----	----	**4.5**	----
Exchangeable Potassium	----	0.1	meq/100g		----	----	----	**0.2**	----
Exchangeable Sodium	----	0.1	meq/100g		----	----	----	**0.3**	----
Cation Exchange Capacity	----	0.1	meq/100g		----	----	----	**14.9**	----
Exchangeable Aluminium	----	0.1	meq/100g		----	----	----	<0.1	----
Exchangeable Sodium Percent	----	0.1	%		----	----	----	**2.2**	----
Magnesium/Potassium Ratio	----	0.1	-		----	----	----	**26.4**	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		----	----	<10	**10**	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	STA07-3	STA07-4	STA07-300	STA07-600	STA08-1
			Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	EB1808040-032	EB1808040-033	EB1808040-035	EB1808040-036	EB1808040-037
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.6	9.3	8.7	9.3	7.5
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	84	341	----	----	72
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	2.8	2.7	----	2.3	<1.0
EA150: Particle Sizing								
+75µm	----	1	%	36	34	----	----	43
+150µm	----	1	%	26	25	----	----	27
+300µm	----	1	%	8	10	----	----	9
+425µm	----	1	%	4	6	----	----	5
+600µm	----	1	%	2	4	----	----	3
+1180µm	----	1	%	<1	1	----	----	<1
+2.36mm	----	1	%	<1	<1	----	----	<1
+4.75mm	----	1	%	<1	<1	----	----	<1
+9.5mm	----	1	%	<1	<1	----	----	<1
+19.0mm	----	1	%	<1	<1	----	----	<1
+37.5mm	----	1	%	<1	<1	----	----	<1
+75.0mm	----	1	%	<1	<1	----	----	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	47	45	----	----	28
Silt (2-60 µm)	----	1	%	16	19	----	----	27
Sand (0.06-2.00 mm)	----	1	%	37	36	----	----	45
Gravel (>2mm)	----	1	%	<1	<1	----	----	<1
Cobbles (>6cm)	----	1	%	<1	<1	----	----	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.66	2.58	----	----	2.51
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	2.0	1.8	----	----	2.2
Exchangeable Magnesium	----	0.2	meq/100g	2.5	2.8	----	----	1.2
Exchangeable Potassium	----	0.2	meq/100g	<0.2	<0.2	----	----	<0.2
Exchangeable Sodium	----	0.2	meq/100g	0.6	0.9	----	----	<0.2
Cation Exchange Capacity	----	0.2	meq/100g	5.2	5.6	----	----	3.4
Exchangeable Sodium Percent	----	0.2	%	12.4	16.0	----	----	<0.2
ED045G: Chloride by Discrete Analyser								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	STA07-3	STA07-4	STA07-300	STA07-600	STA08-1
				Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00
Compound	CAS Number	LOR	Unit		EB1808040-032	EB1808040-033	EB1808040-035	EB1808040-036	EB1808040-037
					Result	Result	Result	Result	Result
ED045G: Chloride by Discrete Analyser - Continued									
Chloride	16887-00-6	10	mg/kg		**30**	**130**	**----**	**150**	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	STA08-3	STA08-5	STA08-300	STA08-600	----
			Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	----
Compound	CAS Number	LOR	Unit	EB1808040-039	EB1808040-041	EB1808040-043	EB1808040-044	--------
				Result	Result	Result	Result	----
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.0	9.0	9.0	9.0	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	420	640	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	2.4	3.2	----	2.9	----
EA150: Particle Sizing								
+75µm	----	1	%	35	29	----	----	----
+150µm	----	1	%	24	20	----	----	----
+300µm	----	1	%	10	6	----	----	----
+425µm	----	1	%	7	3	----	----	----
+600µm	----	1	%	5	2	----	----	----
+1180µm	----	1	%	3	<1	----	----	----
+2.36mm	----	1	%	2	<1	----	----	----
+4.75mm	----	1	%	<1	<1	----	----	----
+9.5mm	----	1	%	<1	<1	----	----	----
+19.0mm	----	1	%	<1	<1	----	----	----
+37.5mm	----	1	%	<1	<1	----	----	----
+75.0mm	----	1	%	<1	<1	----	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	42	48	----	----	----
Silt (2-60 µm)	----	1	%	22	22	----	----	----
Sand (0.06-2.00 mm)	----	1	%	33	30	----	----	----
Gravel (>2mm)	----	1	%	3	<1	----	----	----
Cobbles (>6cm)	----	1	%	<1	<1	----	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.67	2.54	----	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	3.5	4.2	----	----	----
Exchangeable Magnesium	----	0.2	meq/100g	2.6	4.2	----	----	----
Exchangeable Potassium	----	0.2	meq/100g	<0.2	<0.2	----	----	----
Exchangeable Sodium	----	0.2	meq/100g	1.1	2.3	----	----	----
Cation Exchange Capacity	----	0.2	meq/100g	7.3	10.7	----	----	----
Exchangeable Sodium Percent	----	0.2	%	15.4	21.4	----	----	----
ED045G: Chloride by Discrete Analyser								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	STA08-3	STA08-5	STA08-300	STA08-600	----
				Client sampling date / time	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	15-Mar-2018 00:00	----
Compound	CAS Number	LOR	Unit		EB1808040-039	EB1808040-041	EB1808040-043	EB1808040-044	--------
					Result	Result	Result	Result	----
ED045G: Chloride by Discrete Analyser - Continued									
Chloride	16887-00-6	10	mg/kg		**350**	**620**	**----**	**480**	**----**

Certificate of Analysis

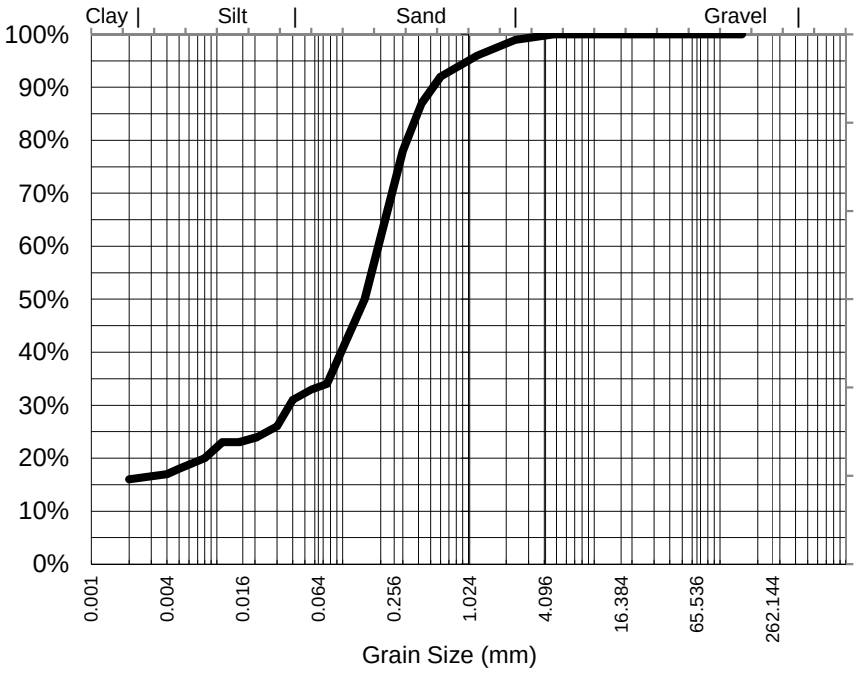
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-001 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA01-1

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	99%
1.18	96%
0.600	92%
0.425	87%
0.300	78%
0.150	50%
0.075	34%
Particle Size (microns)	
75	34%
57	33%
40	31%
21	24%
11	23%
5	18%
2	16%

Median Particle Size (mm)*	0.150

Samples analysed as received.

** Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.37 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA
MUTUAL RECOGNITION ARRANGEMENT ACCREDITATION

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

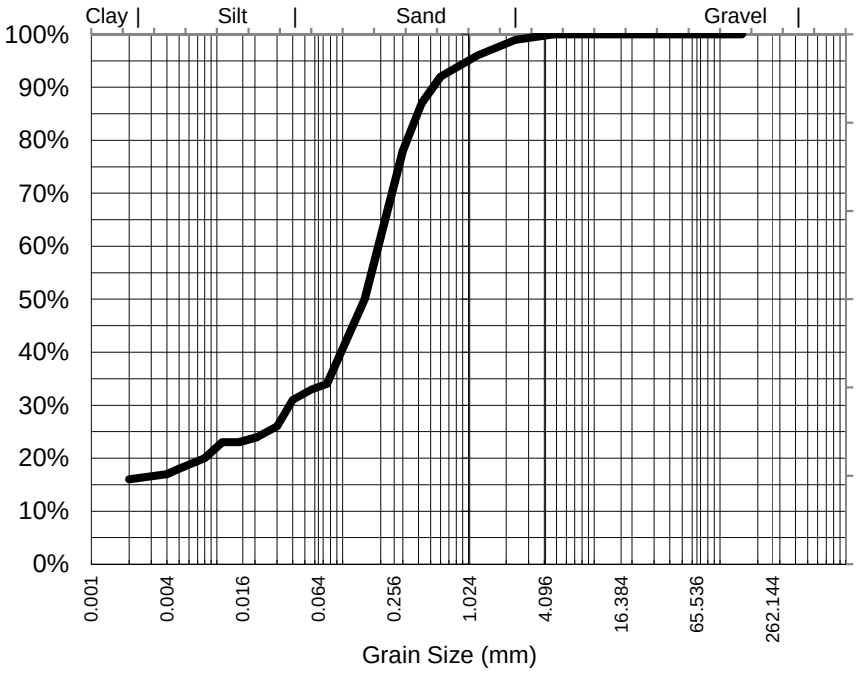
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-001DUP / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA01-1

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	99%
1.18	96%
0.600	92%
0.425	87%
0.300	78%
0.150	50%
0.075	34%
Particle Size (microns)	
75	34%
57	33%
40	31%
21	24%
11	23%
5	18%
2	16%

Median Particle Size (mm)*	0.150

Samples analysed as received.

** Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.37 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

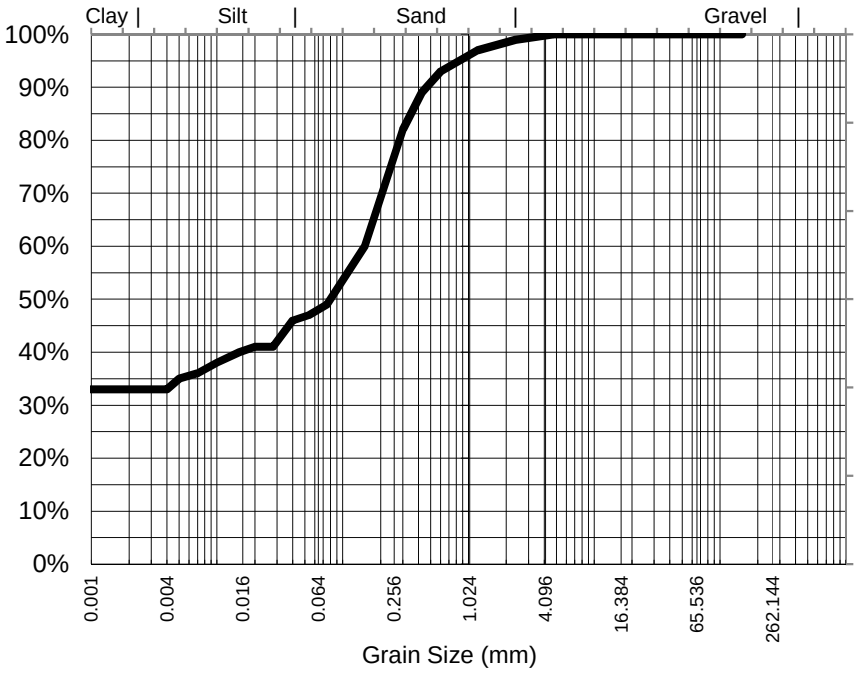
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-003 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA01-3

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	99%
1.18	97%
0.600	93%
0.425	89%
0.300	82%
0.150	60%
0.075	49%
Particle Size (microns)	
75	49%
54	47%
40	46%
20	41%
10	38%
5	35%
1	33%

Samples analysed as received.

Median Particle Size (mm)*	0.082

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.49 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

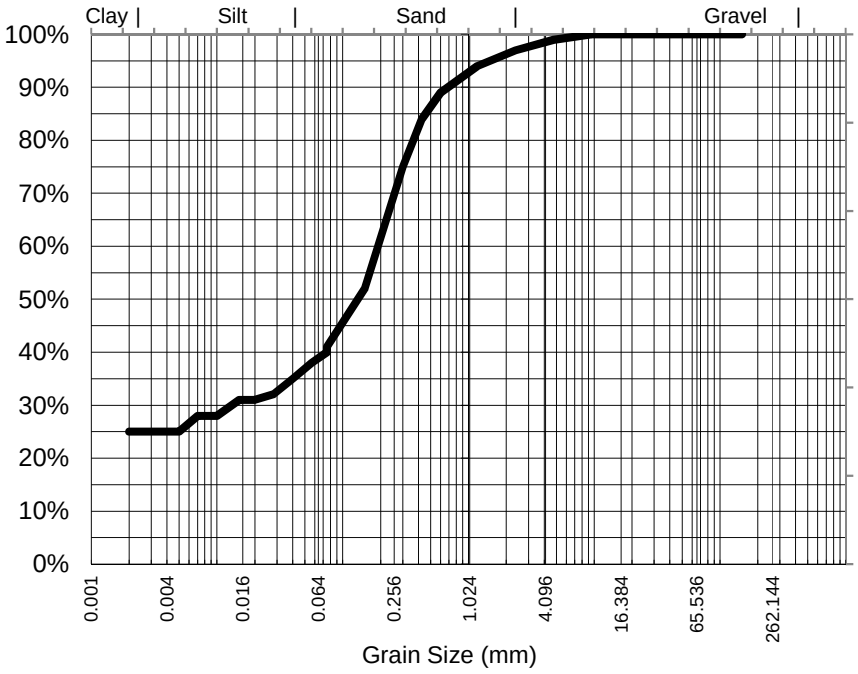
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-004 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA01-4

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	99%
2.36	97%
1.18	94%
0.600	89%
0.425	84%
0.300	75%
0.150	52%
0.075	41%
Particle Size (microns)	
75	40%
57	38%
40	35%
20	31%
10	28%
5	25%
2	25%

Median Particle Size (mm)*	0.136

Samples analysed as received.

** Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.42 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

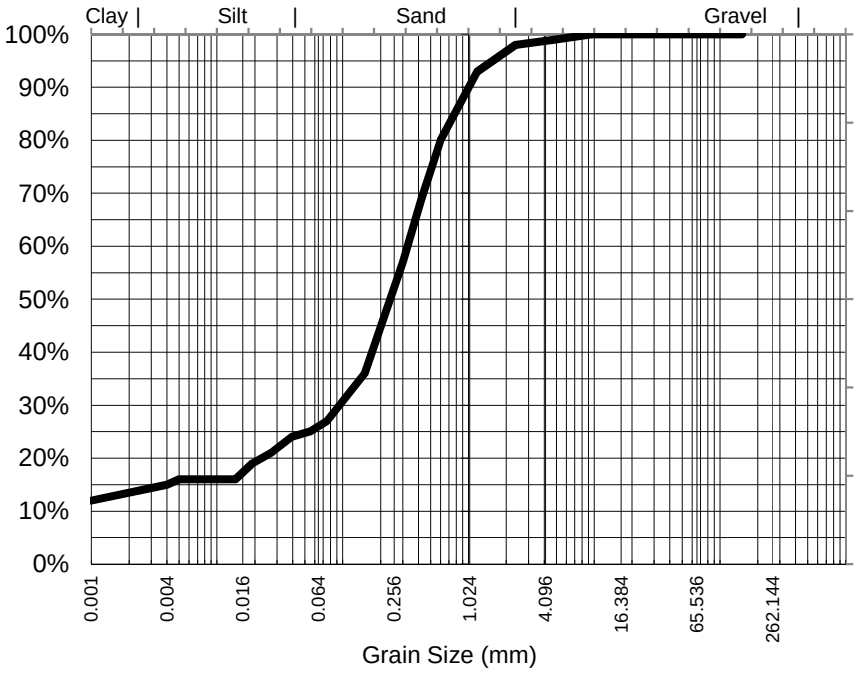
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-008 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA02-1

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	99%
2.36	98%
1.18	93%
0.600	80%
0.425	69%
0.300	57%
0.150	36%
0.075	27%
Particle Size (microns)	
75	27%
55	25%
39	24%
19	19%
10	16%
5	16%
1	12%

Median Particle Size (mm)*	0.250

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.7 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

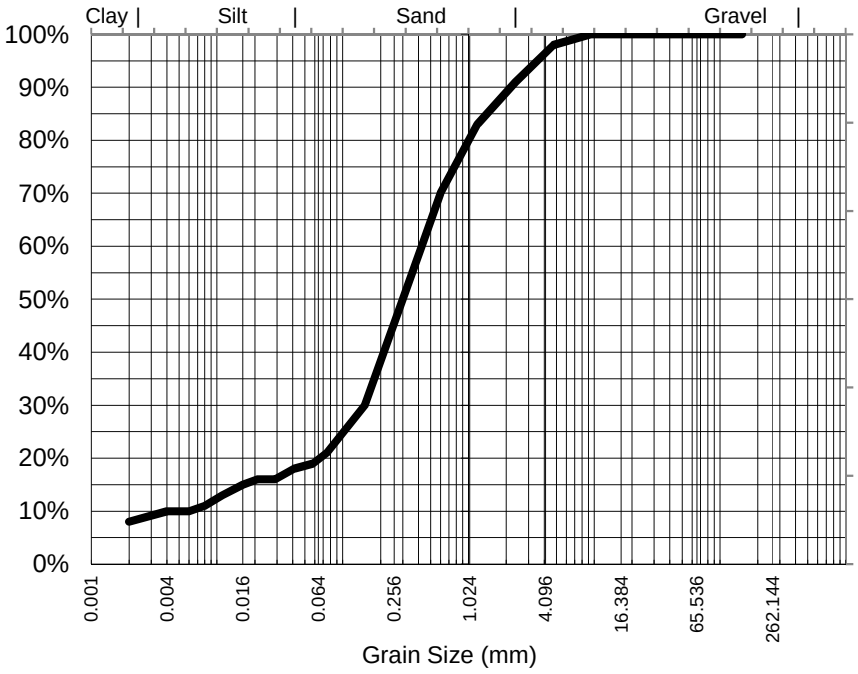
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-010 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA02-3

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	98%
2.36	91%
1.18	83%
0.600	70%
0.425	60%
0.300	50%
0.150	30%
0.075	21%
Particle Size (microns)	
75	21%
58	19%
41	18%
21	16%
11	13%
6	10%
2	8%

Median Particle Size (mm)*	0.300

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.53 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

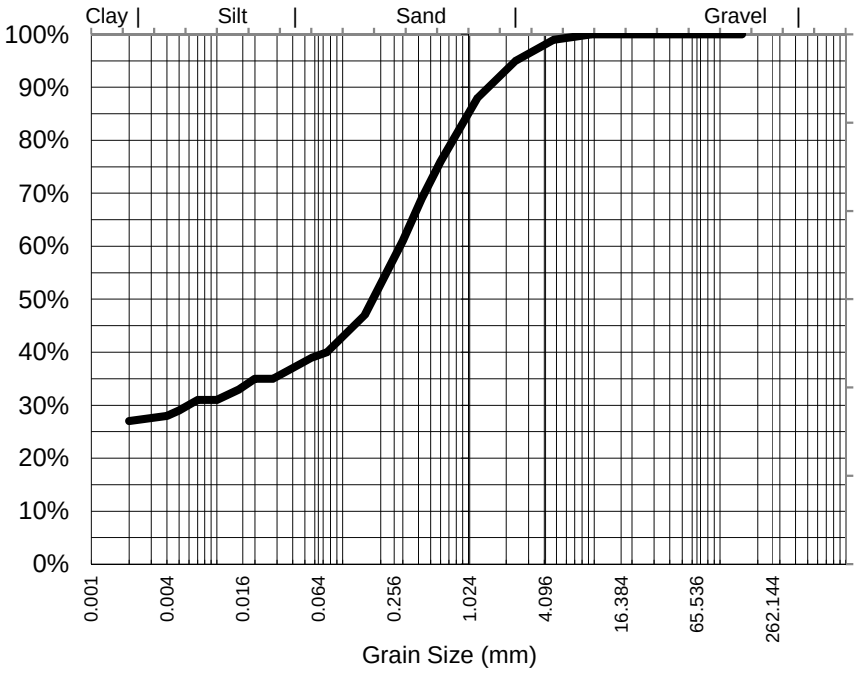
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-011 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA02-4

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	99%
2.36	95%
1.18	88%
0.600	76%
0.425	69%
0.300	61%
0.150	47%
0.075	40%
Particle Size (microns)	
75	40%
57	39%
40	37%
20	35%
10	31%
5	29%
2	27%

Samples analysed as received.

Median Particle Size (mm)*	0.182

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.47 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA
MUTUAL RECOGNITION ARRANGEMENT ACCREDITATION

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

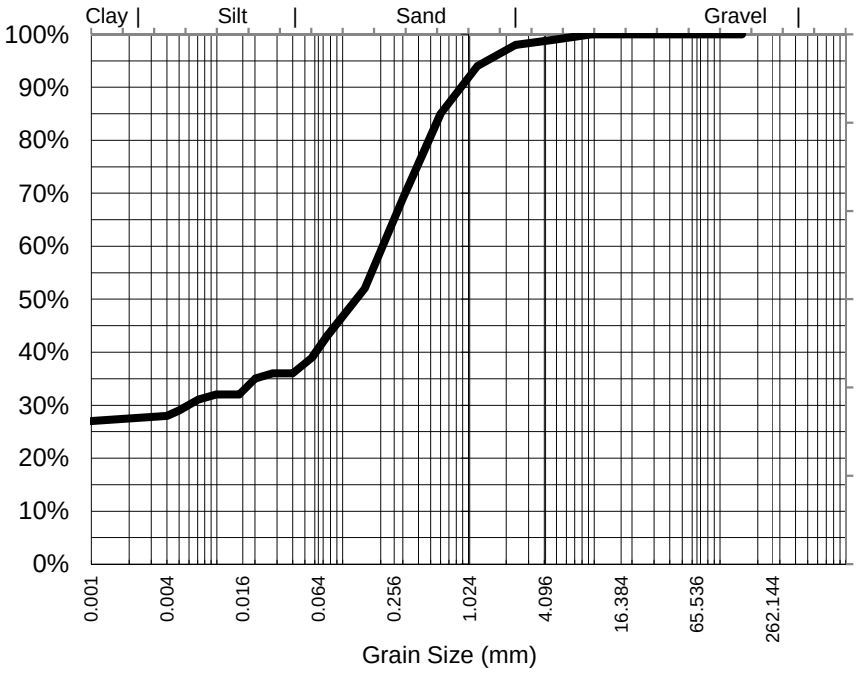
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-012 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA02-5

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	99%
2.36	98%
1.18	94%
0.600	85%
0.425	77%
0.300	69%
0.150	52%
0.075	43%
Particle Size (microns)	
75	43%
57	39%
40	36%
20	35%
10	32%
5	29%
1	27%

Median Particle Size (mm)*	0.133

Samples analysed as received.

** Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.39 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

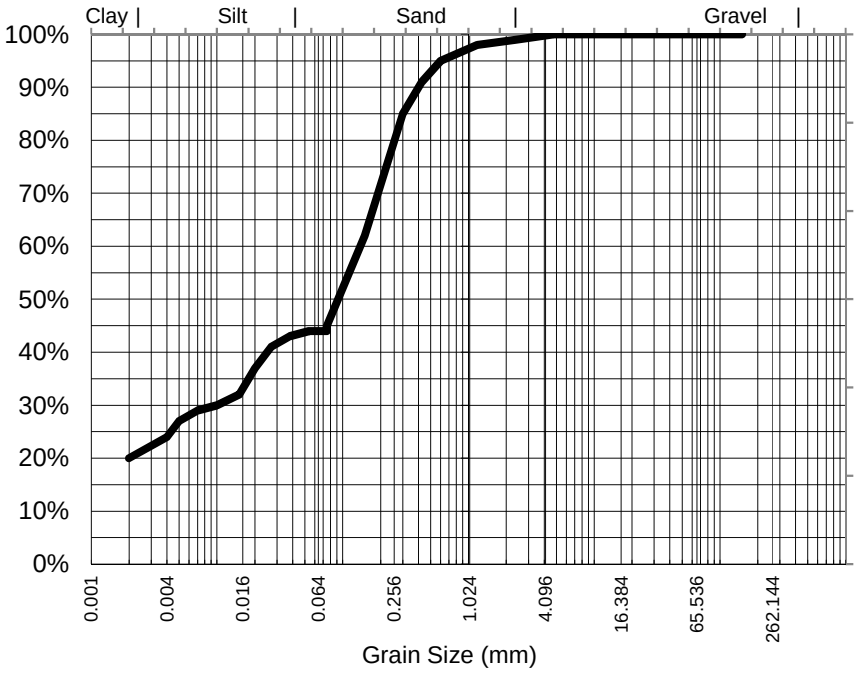
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-016 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA03-1

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	99%
1.18	98%
0.600	95%
0.425	91%
0.300	85%
0.150	62%
0.075	45%
Particle Size (microns)	
75	44%
54	44%
38	43%
20	37%
10	30%
5	27%
2	20%

Median Particle Size (mm)*	0.097

Samples analysed as received.

** Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.36 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

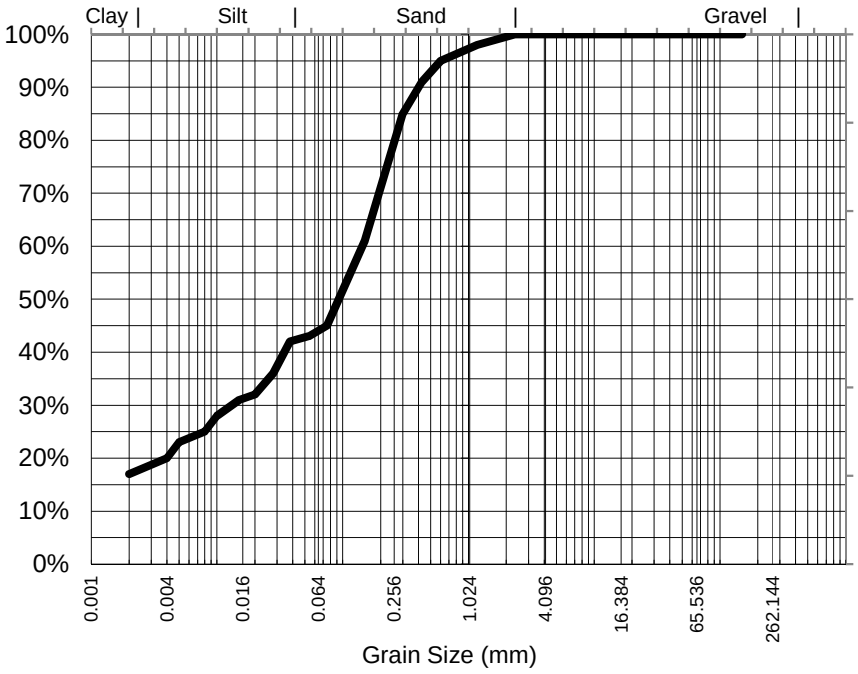
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-017 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA03-2

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	98%
0.600	95%
0.425	91%
0.300	85%
0.150	61%
0.075	45%
Particle Size (microns)	
75	45%
54	43%
38	42%
20	32%
10	28%
5	23%
2	17%

Median Particle Size (mm)*	0.098

Samples analysed as received.

** Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.38 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

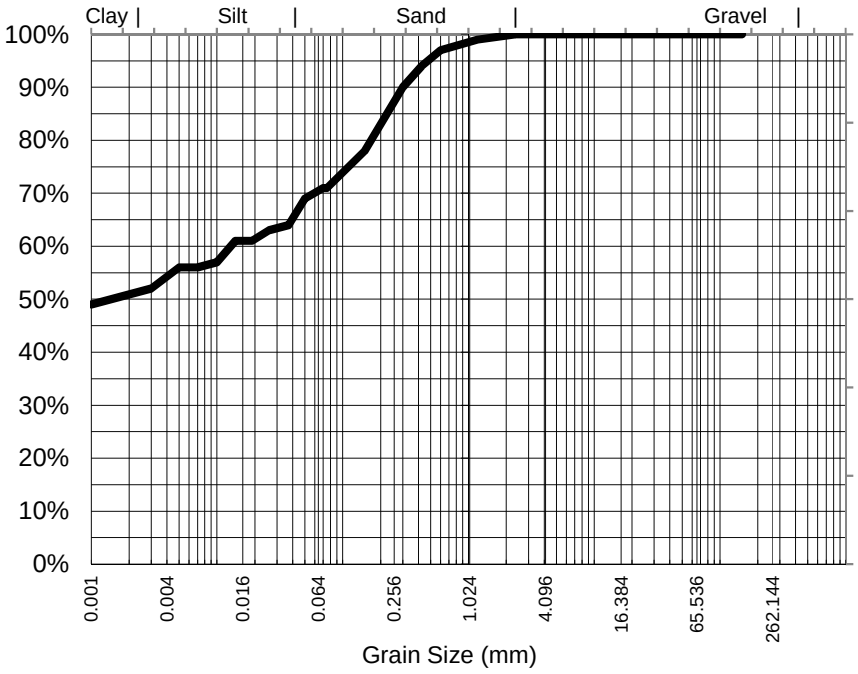
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-018 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA03-3

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	99%
0.600	97%
0.425	94%
0.300	90%
0.150	78%
0.075	71%
Particle Size (microns)	
70	71%
50	69%
37	64%
19	61%
10	57%
5	56%
1	49%

Samples analysed as received.

Median Particle Size (mm)*	0.002

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.55 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

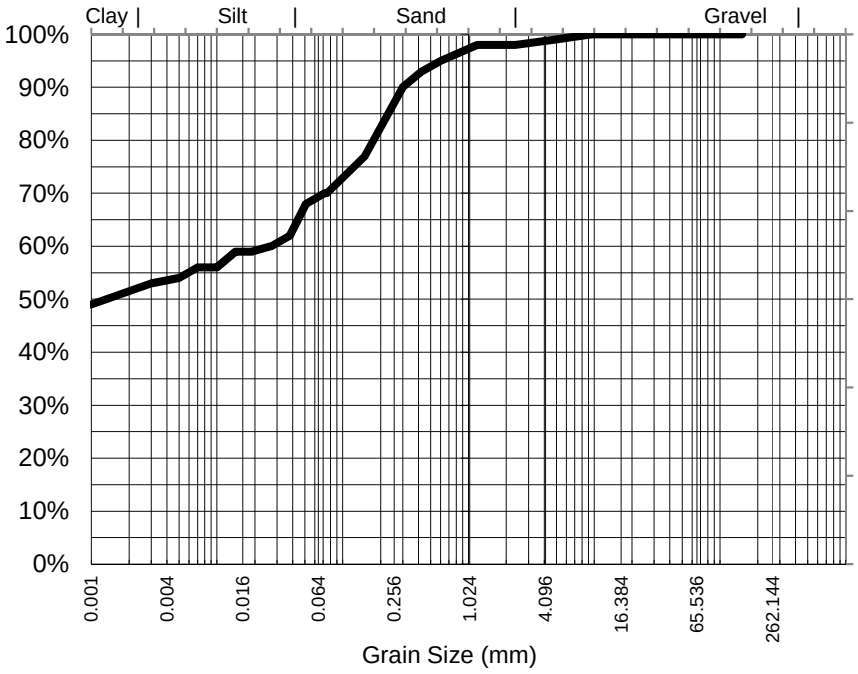
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-019 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA03-4

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	99%
2.36	98%
1.18	98%
0.600	95%
0.425	93%
0.300	90%
0.150	77%
0.075	70%
Particle Size (microns)	
72	70%
51	68%
38	62%
19	59%
10	56%
5	54%
1	49%

Samples analysed as received.

Median Particle Size (mm)*	0.002

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.54 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

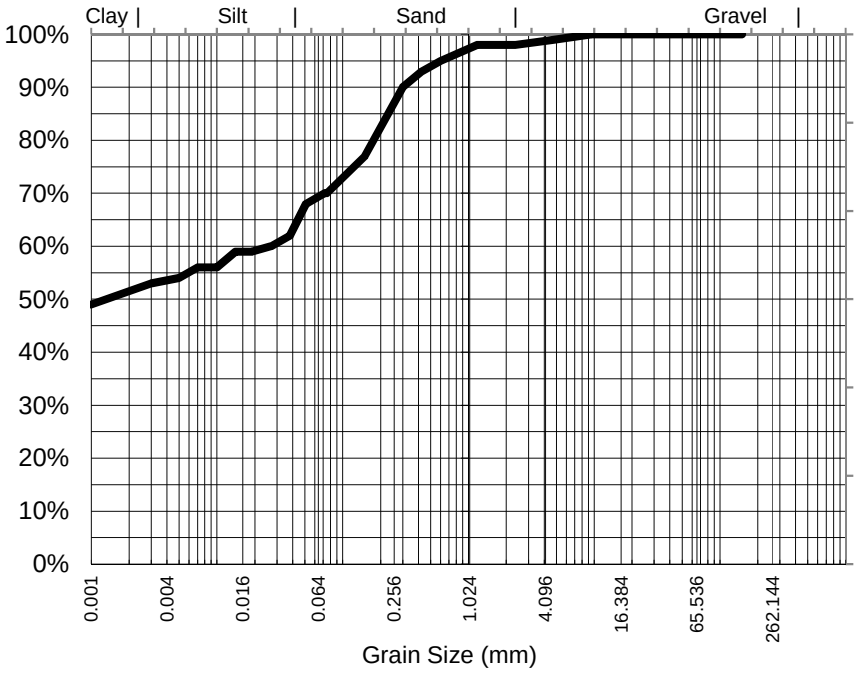
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-019DUP / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA03-4

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	99%
2.36	98%
1.18	98%
0.600	95%
0.425	93%
0.300	90%
0.150	77%
0.075	70%
Particle Size (microns)	
72	70%
51	68%
38	62%
19	59%
10	56%
5	54%
1	49%

Samples analysed as received.

Median Particle Size (mm)*	0.002

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.54 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

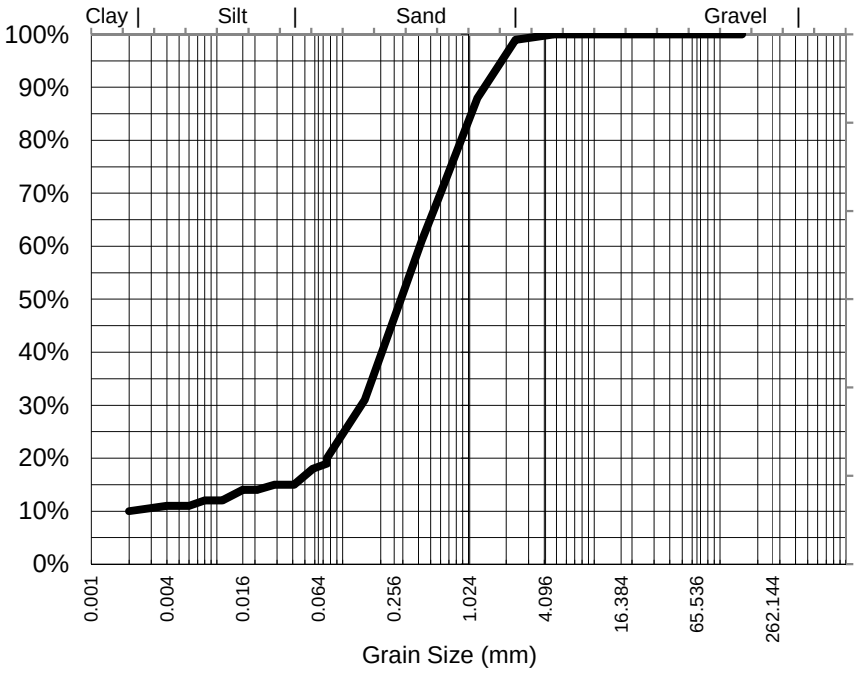
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-023 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA06-1

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	99%
1.18	88%
0.600	70%
0.425	61%
0.300	51%
0.150	31%
0.075	20%
Particle Size (microns)	
75	19%
58	18%
41	15%
21	14%
11	12%
6	11%
2	10%

Samples analysed as received.

Median Particle Size (mm)*	0.293

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.54 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

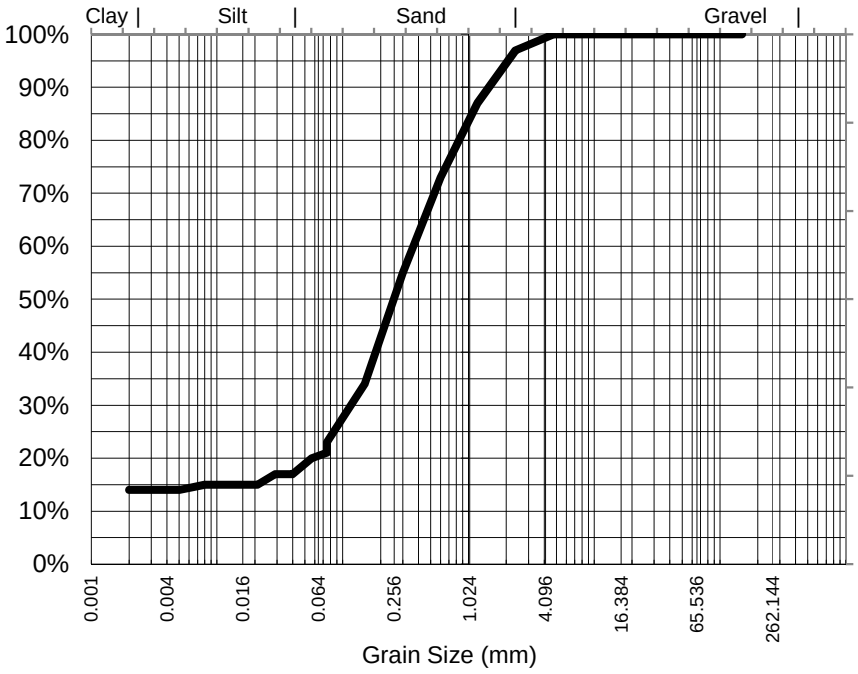
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-025 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA06-3

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	97%
1.18	87%
0.600	73%
0.425	64%
0.300	55%
0.150	34%
0.075	23%
Particle Size (microns)	
75	21%
57	20%
40	17%
21	15%
11	15%
5	14%
2	14%

Samples analysed as received.

Median Particle Size (mm)*	0.264

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.58 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

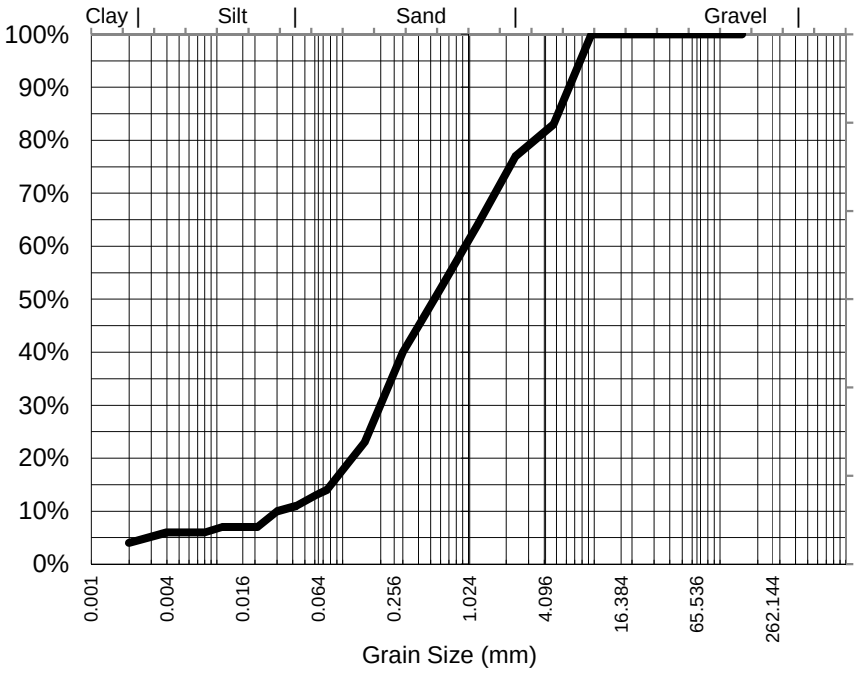
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-026 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA06-4

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	83%
2.36	77%
1.18	64%
0.600	52%
0.425	46%
0.300	40%
0.150	23%
0.075	14%
Particle Size (microns)	
75	14%
61	13%
43	11%
21	7%
11	7%
6	6%
2	4%

Samples analysed as received.

Median Particle Size (mm)*	0.542

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.53 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

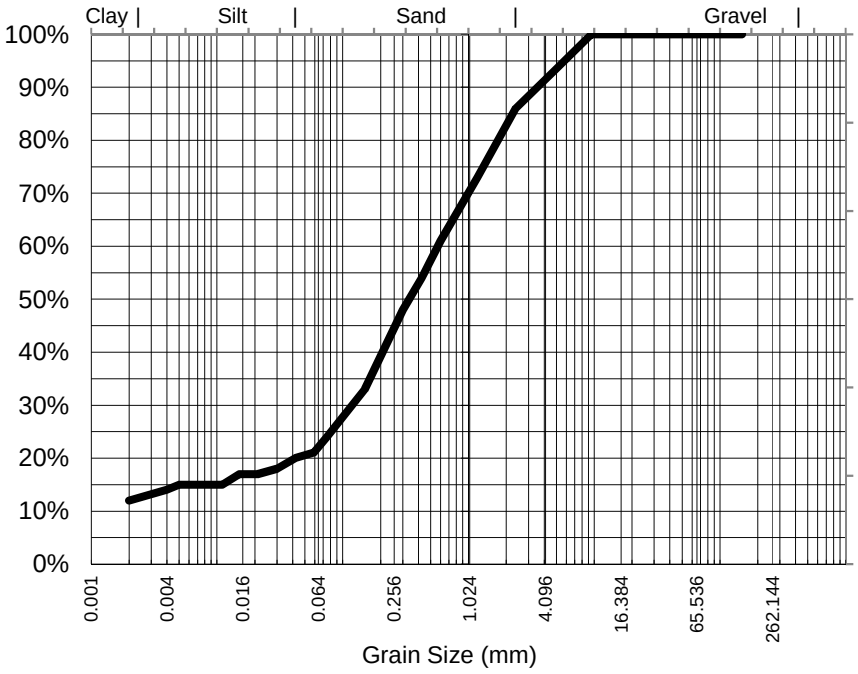
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-027 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA06-5

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	93%
2.36	86%
1.18	73%
0.600	61%
0.425	54%
0.300	48%
0.150	33%
0.075	24%
Particle Size (microns)	
75	24%
59	21%
42	20%
21	17%
11	15%
5	15%
2	12%

Median Particle Size (mm)*	0.342

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.45 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

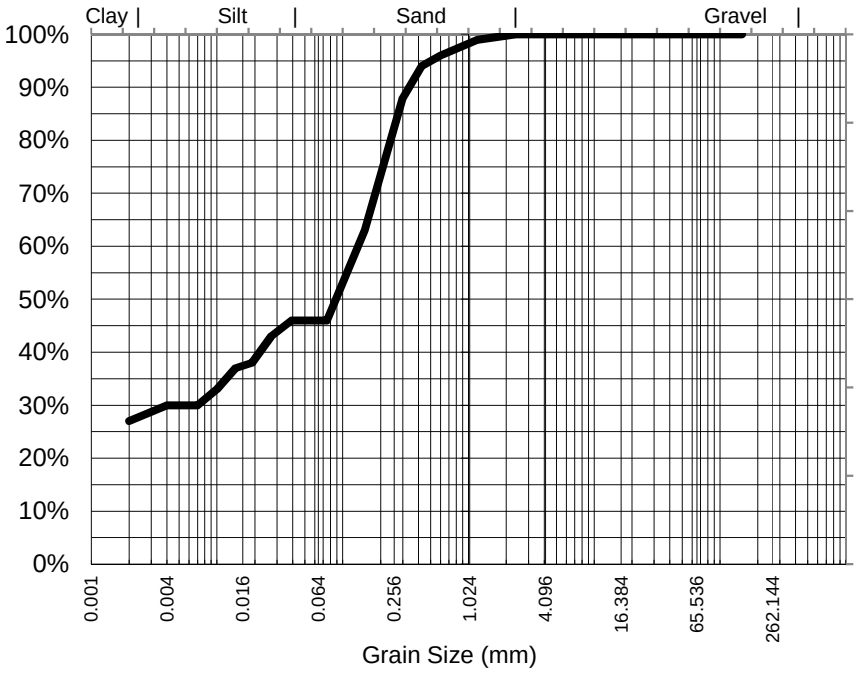
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-030 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA07-1

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	99%
0.600	96%
0.425	94%
0.300	88%
0.150	63%
0.075	46%
Particle Size (microns)	
75	46%
55	46%
39	46%
19	38%
10	33%
5	30%
2	27%

Median Particle Size (mm)*	0.093

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.57 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

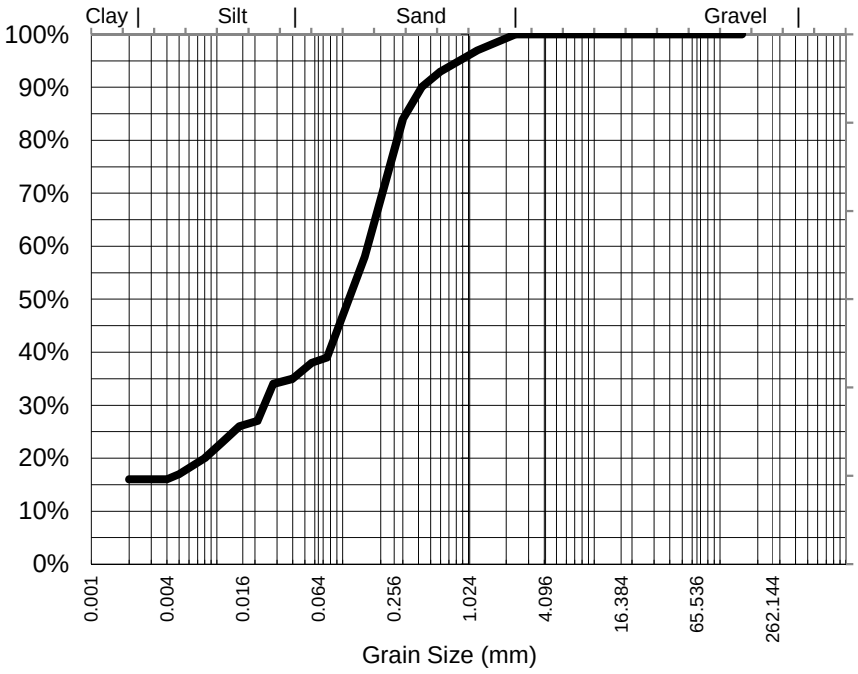
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-031 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA07-2

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	97%
0.600	93%
0.425	90%
0.300	84%
0.150	58%
0.075	39%
Particle Size (microns)	
75	39%
57	38%
40	35%
21	27%
11	23%
5	17%
2	16%

Samples analysed as received.

Median Particle Size (mm)*	0.118

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.48 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA
ACCREDITATION

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

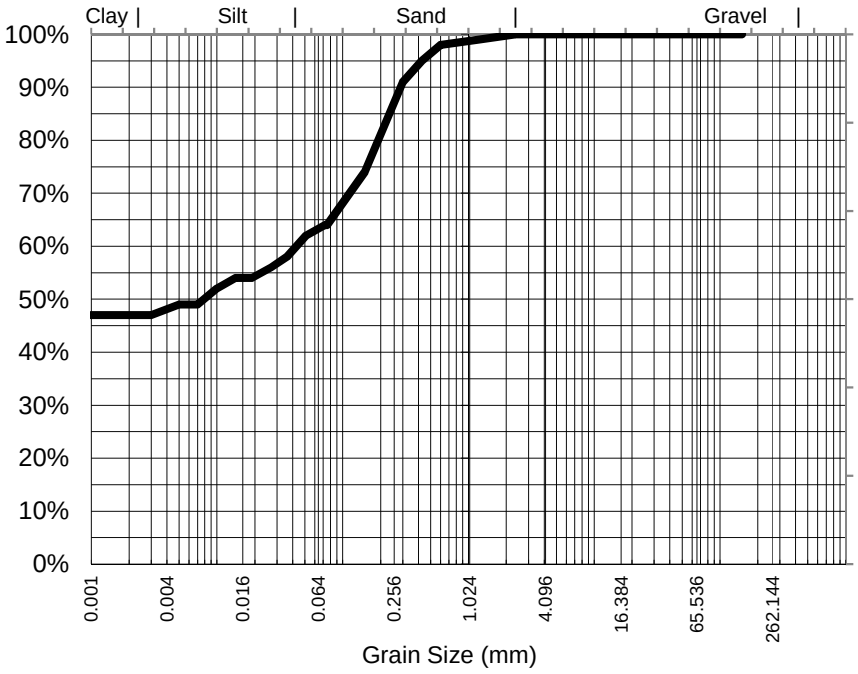
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-032 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA07-3

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	99%
0.600	98%
0.425	95%
0.300	91%
0.150	74%
0.075	64%
Particle Size (microns)	
72	64%
51	62%
36	58%
19	54%
10	52%
5	49%
1	47%

Median Particle Size (mm)*	0.008

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.66 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

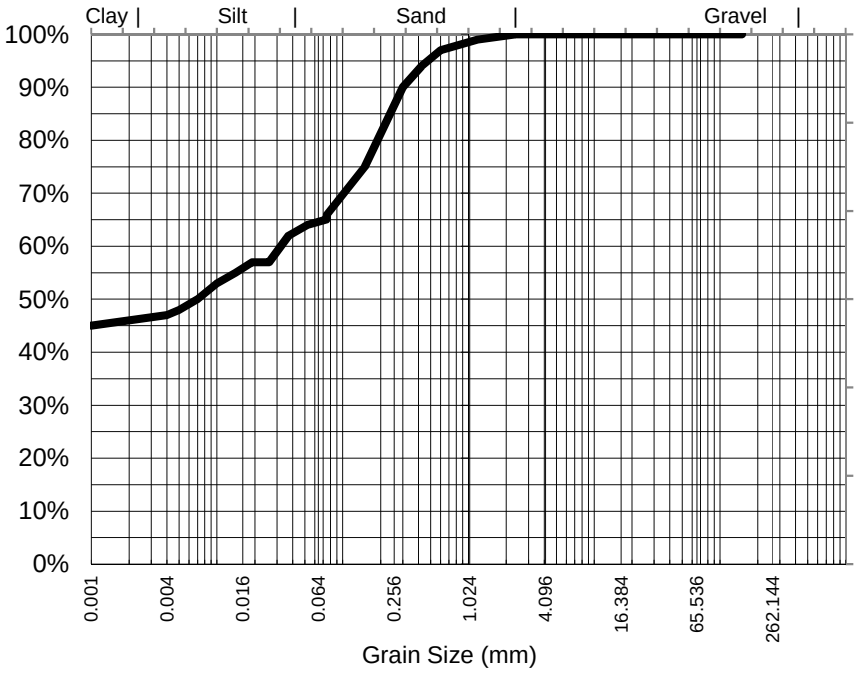
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-033 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA07-4

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	99%
0.600	97%
0.425	94%
0.300	90%
0.150	75%
0.075	66%
Particle Size (microns)	
74	65%
52	64%
37	62%
19	57%
10	53%
5	48%
1	45%

Samples analysed as received.

Median Particle Size (mm)*	0.007

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.58 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

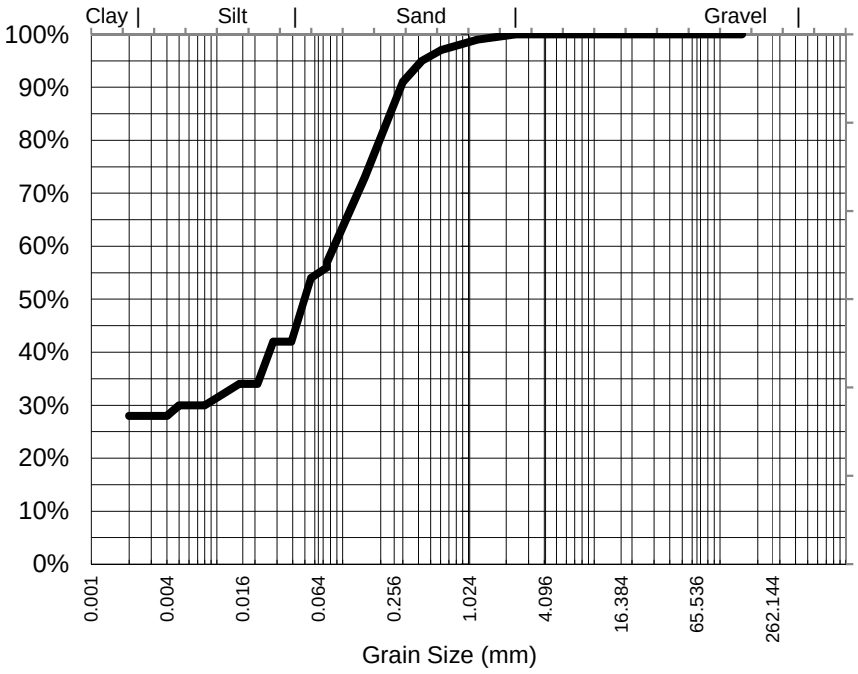
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-037 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA08-1

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	99%
0.600	97%
0.425	95%
0.300	91%
0.150	73%
0.075	57%
Particle Size (microns)	
75	56%
56	54%
39	42%
21	34%
11	32%
5	30%
2	28%

Median Particle Size (mm)*	0.050

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.51 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

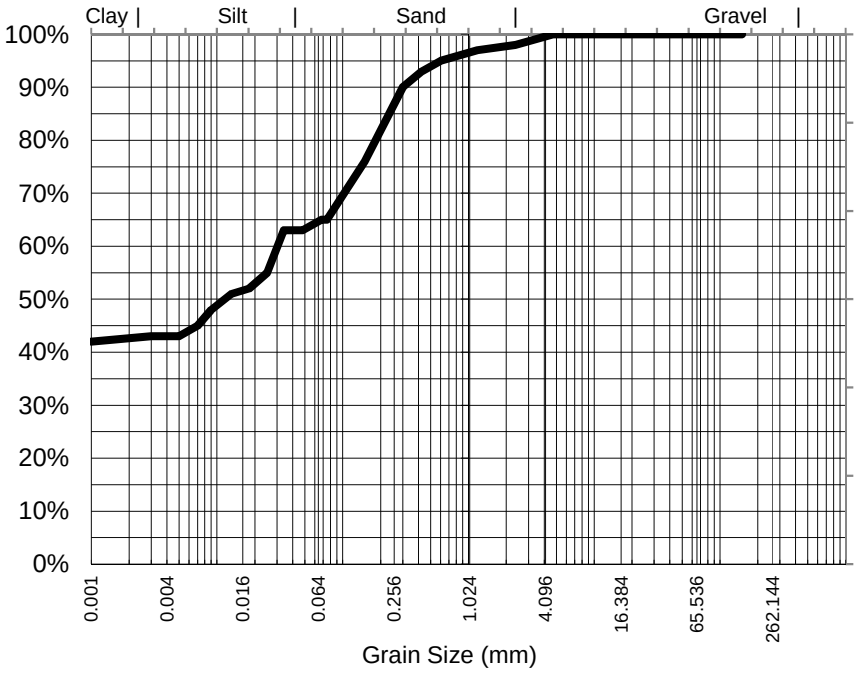
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-039 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA08-3

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	98%
1.18	97%
0.600	95%
0.425	93%
0.300	90%
0.150	76%
0.075	65%
Particle Size (microns)	
68	65%
48	63%
34	63%
18	52%
9	48%
5	43%
1	42%

Samples analysed as received.

Median Particle Size (mm)*	0.012

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.67 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

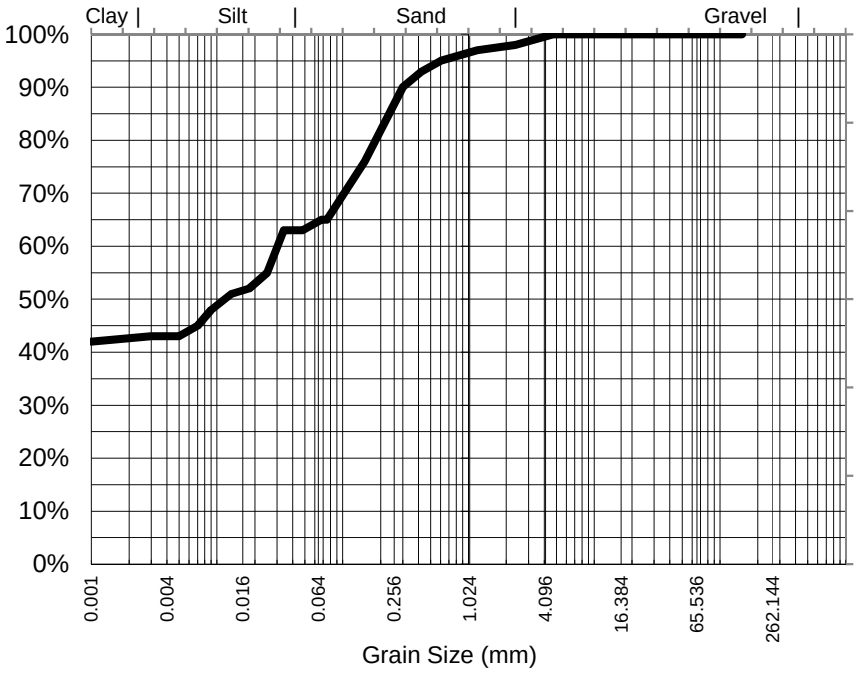
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-039DUP / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA08-3

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	98%
1.18	97%
0.600	95%
0.425	93%
0.300	90%
0.150	76%
0.075	65%
Particle Size (microns)	
68	65%
48	63%
34	63%
18	52%
9	48%
5	43%
1	42%

Median Particle Size (mm)*	0.012

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.67 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

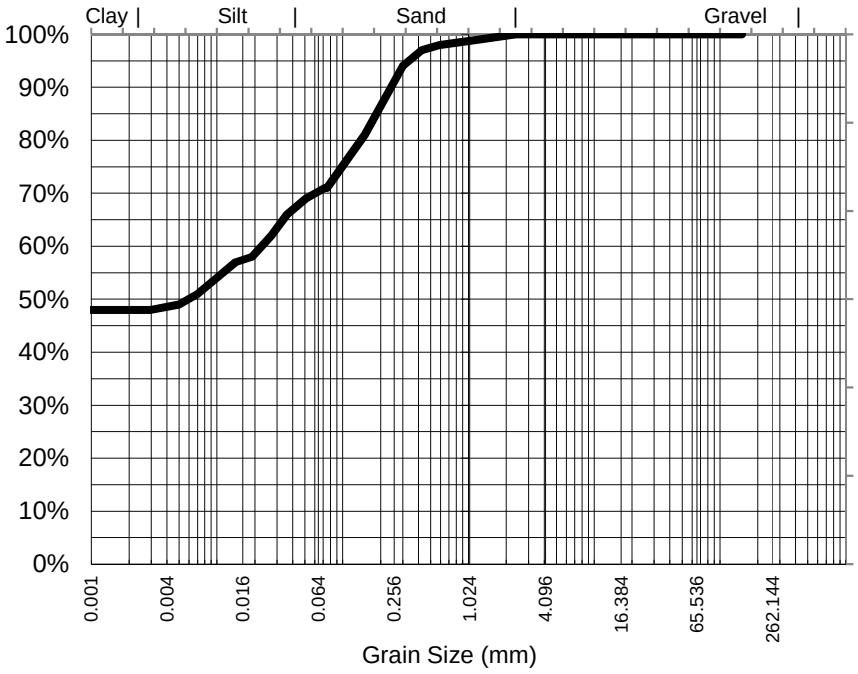
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane, QLD

CLIENT:	SAMUEL DONALD	**DATE REPORTED:**	17-Apr-2018
COMPANY:	RANGE ENVIRONMENTAL CONSULTANTS	**DATE RECEIVED:**	28-Mar-2018
ADDRESS:	266 MARGARET ST TOOWOOMBA QLD 4350	**REPORT NO:**	EB1808040-041 / PSD
PROJECT:	J000030	**SAMPLE ID:**	STA08-5

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	99%
0.600	98%
0.425	97%
0.300	94%
0.150	81%
0.075	71%
Particle Size (microns)	
72	71%
51	69%
36	66%
19	58%
10	54%
5	49%
1	48%

Median Particle Size (mm)*	0.006

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 0-Jan-00

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.54 g/cm3

NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Chemist
Authorised Signatory

Adelaide
Suite 406, 147 Pirie Street,
ADELAIDE, SA 5000
Tel +61 8 8223 2214

Please visit **www.stantec.com** to learn more about how Stantec design with community in mind.

Stantec