13 July 2015

ABBOT POINT GROWTH GATEWAY PROJECT

Acid Sulfate Soil Investigation - Interpretive Report for the Dredged Material Containment Ponds Area

Submitted to:
Project Manager
Department of State Development
Queensland Government

Report Number. 1525905-035-R-Rev2

REPORT

Golder Associates

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1.0 INTRODUCTION

Golder Associates (Golder) was appointed by Department of State Development (DSD) to provide design consultancy services for the proposed on-shore dredge material containment pond (DMCP) associated with the Abbot Point Growth Gateway Project at Abbot Point Coal Terminal, Queensland. The proposed containment pond development area (the site) is shown on Figure 001.

As part of the design consultancy services, an acid sulfate soil (ASS) investigation has been conducted across the proposed containment pond to evaluate the presence and possible extent of ASS that may be disturbed by the proposed development. This report provides a summary of the results and findings of the ASS investigation.

2.0 PROJECT DETAILS

Proposed capital dredging for the expansion of Terminal 0 at Abbot Point is expected to result in about 2.4 million m^3 (bulked volume) of dredge material. Onshore disposal of dredge material will require the construction of ponds to hold the material and to treat dredge tail-water to a standard where it can be discharged back to the ocean. It is intended that the placed material will be re-used for beneficial purposes as part of future coal terminal developments.

The final layout and design of the ponds is currently in progress. The current configuration for the dredge material containment pond has an approximate surface area of approximately 630,000 m^2 and the perimeter bunds will be approximately 5.2 km long. The floor of the pond will have a surface level of about 2.84 m AHD.

For the purposes of this investigation it was assumed that during construction, the containment pond may be subject to excavation activities to depths of up to 4 m below ground level (bgl). Ancillary surface drains and infrastructure are expected to result in ground disturbances of less than 1 m below the existing ground surface.

3.0 SITE DESCRIPTION

The proposed DMCP site is bordered by the existing Abbot Point Coal Terminal settlement pond to the north, beyond which is Bald Hill and then Dingo Beach and the Pacific Ocean. West and south of the site are the Caley Valley wetlands. The Abbot Point Coal Terminal is to the east.

The majority of the proposed DMCP site is located on a relatively level “terrace” area which is about 1m to 2m higher than the surface levels in the Caley Valley wetlands. From the middle of the site, there is a gentle slope from the south to the north ranging in elevation from approximately 5.2 m AHD to 3.0 m AHD.

4.0 ACID SULFATE SOIL OVERVIEW

Acid Sulfate Soil (ASS) is a general term applying to both a soil horizon that contains sulfides (i.e. Potential Acid Sulfate Soil - PASS) and an acid soil horizon affected by oxidation of sulfides (i.e. Actual Acid Sulfate Soil - AASS). The formation of ASS is commonly the result of marine or estuarine deposition of sulfate and iron bearing sediments in the presence of an abundant source of readily decomposable organic matter resulting in the deposition of pyrite. This pyrite is stable within the soil so long as anoxic conditions prevail. Oxidation of this material produces acidic conditions, a process that typically occurs when the material is exposed to air, such as when raised above the water table by excavation, or by lowering the water table during dewatering processes. This can occur as a result of natural processes, for example as a result of fluctuations in the seawater level.

Previous experience and published guidelines indicate that ASS are typically restricted in extent to recent (Holocene age) soil horizons deposited in a saline environment below RL 5 m AHD, with Actual ASS (AASS) often occurring at the top of the soil profile in historically disturbed areas, being underlain by Potential ASS (PASS). ASS commonly occurs throughout Australian coastal areas.

The State Planning Policy SPP July 2014, State Interest Guideline – Water Quality applies to land where the natural ground level is less than 20 m AHD and the proposed disturbance of soil and sediments extends below 5 m AHD. Within such areas the SPP applies to developments involving:

- Excavating or otherwise removing 100 m³ or more of soil or sediment; or
- Filling of land involving 500 m³ or more of material with an average depth of 0.5 m or greater.

The proposed location for the DMCP has both topography and anticipated disturbances (both shallow excavation and filling) that trigger SPP 2014. Therefore, an assessment of potential disturbance of ASS was required.

5.0 DESKTOP REVIEW

5.1 Regional Geology

The 1:250,000 scale Geological Map of the Ayr region indicates that the site is underlain primarily by Quaternary coastal dunes and sand plains (Qr) derived primarily from wind action (aeolian). To the south and south west of the site (Caley Valley Wetland) the geology is comprised of Quaternary age marine coastal mud flats (Qm) comprising clay, silt, sand, estuarine and deltaic deposits.

Near surface Quaternary aged sediments have been deposited in recent geological time (0 – 2 Myr). Quaternary materials can be subdivided into recent Holocene materials (<10 kyr) which are typically loose, or soft normally consolidated materials that are deposited above Pleistocene soils (10 kyr – 2 Myr) which are stiffer, or denser over consolidated materials. The latter were deposited during sea level conditions which oscillated around 120 m below present levels.

Sub-types of Quaternary soils may also be classified by their depositional environment such as marine, estuarine, alluvial or colluvial soils. Other Quaternary aged soils include *in-situ* residual soils which are a remnant weathering product derived from the underlying rock.

5.2 ASS Mapping

The 1:250,000 ASS map for the Bowen Area developed by the Queensland Department of Natural Resources and Water revealed that the Bowen Area ASS map coverage is only for the developed Bowen township area and does not extend to the Abbot Point area. No published Queensland Acid Sulfate Soil Investigation Team (QASSIT) ASS mapping is presently available for Abbot Point.

The Bowen Shire Planning Scheme 2006, Overlay Map 06 “Natural Features and Resources Overlay – Special Management Areas Acid Sulfate Soils” maps Potential Acid Sulfate Soils as being present along the Bowen Shire coastline and along the Abbot Point coastline adjacent to the proposed development area at RL 5 m AHD and below.

The Australian Atlas of Acid Sulfate Soils 1:100,000 ASS map developed by CSIRO Land and Water maps the entirety of the proposed development site as having a high probability of ASS based on a very low confidence level.

5.3 Previous Investigations

In 2009, a detailed ASS investigation was undertaken by Aurecon Hatch on behalf of Ports Corporation Queensland (PCQ) for the Abbot Point Coal Terminal upgrade works (X80/X100 expansion). This investigation covered portions of and areas adjacent to the current subject site. The investigation was limited to 4 m bgl at all locations. Borehole locations investigated by Aurecon Hatch in 2009 are presented in Appendix A. The findings of the Aurecon Hatch report indicated the following:

- The area had not previously been mapped by QASSIT for AASS or PASS.
- Ground conditions across the X80/X100 expansion area generally encountered alluvial sandy clays and clayey sands interbedded with sands to depths of at least 4 m bgl.
- Field pH screening results indicated that AASS were not present under the X80/X100 expansion area within the samples collected. Field screening results indicated the possible presence of PASS in the soil profile along the margin of the Caley Valley wetland, generally greater than 3 m below the existing

ground surface. Field screening results did not indicate the possible presence of PASS over the remainder of the more elevated terrace area.

- Soil laboratory results were consistent with the field screening and confirmed the absence of AASS in the samples analysed, the presence of PASS in the soil profile below 3 m in the soil profile along the margin of the Caley Valley wetland, and the absence of PASS across the terrace areas to depths of at least 4m bgl. Lime neutralisation treatment rates for identified PASS ranged from 1 kg/m^3 to >25 kg/m^3.
- Locations where PASS was identified are situated outside of the proposed DMCP footprint.

The Aurecon Hatch report also referenced an earlier preliminary ASS investigation of the Stage 3 Expansion by WBM Pty Ltd (WBM) in 2005. The WBM investigation involved sampling to maximum depths of 1.3m at 20 locations and confirmed the absence of PASS over that shallow depth range.

6.0 ASS INVESTIGATION SCOPE

Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland, 1998 (QASSIT Guidelines) provides guidance on the investigation of ASS. These guidelines suggest an investigation sampling intensity of 2 borehole/hectare for developments of more than 4 hectares to a depth of at least 1 m below the maximum depth of disturbance. The overall size of the containment pond site is over 63 hectares.

The previous ASS investigation results, geological conditions and ground conditions indicated in previous geotechnical investigations indicate that there a relatively low potential for ASS to be present across the proposed DMCP footprint. On this basis, a sampling intensity of than the QASSIT guidelines was proposed and comprised of:

- Twenty-five investigation locations to a target depth of 5 m bgl across the footprint of the pond area including a series of locations spaced at about 100m intervals along the south-western footprint boundary (i.e., closest to the Caley Valley wetland) where the highest risk of encountering ASS was expected; and
- Installation of 6 groundwater monitoring wells.

This sampling program was considered sufficient to enable characterisation of the ASS risk and to allow development of suitable ASS management measures, if required.

7.0 FIELD INVESTIGATION

The field investigation was conducted between 19 and 24 May 2015 under the supervision of an experienced environmental scientist. Twenty-five investigation locations (designated GA_ASS101 to GA_ASS125) were drilled across the footprint of the containment pond. Borehole locations are shown on Figure 001.

Boreholes were drilled using Golder's 4WD mounted 'Eziprobe' drill rig with continuous core sampling capabilities, allowing the recovery of undisturbed soil samples. All boreholes were drilled to a target depth of 5 m below the existing ground surface. Soil samples were typically collected at 0.25 m depth intervals and placed immediately into sealed polyethylene bags, labelled and then placed into a cooler for transportation to a freezer for storage. Samples were subsequently transported in chilled eskies to laboratories for testing.

The location of each borehole was recorded during drilling using a hand-held GPS unit with a differential correction signal, having an accuracy of ± 5 m. All borehole locations were later surveyed by RPS Australia Asia Pacific for location and relative levels (RL) to Australian Height Datum (AHD). Borehole coordinates and RL's are presented on the Reports of Boreholes in Appendix B, together with explanatory notes.

At six investigation locations, GA_ASS104, GA_ASS107, GA_ASS109, GA_ASS113, GA_ASS117 and GA_ASS125, groundwater monitoring wells (designated MW_ASS104, MW_ASS107, MW_ASS109, MW_ASS113, MW_ASS117 and MW_ASS125) were installed to allow gauging of groundwater levels and collection of groundwater samples. Monitoring well construction details are shown on the borehole logs in Appendix B.

Groundwater levels and samples were collected in four of the monitoring wells (MW_ASS107, MW_ASS109, MW_ASS113 and MW_ASS125) by an experienced environmental scientist on 24 May 2015 (at least 3 days after their development). Two of the monitoring wells (MW_ASS104 and MW_ASS117) were dry at the time of sampling and therefore could not be sampled. Monitoring wells GA_MW01 and GA_MW03 installed by Golder as part of geotechnical investigations were also sampled. GA_MW01 is approximately 120 m west of MW_ASS104 and GA_MW03 is approximately 40 m south of MW_ASS117. Monitoring well locations are presented in Figure 001.

Field measurements of pH and electrical conductivity (EC) in groundwater samples were recorded using a calibrated field meter.

8.0 LABORATORY ANALYSIS

8.1 Screening Test Results

A total of 500 soil samples were screened at Golder's Cairns laboratory using the "field" screening test method - pH (pH_F) and pH after oxidation (pH_{FOX}).

The pH_F tests were conducted on a portion of each recovered sample by mixing small individual subsamples of soil and deionised water (ratio of 1:5 respectively) and measuring the pH using a calibrated pH meter. The pH_{FOX} tests were also conducted on recovered samples following the addition of 30 % laboratory grade hydrogen peroxide. A description of the strength of reaction with peroxide and the pH_{FOX} measured using a calibrated pH meter was recorded for each sample.

The field test results (pH_F, pH_{FOX}, reaction strength) and interpreted PASS potential (high, moderate or low) are tabulated in Appendix B. Where pH_F of about 4.5 or below were measured, the results have been interpreted as indicating the possible presence of AASS.

It should be noted that screening tests provide an indication of the possible presence of AASS or PASS. It is not a definitive test to confirm the presence or absence of AASS/PASS.

8.2 Chromium Suite Analysis

A total of 50 soil samples were selected for quantitative analysis. Selection was based on a review of the screening test results and the soil profiles.

The selected samples were submitted to SGS Environmental (SGS) in Cairns for analysis of the Chromium Suite in accordance with ASS Method 23F and 22B laboratory procedures of Ahern et al (2004). SGS is National Association of Testing Authorities (NATA) accredited for the analytical tests.

Laboratory certificates of analysis are presented in Appendix C.

8.3 Groundwater Analysis

Groundwater samples were submitted to SGS for analysis of a range of ASS indicator parameters (iron, aluminium, chloride, sulfate, total acidity and total alkalinity). SGS is NATA accredited for these analytical tests.

Laboratory certificates of analysis are presented in Appendix C.

9.0 ASSESSMENT CRITERIA

9.1 Soils

QASSIT Action Criteria (Table 1) have been used to determine the presence of ASS at this site.

Table 1: QASSIT Action Criteria

Type of Material		Action Criteria > 1000 tonnes disturbed (and major fill projects)	
		Existing + Potential Acidity	
Texture range McDonald et al. (1990)	Approx clay content (%)	Equivalent sulfur %S oxidisable (oven-dry basis)	Equivalent acid mol H^+/ tonne (oven-dry basis)
Coarse Texture Sands to loamy sands	≤5	≥0.03	≥18
Medium Texture Sandy loams to light clays	5 – 40		
Fine Texture Medium to heavy clays and silty clays	≥40		

9.2 Groundwater

Treatment and management of soils and water in acid sulfate soil landscapes (July 2011, WA DEC) provides a guide for the assessment of the buffering capacity of groundwater as described in Table 2.

Table 2: Groundwater Buffering Capacity

Designation	Alkalinity		pH	Description
	mg/L	meq./L		
Very high alkalinity	>180	>3	>6.5	Adequate to maintain acceptable pH level in the future.
High alkalinity	60-80	1-3	>6.0	Adequate to maintain acceptable pH level in the future.
Moderate alkalinity	30-60	0.5-1.0	5.5-7.5	Inadequate to maintain stable, acceptable pH level in areas vulnerable to acidification.
Low alkalinity	10-30	0.2-0.5	5.0-6.0	Inadequate to maintain stable, acceptable pH level.
Very low alkalinity	<10	<0.2	<6.0	Unacceptable pH level under all circumstances.

Chemical indicators that may indicate that groundwater is being affected by, or has already been affected by, the oxidation of sulfides include:

- A chloride:sulfate ratio less than 2 (this ratio has little relevance in a freshwater groundwater environment)
- A pH of less than 5 and/or
- A soluble aluminium concentration greater than 1 mg/L.

10.0 INVESTIGATION RESULTS

10.1 Soils

The field screening test results indicated the following:

- The possible presence of AASS was not detected
- A low PASS potential was indicated in all soil samples.

Chromium Suite test results were used to calculate 'net acidity' by acid-base accounting methods as described below:

Net Acidity = Actual Acidity (as TAA) + Retained Acidity (as S_{NAS}) + Potential Acidity (as S_{CR}) – Acid Neutralising Capacity (ANC).

Calculated net acidity including estimates of lime neutralisation rates (where appropriate) are presented in Table 1D in Appendix D.

Results of the 50 soil samples analysed from within the proposed dredge material containment pond site are summarised below:

- All samples analysed returned existing acidity (TAA) below the laboratory detection limit (0.01%S).
- All samples analysed returned a S_{CR} result less than the laboratory detection limit (0.005%S).
- Net Acidity was below the QASSIT Action Criteria for all samples analysed.

10.2 Groundwater

Field and laboratory results for groundwater samples are summarised in Table 3 below:

Table 3: Groundwater Results

Parameter	MW ASS107	MW ASS109	MW ASS113	MW ASS125	GA MW01	GA MW03
Well Depth	5.13	5.22	4.73	4.73	9.98	19.35
Groundwater level (m bgl) 24/05/15	3.90	4.27	3.59	4.48	5.43	4.06
Groundwater level (m AHD) 24/05/15	-0.08	-0.13	0.06	-0.09	-0.14	0.27
Electrical Conductivity (mS/cm)*	0.7	0.4	15.61	0.7	1.3	40.93
pH	7.3	6.9	7.0	7.1	7.1	7.4
Total Alkalinity as $CaCO_3$ (mg/L)	150	84	360	300	190	250
Acidity as $CaCO_3$ (mg/L)	<5	<5	<5	<5	<5	<5
Sulfate as SO_4 (mg/L)	31	29	510	42	34	77
Chloride (mg/L)	120	5,000	5,000	86	260	2,500
Cl:SO_4 Ratio	3.9	172.4	9.8	2	7.6	32.4
Dissolved Aluminium (mg/L)	0.83	4.7	0.24	13	<0.02	<0.02
Dissolved Iron (mg/L)	0.64	1.9	0.22	20	0.07	<0.02

Notes: '*' Field measurement

A summary of findings are presented below:

- Groundwater levels in shallow monitoring wells (MW_ASS107, MW_ASS109, MW_ASS113 and MW_ASS125) ranged between about -0.14 m AHD to 0.27 m AHD generally indicate no discernible groundwater gradient across the site.

- Electrical conductivity (EC) collected from shallow groundwater wells generally ranged between 0.7 to 1.3 mS/cm, representative of freshwater to brackish conditions. Brackish to saline conditions were indicated at MW_ASS113 (15.61 mS/cm) located along the north western boundary and in the deepest well, GA_MW03 (40.93 mS/cm).
- The pH in groundwater samples ranged from pH 6.9 (MW_ASS109) to pH 7.4 (GA_MW03) indicating near neutral conditions.
- Total alkalinity concentrations ranged from 84 mg/L (MW_ASS109) to 360 mg/L (MW_ASS113). Samples at all locations would be categorized as high to very high alkalinity groundwater with adequate buffering capacity to maintain pH.
- Chloride to Sulfate ratio is not considered to be a useful indicator for the mainly freshwater to brackish conditions encountered.
- Relatively high levels of dissolved aluminium and iron concentrations were encountered at MW_ASS109 and MW_ASS125.

11.0 DISCUSSION

The field and laboratory results on soil samples do not indicate the presence of AASS and PASS within the upper 5m across the proposed DMCP site. Excavation below this depth is not proposed.

Limited groundwater sampling conducted during the ASS investigations generally indicates a relatively stable and neutral environment with a high buffering capacity. Test results do not indicate that groundwater has been affected by historical oxidation of sulfides although; relatively high levels of aluminium and iron have been detected in some groundwater samples. Groundwater dewatering from the pond footprint will not be required to construct the DMCP and therefore monitoring and possible treatment of groundwater is not anticipated.

12.0 CONSTRUCTION IMPLICATIONS/MANAGEMENT STRATEGIES

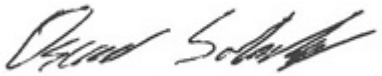
On the basis of the investigation findings, no specific ASS management is required for proposed ground disturbances associated with the DMCP construction. Measures to be proposed in the event that PASS is encountered are incorporated in the project ASS Management Plan.

13.0 LIMITATIONS

Your attention is drawn to the document - Limitations, which are attached in Appendix E. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks associated with the services provided for this project. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may use this report are aware of the responsibilities each assumes in so doing.

Report Signature Page

GOLDER ASSOCIATES PTY LTD



Oscar Solvander
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Paul Scells
Principal Engineer

OS/PKS/os

A.B.N. 64 006 107 857

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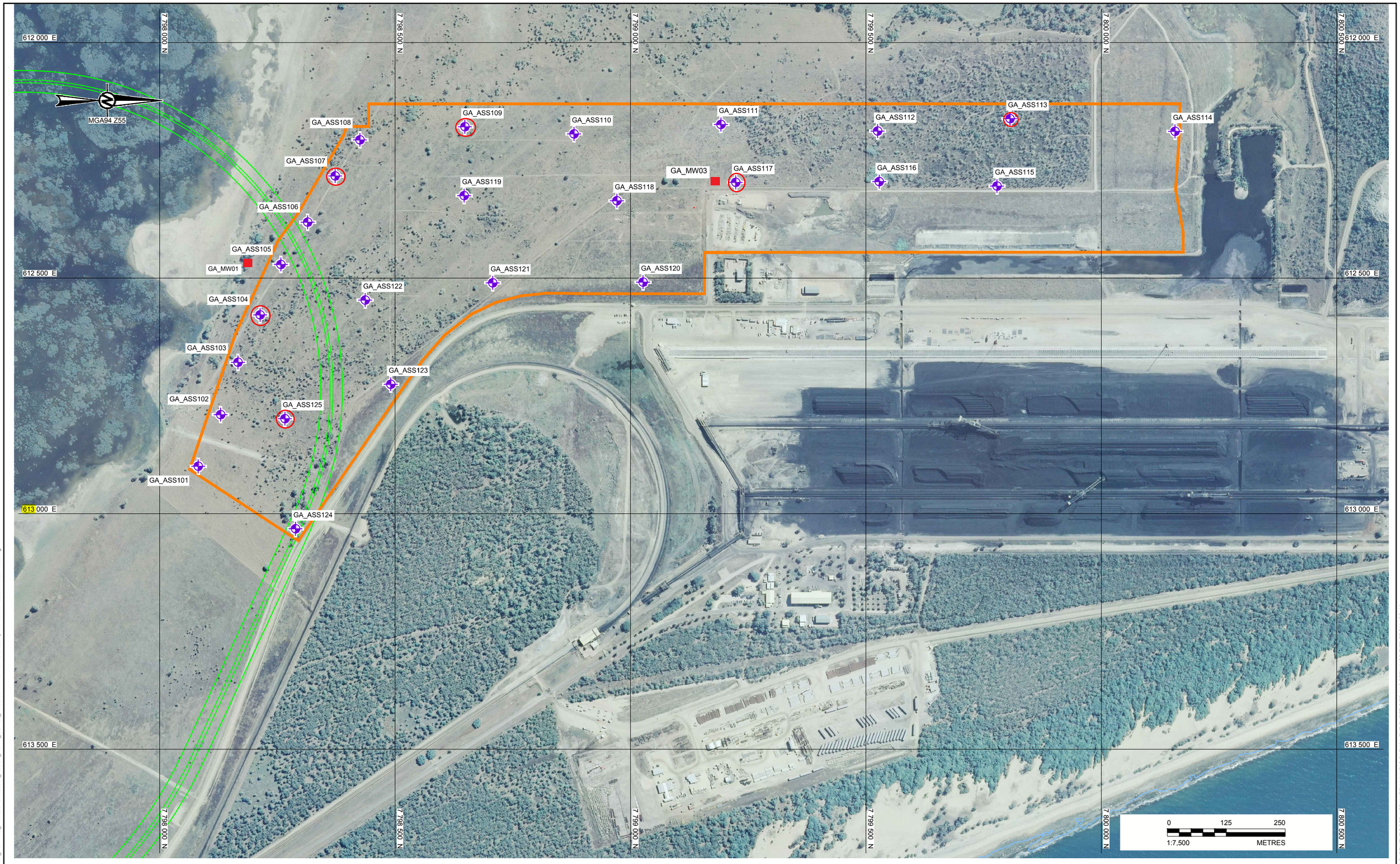
FIGURES



LEGEND

- ASS BOREHOLE LOCATION
- LIMIT OF ASS SITE INVESTIGATION
- APPROVED T3 RAIL
- ASS MONITORING WELL
- GEOTECHNICAL MONITORING WELL

CLIENT
DEPARTMENT OF STATE DEVELOPMENT

PROJECT
ABBOT POINT GROWTH GATEWAY PROJECT

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-06-12
PREPARED	EJC
DESIGN	CSvL
REVIEW	PKS
APPROVED	PKS

Title
ASS Investigation Locations

PROJECT No.	DOC No.	Rev.	FIGURE
1525905	035	0	F001

25 mm
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

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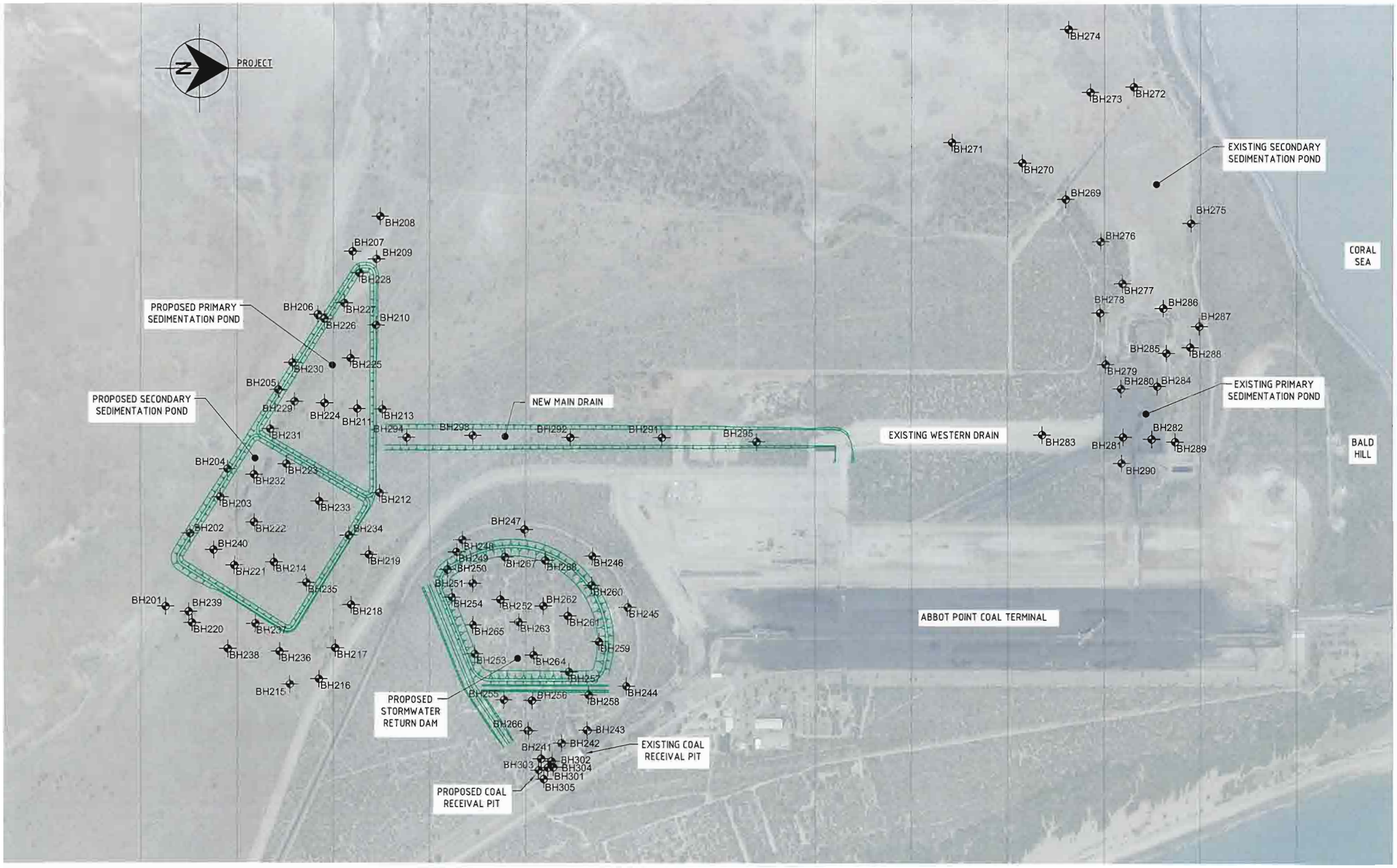
APPENDIX A

Aurecon Hatch 2009 Investigation Locations



LEGEND:

BH220 BOREHOLE

NOTES

1. HORIZONTAL DATUM IS ABBOT POINT PROJECT DATUM
2. DATA POINTS ARE ACCURATE TO ±4m.

100 0 100 200 300 400 500m
SCALE 1:5000

SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev.	Date	Revision Details	Drn	Ver.	App.
01	09.03.09	ISSUED FOR ASS REPORT	BC		

Connell HATCH infrastructure for industry
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Client: Ports Corporation of Queensland (PCQ)

Project: ABBOT POINT COAL TERMINAL X80/X110 EXPANSION

Drawn BC	Signed	Date	
Designed PC	Signed	Date	
Verified	Signed	Date	
Approved	Signed	Date	

Drawing Title: FIGURE 1 ACID SULFATE SOIL INVESTIGATION TEST LOCATION PLAN

Project No. H6000-80
Scale 1: 5,000
Sheet Size A1
Drawing No. 700-1-0023
Rev. 01

20 10 0 10 20 30 40 50 100mm

APPENDIX B

Borehole Reports

REPORT OF BOREHOLE: GA-ASS101

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612889.0 m 7798076.1 m
SURFACE RL: 4.16 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 23/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	M		0	4.16	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown		MD	
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-1.00 m							
			1	*1.00* 3.16	ASS 1.00-1.25 m				Clayey SAND fine to coarse grained, pale grey/brown orange			
	H				ASS 1.25-1.50 m						D	
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m					D		
				2.40 1.76	ASS 2.25-2.40 m							
ADH	M-H				ASS 2.40-2.75 m				Silty SAND fine to coarse grained, pale grey		MD	
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
		▽		*4.50* -0.34	ASS 4.50-4.75 m				Silty SAND fine to medium grained, grey/green	M - W		
	M	23/05/15, SWL			ASS 4.75-5.00 m							
			5	-0.84					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS102

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612789.4 m 7798130.6 m
SURFACE RL: 3.98 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 22/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	M		0	3.98	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown		MD	
					ASS 0.25-0.50 m							
					ASS 0.50-0.70 m							
				0.70								
				3.28	ASS 0.70-1.00 m				Clayey SAND fine to coarse grained, pale grey/brown orange			
			1		ASS 1.00-1.25 m							
					ASS 1.25-1.50 m					D		
					ASS 1.50-1.75 m						D	
ADH	H				ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
				2.50								
				1.48	ASS 2.50-2.75 m				. becoming pale grey (reduced clay content)			
					ASS 2.75-3.00 m							
				3.00								
PT			3	0.98	ASS 3.00-3.25 m				Silty SAND fine to coarse grained, pale grey, with some clay			
					ASS 3.25-3.50 m					M	MD	
	M			*3.50*								
				0.48	ASS 3.50-3.75 m				. trace of clay from 3.5m			
				3.80								
				0.18	ASS 3.75-4.00 m				. fine to medum grained from 3.8m			
			4		ASS 4.00-4.25 m							
		22/05/15, SWL		*4.20*								
				-0.22	ASS 4.25-4.50 m				Silty SAND fine to coarse grained, pale grey			
	M-L				ASS 4.50-4.75 m					M - W	L	
					ASS 4.75-5.00 m							
			5	-1.02					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS103

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612686.9 m 7798161.6 m
SURFACE RL: 4.21 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 22/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	M		0	4.21	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown		MD	
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-1.00 m							
			1		ASS 1.00-1.20 m							
				1.20								
	H			3.01	ASS 1.20-1.50 m				Clayey SAND fine to coarse grained, pale grey/brown orange	D	D	
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							
				3.00								
ADH	M	GW inflow 4.0m	3	1.21	ASS 3.00-3.25 m				Silty SAND fine to coarse grained, pale grey, trace clay	M - W	L	
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-0.79					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA-ASS104/MW104

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612580.8 m 7798212.2 m
SURFACE RL: 4.32 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 21/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS
			-1									
			0	4.32	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown		MD	Backfill
					ASS 0.25-0.50 m							Bentonite
PT	M				ASS 0.50-0.80 m							
				0.80								
				3.52	ASS 0.80-1.00 m				Clayey SAND fine to coarse grained, pale grey/brown orange			
			1		ASS 1.00-1.25 m							
					ASS 1.25-1.50 m					D		
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m						D	
			2		ASS 2.00-2.25 m							
	H				ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							Sand
			3	*3.00*								
ADH				1.32	ASS 3.00-3.25 m				Silty SAND fine to coarse grained, pale grey			
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							Screen PVC
	M		4		ASS 4.00-4.25 m					M	MD	
					ASS 4.25-4.50 m							
		GW inflow 4.5m			ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-0.68					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01d RL3

REPORT OF BOREHOLE: GA-ASS105

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612461.2 m 7798258.3 m
SURFACE RL: 5.13 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 23/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	M	Groundwater not encountered	0	5.13	ASS 0.00-0.25 m				Silty SAND fine to medium grained, brown/yellow red			
					ASS 0.25-0.50 m							
	H				ASS 0.50-0.75 m						MD	
					ASS 0.75-1.00 m							
			1		ASS 1.00-1.20 m							
				1.20								
				3.93	ASS 1.20-1.50 m				Silty Clayey SAND fine to coarse grained, brown/yellow red			
ADH					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m						D	
			2		ASS 2.00-2.30 m							
				2.30								
	M-H			2.83	ASS 2.30-2.50 m				Silty SAND fine to coarse grained, brown orange	D		
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.30 m							
				3.30								
				1.83	ASS 3.30-3.50 m				Silty SAND fine to coarse grained, pale grey			
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m						MD	
			4	*4.00*								
				1.13	ASS 4.00-4.25 m				. becoming brown at 4.0m			
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	0.13					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA-ASS106

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612382.2 m 7798308.8 m
SURFACE RL: 5.28 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 23/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	M	Groundwater not encountered	0	5.28	ASS 0.00-0.25 m				Silty SAND fine to medium grained, brown		MD	
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-1.00 m							
			1	*1.00* 4.28	ASS 1.00-1.30 m				Clayey Sandy SILT yellow, fine to coarse grained sand	D		
				1.30 3.98	ASS 1.30-1.50 m				Silty Slag And SAND fine to coarse grained, yellow, red/brown orange		D	
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2	*2.00* 3.28	ASS 2.00-2.25 m				Silty SAND fine to coarse grained, yellow, red/brown orange, with some clay			
				2.40 2.88	ASS 2.25-2.40 m				Silty SAND fine to coarse grained, brown orange			
	M-H				ASS 2.40-2.75 m							
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m						MD	
				3.70 1.58	ASS 3.75-4.00 m				becoming pale grey/brown orange at 3.7m	D - M		
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	0.28					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

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GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS107/MW107

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612278.6 m 7798368.7 m
SURFACE RL: 3.77 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 21/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS
			-1									Stick uo 0.69m
PT	M		0	3.77	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown		MD	Backfill Bentonite
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-1.00 m							
			1	1.00 2.77	ASS 1.00-1.25 m				Clayey SAND fine to medium grained, pale grey/orange brown	D		
					ASS 1.25-1.50 m							
ADH	H				ASS 1.50-1.75 m						D	
					ASS 1.75-2.00 m							
			2	2.00 1.77	ASS 2.00-2.25 m				Silty SAND fine to coarse grained, pale grey/brown orange, trace clay			
					ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							Sand
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
PT	M-H	21/03/15, SWL			ASS 3.50-3.75 m					M	MD	
					ASS 3.75-4.00 m							
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
					ASS 4.50-4.80 m							
	M			4.80 -1.03	ASS 4.80-5.00 m				Silty SAND grey/green, trace clay		L	Screen PVC
			5	-1.23					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01d
RL3

REPORT OF BOREHOLE: GA-ASS108

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612205.5 m 7798426.9 m
SURFACE RL: 3.34 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 22/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	M		0	3.34	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-0.90 m							
				0.90								
	H		1	2.44	ASS 0.90-1.25 m				Clayey SAND fine to coarse grained, pale grey/brown orange	D	MD	
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
				2.50								
ADH	M-H			0.84	ASS 2.50-2.75 m				Silty SAND fine to coarse grained, pale grey/brown orange, with some clay	D - M	D	
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.60 m							
				3.60								
				-0.26	ASS 3.60-3.75 m				Silty SAND fine to coarse grained, pale grey, trace clay	M		
					ASS 3.75-4.00 m							
			4		ASS 4.00-4.20 m							
				4.20								
				-0.86	ASS 4.20-4.50 m				Silty SAND fine to medium grained, grey/green, trace clay	M - W	MD	
		21/03/15, SWL			ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-1.66					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA-ASS109/MW109

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612174.6 m 7798648.9 m
SURFACE RL: 4.08 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.25 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 19/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS
			-1									Stick uo 0.69m
PT	M		0	4.08	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			Backfill
					ASS 0.25-0.50 m							
					ASS 0.50-0.80 m							Bentonite
				0.80								
	H		1	3.28	ASS 0.80-1.00 m				Clayey SAND fine to medium grained, brown/orange brown	D		
					ASS 1.00-1.25 m							
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.30 m							
				2.30								
				1.78	ASS 2.30-2.50 m				SAND fine to coarse grained, pale grey, with some fine grained gravel and clay		D	
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							Sand
			3		ASS 3.00-3.25 m							
				3.25								
ADH	M	▽		0.83	ASS 3.25-3.50 m				Silty SAND fine to coarse grained, pale grey, with some fine grained gravel	M		
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							Screen PVC
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5									
				-1.17					END OF BOREHOLE @ 5.25 m TARGET DEPTH			
			6									
			7									
			8									
			9									

REPORT OF BOREHOLE: GA-ASS110

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612192.0 m 7798879.3 m
SURFACE RL: 4.49 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 20/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	M-H	▽	0	4.49	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown	D	L	
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-0.90 m							
				0.90								
			1	3.59	ASS 0.90-1.25 m				Clayey SAND fine to medium grained, brown orange/yellow red, trace ironstone			
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
				2.50								
				1.99	ASS 2.50-2.75 m				Silty SAND fine to coarse grained, grey/brown orange, trace clay	D - M	MD	
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-0.51					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA-ASS111

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612169.8 m 7799184.5 m
SURFACE RL: 3.78 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 20/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	3.78	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.60 m						L	
				0.60								
				3.18	ASS 0.60-0.75 m				Clayey SAND brown orange/yellow			
					ASS 0.75-1.00 m							
			1	*1.00*								
				2.78	ASS 1.00-1.25 m				becoming pale grey/brown orange			
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m					D		
				2.50								
				1.28	ASS 2.50-2.75 m				Silty SAND fine to coarse grained, pale brown, trace fine grained gravel		D	
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
		▽	4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
				4.50								
				-0.72	ASS 4.50-4.75 m				Silty SAND fine to medium grained, grey/green, trace clay	W	MD	
					ASS 4.75-5.00 m							
			5	-1.22					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

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GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS112

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612184.9 m 7799520.4 m
SURFACE RL: 4.23 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 20/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	4.23	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m						MD	
					ASS 0.75-1.10 m							
			1	*1.10*								
				3.13	ASS 1.10-1.25 m				Clayey SAND fine to medium grained, pale grey/brown orange			
					ASS 1.25-1.50 m					D		
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m						D	
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
				2.50								
				1.73	ASS 2.50-2.75 m				Silty SAND fine to coarse grained, pale grey			
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.25 m					M		
					ASS 3.25-3.50 m							
				3.50								
				0.73	ASS 3.50-3.75 m				Silty SAND fine to medium grained, grey			
					ASS 3.75-4.00 m						MD	
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m					M - W		
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-0.77					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

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GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS113/MW113

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612158.0 m 7799807.5 m
SURFACE RL: 3.57 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 19/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS
			0	3.57	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown		L	Backfill
					ASS 0.25-0.50 m							Bentonite
					ASS 0.50-0.70 m							
				0.70								
				2.87	ASS 0.70-1.00 m				Clayey SAND fine to coarse grained, pale grey			
			1		ASS 1.00-1.25 m							
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m					D		
					ASS 2.25-2.50 m						D	
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							Sand
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
		19/05/15, SWL			ASS 3.75-4.00 m							Screen PVC
			4	*4.00*								
				-0.43	ASS 4.00-4.25 m				Silty SAND fine to coarse grained, pale grey/green, with some clay	M	MD	
					ASS 4.25-4.50 m							
				4.50								
				-0.93	ASS 4.50-4.75 m				Silty SAND fine to medium grained, grey/green	W	L	
					ASS 4.75-5.00 m							
			5	-1.43					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01d
RL3

REPORT OF BOREHOLE: GA-ASS114

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612187.1 m 7800161.7 m
SURFACE RL: 3.34 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 22/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	3.34	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
				0.50								
				2.84	ASS 0.50-0.75 m				Clayey SAND fine to coarse grained, pale grey/brown orange			
					ASS 0.75-1.00 m							
			1		ASS 1.00-1.25 m							
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
				2.75								
				0.59	ASS 2.75-3.00 m				Silty SAND fine to medium grained, grey/green, trace clay			
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
				4.00								
			4	-0.66	ASS 4.00-4.25 m				Silty SAND fine to coarse grained, grey			
		▽			ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-1.66					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS115

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612300.7 m 7799775.7 m
SURFACE RL: 3.12 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 20/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	3.12	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.70 m							
				0.70								
				2.42	ASS 0.70-1.00 m				Clayey SAND fine to coarse grained, pale grey/brown orange			
			1		ASS 1.00-1.25 m							
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2	*2.00*								
				1.12	ASS 2.00-2.25 m				Silty SAND fine to coarse grained, pale grey, trace clay			
					ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							
		20/05/15, SWL	3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
				4.00								
			4	-0.88	ASS 4.00-4.25 m				Silty SAND fine to medium grained, grey/green, trace clay			
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-1.88					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

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GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS116

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612300.9 m 7799534.3 m
SURFACE RL: 3.79 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 20/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	3.79	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.70 m							
				0.70								
				3.09	ASS 0.70-1.00 m				Clayey SAND fine to medium grained, pale grey/brown orange			
			1		ASS 1.00-1.25 m							
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
				2.50								
				1.29	ASS 2.50-2.75 m				Silty SAND fine to coarse grained, pale grey			
			3		ASS 2.75-3.00 m							
					ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
		20/05/15, SWL			ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
			4	*4.00*								
				-0.21	ASS 4.00-4.25 m				Silty SAND fine to medium grained, grey/green			
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-1.21					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

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GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS117/MW117

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612293.8 m 7799219.8 m
SURFACE RL: 4.50 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 19/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS
			-1									Stick uo 0.69m
			0	4.50	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			Backfill
					ASS 0.25-0.50 m							Bentonite
					ASS 0.50-0.80 m							
				0.80								
				3.70					Clayey SAND fine to medium grained, brown, red brown, pale grey			
			1		ASS 1.00-1.25 m							
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
				2.50								
				2.00	ASS 2.50-2.75 m				Clayey SAND fine to coarse grained, brown orange and pale grey, trace fine grained gravel			
					ASS 2.75-3.00 m							Sand
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
				3.50								
				1.00	ASS 3.50-3.75 m				Silty SAND fine to medium grained, grey, trace clay			
					ASS 3.75-4.00 m							
		▽	4		ASS 4.00-4.25 m							Screen PVC
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-0.50					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8		ASS 8.00-1.00 m							
			9									

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GAP gINT FN. F01d RL3

REPORT OF BOREHOLE: GA-ASS118

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612334.3 m 7798969.3 m
SURFACE RL: 4.09 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 20/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	4.09	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.80 m							
				0.80								
				3.29	ASS 0.80-1.00 m				Clayey SAND fine to medium grained, pale grey/yellow red/orange brown			
			1		ASS 1.00-1.25 m							
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
				2.00								
			2	2.09	ASS 2.00-2.25 m				Silty SAND fine to coarse grained, pale grey, trace clay			
					ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
		▽		*3.50*								
				0.59	ASS 3.50-3.75 m				Silty SAND fine to medium grained, grey/green, trace clay			
					ASS 3.75-4.00 m							
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-0.91					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

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GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS119

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612325.7 m 7798640.1 m
SURFACE RL: 4.53 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 21/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	4.53	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
				0.90	ASS 0.75-0.90 m							
			1	3.63	ASS 0.90-1.25 m				Clayey SAND fine to medium grained, pale grey/brown orange			
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
					ASS 2.50-2.70 m							
				2.70								
				1.83	ASS 2.70-3.00 m				Silty SAND fine to coarse grained, pale grey			
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
		20/05/15, SWL		*4.00*								
			4	0.53	ASS 4.00-4.25 m				Silty SAND fine to medium grained, grey/green			
					ASS 4.25-4.60 m							
				4.60								
				-0.07	ASS 4.60-4.75 m				Silty SAND fine to coarse grained, pale grey/brown orange			
					ASS 4.75-5.00 m							
			5	-0.47					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

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GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS120

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612510.2 m 7799022.6 m
SURFACE RL: 3.99 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 21/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	3.99	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-1.00 m							
			1	*1.00* 2.99	ASS 1.00-1.25 m				Clayey SAND fine to medium grained, pale grey/brown orange			
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2	*2.00* 1.99	ASS 2.00-2.25 m				Silty SAND fine to coarse grained, pale grey/brown orange, trace clay			
					ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
				3.50 0.49	ASS 3.50-3.75 m				Silty SAND fine to medium grained, grey/green, trace clay			
		21/05/15, SWL			ASS 3.75-4.00 m							
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-1.01					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS121

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612512.1 m 7798704.1 m
SURFACE RL: 4.26 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 21/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	4.26	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-1.00 m							
			1	*1.00* 3.26	ASS 1.00-1.25 m				Clayey SAND fine to medium grained, pale grey/brown orange			
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
					ASS 2.75-3.10 m							
			3	*3.10* 1.16	ASS 3.10-3.25 m				Silty SAND fine to coarse grained, brown orange/pale grey, trace clay			
					ASS 3.25-3.50 m							
					ASS 3.50-3.70 m							
				3.70 0.56	ASS 3.70-4.00 m				Silty SAND fine to coarse grained, grey/green, trace clay			
		▽	4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
					ASS 4.50-4.75 m							
					ASS 4.75-5.00 m							
			5	-0.74					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS122

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612555.8 m 7798424.2 m
SURFACE RL: 4.52 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 23/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	4.52	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-1.10 m							
			1	*1.10*								
				3.42	ASS 1.10-1.25 m				Clayey SAND fine to coarse grained, brown orange/yellow red			
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
				2.50								
				2.02	ASS 2.50-2.75 m				Silty SAND fine to coarse grained, pale grey/brown orange, trace clay			
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.30 m							
				3.30								
				1.22	ASS 3.30-3.50 m				Silty SAND fine to coarse grained, pale grey			
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
		21/05/15, SWL	4		ASS 4.00-4.25 m							
				4.40	ASS 4.25-4.40 m							
				0.12	ASS 4.40-4.75 m				Silty SAND fine to medium grained, grey/green/brown			
					ASS 4.75-5.00 m							
			5	-0.48					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA-ASS123

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612727.7 m 7798475.2 m
SURFACE RL: 3.87 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 23/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	3.87	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
				0.50								
				3.37	ASS 0.50-0.75 m				Clayey SAND fine to coarse grained, pale grey/brown orange			
					ASS 0.75-1.00 m							
			1		ASS 1.00-1.25 m							
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.60 m							
				2.60								
				1.27	ASS 2.60-2.75 m				Silty SAND fine to coarse grained, pale grey/brown orange, trace clay			
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
				3.50								
				0.37	ASS 3.50-3.75 m				Silty SAND fine to coarse grained, grey/green			
		21/05/15, SWL			ASS 3.75-4.00 m							
			4		ASS 4.00-4.25 m							
					ASS 4.25-4.50 m							
					ASS 4.50-4.70 m							
				4.70								
				-0.83	ASS 4.70-5.00 m				Silty SAND fine to medium grained, grey/yellow brown			
			5	-1.13					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: GA-ASS124

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 613031.8 m 7798280.6 m
SURFACE RL: 4.24 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 23/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	4.24	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			
					ASS 0.25-0.50 m							
					ASS 0.50-0.75 m							
					ASS 0.75-1.00 m							
			1	*1.00* 3.24	ASS 1.00-1.25 m				Clayey SAND fine to coarse grained, pale grey/brown orange			
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
					ASS 2.75-3.00 m							
			3		ASS 3.00-3.20 m							
				3.20 1.04	ASS 3.20-3.50 m				Silty SAND fine to coarse grained, pale grey/brown orange, with some clay			
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							
			4		ASS 4.00-4.25 m							
		23/05/15, SWL			ASS 4.25-4.50 m							
				4.50 -0.26	ASS 4.50-4.75 m				Silty SAND fine to medium grained, grey/green, trace clay			
					ASS 4.75-5.00 m							
			5	-0.76					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: GA-ASS125/MW125

SHEET: 1 OF 1

CLIENT: Department of State Development
PROJECT: Abbot Point Growth Gateway Project
LOCATION: Abbot Point
JOB NO: 1525905

COORDS: 612789.3 m 7798273.6 m
SURFACE RL: 4.38 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 5.00 m

DRILL RIG: Ezi Probe
CONTRACTOR:
LOGGED: OS DATE: 22/5/15
CHECKED: PKS DATE: 17/6/15

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS
			-1									Stick up 0.69m
			0	4.38	ASS 0.00-0.25 m				Silty SAND fine to medium grained, pale brown			Backfill
					ASS 0.25-0.50 m							Bentonite
					ASS 0.50-0.75 m							
					ASS 0.75-0.90 m							
				0.90								
			1	3.48	ASS 1.00-1.25 m				Clayey SAND fine to coarse grained, pale grey/brown orange			
					ASS 1.25-1.50 m							
					ASS 1.50-1.75 m							
					ASS 1.75-2.00 m							
			2		ASS 2.00-2.25 m							
					ASS 2.25-2.50 m							
					ASS 2.50-2.75 m							
				2.75								
				1.63	ASS 2.75-3.00 m				Silty SAND fine to coarse grained, pale grey			Sand
			3		ASS 3.00-3.25 m							
					ASS 3.25-3.50 m							
					ASS 3.50-3.75 m							
					ASS 3.75-4.00 m							Screen PVC
			4	*4.00*								
				0.38	ASS 4.00-4.25 m				Silty SAND fine to medium grained, grey			
					ASS 4.25-4.50 m							
					ASS 4.50-4.80 m							
				4.80								
		22/05/15, SWL		-0.42	ASS 4.80-5.00 m				Silty SAND fine to coarse grained, grey/brown			
			5	-0.62					END OF BOREHOLE @ 5.00 m TARGET DEPTH			
			6									
			7									
			8									
			9									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01d
RL3

APPENDIX C

Field Screening Test Results

pH FIELD TESTS

Method: As per the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998.

Client :	**DSDIP**	**Project Number :**	1525905
Project :	**Abbot Point Growth Gateway**	**Tested By/Date :**	OS & AB 1-3/06/2015
Location :	**Abbot Point**	**Checked By / Date :**	

pH Meter No. :	GAC501 & GAC502	**pH Peroxide :**	5.5
Date pH Meter Calibrated :	1-3/06/2015	**pH Distilled Water :**	6.2

Hole No.	Depth (m)		Soil Type	pH	pH fox	reaction	Potential AASS	PASS Potential high	medium	low
GA_ASS101	0	0.25	silty SAND, brown	6.2	5.2	0				X
	0.25	0.5	silty SAND, brown	6.3	5.4	0				X
	0.5	0.75	silty SAND, brown	6.4	5.6	0				X
	0.75	1	silty SAND, brown	6.3	5.7	0				X
	1	1.25	clayey SAND, brown	6.1	5.8	0				X
	1.25	1.5	clayey SAND, brown	5.9	5.7	0				X
	1.5	1.75	clayey SAND, brown	5.9	5.4	0				X
	1.75	2	clayey SAND, brown	6.1	5.5	0				X
	2	2.25	clayey SAND, brown	6.0	5.5	0				X
	2.25	2.4	clayey SAND, brown	6.1	5.5	0				X
	2.4	2.75	silty SAND, grey	6.1	5.5	0				X
	2.75	3	silty SAND, grey	7.2	5.7	0				X
	3	3.25	silty SAND, grey	7.0	5.7	0				X
	3.25	3.5	silty SAND, grey	7.2	5.7	0				X
	3.5	3.75	silty SAND, grey	7.2	5.9	0				X
	3.75	4	silty SAND, grey	7.4	5.8	0				X
	4	4.25	silty SAND, grey	7.5	6.0	0				X
	4.25	4.5	silty SAND, grey	7.7	5.7	0				X
	4.5	4.75	silty SAND, grey	7.6	6.0	0				X
	4.75	5	silty SAND, grey	7.6	5.9	0				X
GA_ASS102	0	0.25	silty SAND, brown	5.3	4.6	0				X
	0.25	0.5	silty SAND, brown	5.5	5.2	0				X
	0.5	0.7	silty SAND, brown	5.8	5.4	0				X
	0.7	1	clayey SAND, brown	5.3	5.1	0				X
	1	1.25	clayey SAND, brown	5.4	5.1	0				X
	1.25	1.5	clayey SAND, brown	5.4	5.1	0				X
	1.5	1.75	clayey SAND, brown	5.5	5.6	X				X
	1.75	2	clayey SAND, brown	5.9	5.8	X				X
	2	2.25	clayey SAND, brown	5.9	5.7	0				X
	2.25	2.5	clayey SAND, brown	5.9	5.4	0				X
	2.5	2.75	clayey SAND, brown	6.2	5.5	0				X
	2.75	3	clayey SAND, brown	6.2	5.5	0				X
	3	3.25	silty SAND, grey	5.8	5.5	0				X
	3.25	3.5	silty SAND, grey	6.3	5.4	0				X
	3.5	3.8	silty SAND, grey	6.3	5.5	0				X
	3.8	4	silty SAND, grey	6.5	5.8	0				X
	4	4.2	silty SAND, grey	6.4	5.5	0				X
	4.2	4.5	silty SAND, grey	6.0	5.5	0				X
	4.5	4.75	silty SAND, grey	6.1	5.6	0				X
	4.75	5	silty SAND, grey	6.1	5.6	0				X
GA_ASS103	0	0.25	silty SAND, brown	6.4	5.3	0				X
	0.25	0.5	silty SAND, brown	6.4	5.7	0				X
	0.5	0.75	silty SAND, brown	6.4	5.7	0				X
	0.75	1	silty SAND, brown	6.4	5.7	0				X
	1	1.2	silty SAND, brown	6.5	6.2	0				X
	1.2	1.5	clayey SAND, brown	6.5	6.1	X				X
	1.5	1.75	clayey SAND, brown	6.3	5.7	0				X
	1.75	2	clayey SAND, brown	6.2	5.5	0				X
	2	2.25	clayey SAND, brown	6.3	5.7	0				X
	2.25	2.5	clayey SAND, brown	6.0	5.7	0				X
	2.5	2.75	clayey SAND, brown	6.1	5.5	0				X
	2.75	3	clayey SAND, brown	6.0	5.8	0				X
	3	3.25	silty SAND, grey	5.9	5.8	0				X
	3.25	3.5	silty SAND, grey	6.8	5.8	0				X
	3.5	3.75	silty SAND, grey	6.8	5.9	0				X
	3.75	4	silty SAND, grey	7.0	5.7	0				X
	4	4.25	silty SAND, grey	6.7	5.8	0				X
	4.25	4.5	silty SAND, grey	6.8	5.9	0				X
	4.5	4.75	silty SAND, grey	7.2	5.9	0				X
	4.75	5	silty SAND, grey	7.0	5.8	0				X
GA_ASS104	0	0.25	silty SAND, brown	6.0	4.8	0				X
	0.25	0.5	silty SAND, brown	5.9	5.3	0				X
	0.5	0.8	silty SAND, brown	6.1	5.7	0				X
	0.8	1	clayey SAND, brown	6.1	5.3	0				X
	1	1.25	clayey SAND, brown	6.1	5.3	0				X
	1.25	1.5	clayey SAND, brown	6.1	5.3	0				X
	1.5	1.75	clayey SAND, brown	6.4	5.6	0				X
	1.75	2	clayey SAND, brown	6.6	5.7	0				X
	2	2.25	clayey SAND, brown	6.5	5.7	0				X
	2.25	2.5	clayey SAND, brown	6.4	5.5	0				X
	2.5	2.75	clayey SAND, brown	6.5	5.5	0				X
	2.75	3	clayey SAND, brown	6.3	5.6	0				X
	3	3.25	silty SAND, grey	6.6	5.7	0				X
	3.25	3.5	silty SAND, grey	6.7	5.8	0				X
	3.5	3.75	silty SAND, grey	6.7	5.6	0				X
	3.75	4	silty SAND, grey	6.8	5.6	0				X
	4	4.25	silty SAND, grey	6.7	5.8	0				X
	4.25	4.5	silty SAND, grey	6.7	5.7	0				X
	4.5	4.75	silty SAND, grey	6.7	5.6	0				X
	4.75	5	silty SAND, grey	6.6	5.7	0				X

pH FIELD TESTS

Method: As per the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998.

Client :	**DSDIP**	**Project Number :**	1525905
Project :	**Abbot Point Growth Gateway**	**Tested By/Date :**	OS & AB 1-3/06/2015
Location :	**Abbot Point**	**Checked By / Date :**	

pH Meter No. :	GAC501 & GAC502	**pH Peroxide :**	5.5
Date pH Meter Calibrated :	1-3/06/2015	**pH Distilled Water :**	6.2

Hole No.	Depth (m)		Soil Type	pH	pH fox	reaction	Potential AASS	PASS Potential high	medium	low
GA_ASS105	0	0.25	silty SAND, brown	7.3	4.4	XXXX				X
	0.25	0.5	silty SAND, brown	7.3	6.3	XXXX				X
	0.5	0.75	silty SAND, brown	7.0	6.2	XXXX				X
	0.75	1	silty SAND, brown	6.9	5.9	0				X
	1	1.2	silty SAND, brown	6.9	5.9	0				X
	1.2	1.5	clayey SAND, brown	6.6	5.7	0				X
	1.5	1.75	clayey SAND, brown	6.7	5.5	0				X
	1.75	2	clayey SAND, brown	6.8	5.5	0				X
	2	2.3	clayey SAND, brown	6.8	5.5	0				X
	2.3	2.5	silty SAND, brown	6.7	5.5	0				X
	2.5	2.75	silty SAND, brown	6.7	5.5	0				X
	2.75	3	silty SAND, brown	6.7	5.5	0				X
	3	3.3	silty SAND, brown	6.7	5.5	0				X
	3.3	3.5	silty SAND, grey	6.8	5.6	0				X
	3.5	3.75	silty SAND, grey	6.9	5.6	0				X
	3.75	4	silty SAND, grey	7.2	5.7	0				X
	4	4.25	silty SAND, grey	7.3	5.7	0				X
	4.25	4.5	silty SAND, grey	7.5	5.7	0				X
	4.5	4.75	silty SAND, grey	7.3	6.9	0				X
	4.75	5	silty SAND, grey	7.2	5.6	0				X
GA_ASS106	0	0.25	silty SAND, brown	5.9	5.6	0				X
	0.25	0.5	silty SAND, brown	5.8	5.7	XXXX				X
	0.5	0.75	silty SAND, brown	6.1	5.7	0				X
	0.75	1	silty SAND, brown	5.8	5.7	0				X
	1	1.3	sandy SILT, red	5.8	5.4	0				X
	1.3	1.5	clayey SAND, brown	5.7	5.4	0				X
	1.5	1.75	clayey SAND, brown	5.9	5.3	0				X
	1.75	2	clayey SAND, brown	5.9	5.3	0				X
	2	2.25	silty SAND, brown	5.8	5.3	0				X
	2.25	2.4	silty SAND, brown	5.8	5.3	0				X
	2.4	2.75	silty SAND, brown	5.7	5.4	0				X
	2.75	3	silty SAND, brown	6.0	5.4	0				X
	3	3.25	silty SAND, brown	5.9	5.4	0				X
	3.25	3.5	silty SAND, brown	6.0	5.4	0				X
	3.5	3.7	silty SAND, brown	6.1	5.5	0				X
	3.7	4	silty SAND, grey	6.1	5.5	0				X
	4	4.25	silty SAND, grey	6.2	5.4	0				X
	4.25	4.5	silty SAND, grey	6.2	5.9	X				X
	4.5	4.75	silty SAND, grey	6.2	5.7	X				X
	4.75	5	silty SAND, grey	6.2	5.6	0				X
GA_ASS107	0	0.25	silty SAND, brown	6.1	5.1	0				X
	0.25	0.5	silty SAND, brown	6.2	5.4	0				X
	0.5	0.75	silty SAND, brown	6.1	5.5	0				X
	0.75	1	silty SAND, brown	6.1	5.5	0				X
	1	1.25	clayey SAND, brown	6.0	5.7	0				X
	1.25	1.5	clayey SAND, brown	6.1	5.6	0				X
	1.5	1.75	clayey SAND, brown	6.5	5.7	0				X
	1.75	2	clayey SAND, brown	6.4	5.7	0				X
	2	2.25	silty SAND, brown	6.6	5.7	0				X
	2.25	2.5	silty SAND, brown	6.6	5.7	0				X
	2.5	2.7	silty SAND, brown	6.6	5.9	0				X
	2.7	3	silty SAND, brown	6.8	5.8	0				X
	3	3.25	silty SAND, brown	6.2	5.6	0				X
	3.25	3.5	silty SAND, brown	6.6	5.7	0				X
	3.5	3.75	silty SAND, brown	6.6	5.7	0				X
	3.75	4	silty SAND, brown	6.7	5.5	0				X
	4	4.25	silty SAND, brown	6.6	5.5	0				X
	4.25	4.5	silty SAND, brown	6.7	5.8	0				X
	4.5	4.8	silty SAND, brown	6.7	5.7	0				X
	4.8	5	silty SAND, grey	8.6	6.2	0				X
GA_ASS108	0	0.25	silty SAND, brown	5.9	5.4	0				X
	0.25	0.5	silty SAND, brown	5.8	5.4	0				X
	0.5	0.75	silty SAND, brown	5.9	5.3	0				X
	0.75	0.9	silty SAND, brown	6.0	5.3	0				X
	0.9	1.25	clayey SAND, brown	5.9	5.4	0				X
	1.25	1.5	clayey SAND, brown	5.9	5.4	0				X
	1.5	1.75	clayey SAND, brown	6.0	5.6	0				X
	1.75	2	clayey SAND, brown	6.1	5.7	0				X
	2	2.25	clayey SAND, brown	6.1	5.7	0				X
	2.25	2.5	clayey SAND, brown	7.6	5.5	0				X
	2.5	2.75	silty SAND, brown	7.5	5.8	0				X
	2.75	3	silty SAND, brown	7.3	5.7	0				X
	3	3.25	silty SAND, brown	7.0	5.7	0				X
	3.25	3.6	silty SAND, brown	7.3	5.5	0				X
	3.6	3.75	silty SAND, grey	7.2	5.6	0				X
	3.75	4	silty SAND, grey	6.8	5.4	0				X
	4	4.25	silty SAND, grey	8.5	5.8	0				X
	4.25	4.5	silty SAND, grey	7.9	5.9	0				X
	4.5	4.75	silty SAND, grey	9.0	6.1	0				X
	4.75	5	silty SAND, grey	9.0	6.4	0				X

pH FIELD TESTS

Method: As per the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998.

Client :	**DSDIP**	**Project Number :**	1525905
Project :	**Abbot Point Growth Gateway**	**Tested By/Date :**	OS & AB 1-3/06/2015
Location :	**Abbot Point**	**Checked By / Date :**	

pH Meter No. :	GAC501 & GAC502	**pH Peroxide :**	5.5
Date pH Meter Calibrated :	1-3/06/2015	**pH Distilled Water :**	6.2

Hole No.	Depth (m)		Soil Type	pH	pH fox	reaction	Potential AASS	PASS Potential high	medium	low
GA_ASS109	0	0.25	silty SAND, brown	6.1	4.5	X				X
	0.25	0.5	silty SAND, brown	6.2	4.9	X				X
	0.5	0.8	silty SAND, brown	6.0	5.1	0				X
	0.8	1	clayey SAND, brown	6.2	5.3	0				X
	1	1.25	clayey SAND, brown	6.2	5.3	0				X
	1.25	1.5	clayey SAND, brown	6.2	5.2	0				X
	1.5	1.75	clayey SAND, brown	6.4	5.2	0				X
	1.75	2	clayey SAND, brown	6.5	5.3	0				X
	2	2.3	clayey SAND, brown	6.5	5.1	0				X
	2.3	2.5	silty SAND, grey	6.8	5.3	0				X
	2.5	2.75	silty SAND, grey	6.8	5.5	0				X
	2.75	3	silty SAND, grey	6.8	5.6	0				X
	3	3.25	silty SAND, grey	7.1	5.4	0				X
	3.25	3.5	silty SAND, grey	7.2	5.4	0				X
	3.5	3.75	silty SAND, grey	7.3	5.5	0				X
	3.75	4	silty SAND, grey	7.1	5.4	0				X
	4	4.25	silty SAND, grey	7.2	5.4	0				X
	4.25	4.5	silty SAND, grey	7.4	5.6	0				X
	4.5	4.75	silty SAND, grey	7.7	5.6	0				X
	4.75	5	silty SAND, grey	6.9	5.7	0				X
GA_ASS110	0	0.25	silty SAND, brown	6.3	5.1	0				X
	0.25	0.5	silty SAND, brown	6.2	5.7	0				X
	0.5	0.75	silty SAND, brown	6.2	5.6	0				X
	0.75	0.9	silty SAND, brown	6.2	5.7	0				X
	0.9	1.25	clayey SAND, brown	6.1	5.5	0				X
	1.25	1.5	clayey SAND, brown	6.2	5.6	0				X
	1.5	1.75	clayey SAND, brown	6.1	5.5	0				X
	1.75	2	clayey SAND, brown	6.2	5.4	0				X
	2	2.25	clayey SAND, brown	6.2	5.4	0				X
	2.25	2.5	clayey SAND, brown	6.0	5.5	0				X
	2.5	2.75	silty SAND, grey	6.2	5.3	0				X
	2.75	3	silty SAND, grey	6.2	5.4	0				X
	3	3.25	silty SAND, grey	6.5	5.6	0				X
	3.25	3.5	silty SAND, grey	6.2	5.5	0				X
	3.5	3.75	silty SAND, grey	6.2	5.5	0				X
	3.75	4	silty SAND, grey	6.5	5.7	0				X
	4	4.25	silty SAND, grey	6.3	5.7	0				X
	4.25	4.5	silty SAND, grey	6.3	5.6	0				X
	4.5	4.75	silty SAND, grey	6.9	5.7	0				X
	4.75	5	silty SAND, grey	6.3	5.3	0				X
GA_ASS111	0	0.25	silty SAND, brown	6.2	5.5	0				X
	0.25	0.6	silty SAND, brown	5.7	5.5	0				X
	0.6	0.75	clayey SAND, brown	5.7	5.7	0				X
	0.75	1	clayey SAND, brown	5.9	5.6	0				X
	1	1.25	clayey SAND, brown	5.7	5.5	0				X
	1.25	1.5	clayey SAND, brown	5.5	5.4	0				X
	1.5	1.75	clayey SAND, brown	5.9	5.5	0				X
	1.75	2	clayey SAND, brown	6.0	5.3	0				X
	2	2.25	clayey SAND, brown	6.3	5.6	0				X
	2.25	2.5	clayey SAND, brown	5.9	5.5	0				X
	2.5	2.75	silty SAND, brown	6.3	5.0	0				X
	2.75	3	silty SAND, brown	6.2	5.8	0				X
	3	3.25	silty SAND, brown	7.1	5.8	0				X
	3.25	3.5	silty SAND, brown	6.8	5.8	0				X
	3.5	3.75	silty SAND, brown	6.5	5.8	0				X
	3.75	4	silty SAND, brown	6.8	6.0	0				X
	4	4.25	silty SAND, brown	6.4	5.9	0				X
	4.25	4.5	silty SAND, brown	6.4	5.9	0				X
	4.5	4.75	silty SAND, grey	9.0	6.1	0				X
	4.75	5	silty SAND, grey	7.4	5.8	0				X
GA_ASS112	0	0.25	silty SAND, brown	5.9	5.2	0				X
	0.25	0.5	silty SAND, brown	6.3	5.5	0				X
	0.5	0.75	silty SAND, brown	6.2	5.7	0				X
	0.75	1.1	silty SAND, brown	6.5	5.7	0				X
	1.1	1.25	clayey SAND, brown	6.5	5.5	0				X
	1.25	1.5	clayey SAND, brown	6.5	5.4	0				X
	1.5	1.75	clayey SAND, brown	7.0	6.0	X				X
	1.75	2	clayey SAND, brown	7.1	5.7	0				X
	2	2.25	clayey SAND, brown	7.1	5.6	0				X
	2.25	2.5	clayey SAND, brown	7.1	5.7	0				X
	2.5	2.75	silty SAND, grey	7.1	5.6	0				X
	2.75	3	silty SAND, grey	7.1	5.5	0				X
	3	3.25	silty SAND, grey	7.6	5.8	0				X
	3.25	3.5	silty SAND, grey	8.0	5.6	0				X
	3.5	3.75	silty SAND, grey	8.0	5.6	0				X
	3.75	4	silty SAND, grey	8.5	5.5	0				X
	4	4.25	silty SAND, grey	8.5	5.9	0				X
	4.25	4.5	silty SAND, grey	8.0	5.7	0				X
	4.5	4.75	silty SAND, grey	8.4	5.9	0				X
	4.75	5	silty SAND, grey	8.1	5.9	0				X

pH FIELD TESTS

Method: As per the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998.

Client :	**DSDIP**	**Project Number :**	1525905
Project :	**Abbot Point Growth Gateway**	**Tested By/Date :**	OS & AB 1-3/06/2015
Location :	**Abbot Point**	**Checked By / Date :**	

pH Meter No. :	GAC501 & GAC502	**pH Peroxide :**	5.5
Date pH Meter Calibrated :	1-3/06/2015	**pH Distilled Water :**	6.2

Hole No.	Depth (m)		Soil Type	pH	pH fox	reaction	Potential AASS	PASS Potential high	medium	low
GA_ASS113	0	0.25	silty SAND, brown	6.1	5.5	0				X
	0.25	0.5	silty SAND, brown	6.0	6.1	XX				X
	0.5	0.7	silty SAND, brown	6.0	6.4	XXX				X
	0.7	1	clayey SAND, grey	5.9	5.4	0				X
	1	1.25	clayey SAND, grey	5.9	5.3	0				X
	1.25	1.5	clayey SAND, grey	6.0	5.5	0				X
	1.5	1.75	clayey SAND, grey	6.1	5.5	0				X
	1.75	2	clayey SAND, grey	6.3	5.4	0				X
	2	2.25	clayey SAND, grey	6.1	5.3	0				X
	2.25	2.5	clayey SAND, grey	5.8	5.2	0				X
	2.5	2.75	clayey SAND, grey	5.9	5.5	0				X
	2.75	3	clayey SAND, grey	5.9	5.5	0				X
	3	3.25	clayey SAND, grey	5.9	5.6	0				X
	3.25	3.5	clayey SAND, grey	6.3	5.5	0				X
	3.5	3.75	clayey SAND, grey	6.2	5.9	0				X
	3.75	4	clayey SAND, grey	6.3	5.7	0				X
	4	4.25	silty SAND, grey	6.4	5.9	0				X
	4.25	4.5	silty SAND, grey	6.3	5.7	0				X
	4.5	4.75	silty SAND, grey	6.9	6.0	0				X
	4.75	5	silty SAND, grey	6.7	5.6	0				X
GA_ASS114	0	0.25	silty SAND, brown	7.8	5.7	0				X
	0.25	0.5	silty SAND, brown	7.5	5.6	0				X
	0.5	0.75	clayey SAND, brown	7.4	5.6	0				X
	0.75	1	clayey SAND, brown	7.9	5.6	0				X
	1	1.25	clayey SAND, brown	7.9	5.5	0				X
	1.25	1.5	clayey SAND, brown	7.5	5.5	0				X
	1.5	1.75	clayey SAND, brown	7.6	5.6	0				X
	1.75	2	clayey SAND, brown	7.4	5.6	0				X
	2	2.25	clayey SAND, brown	7.4	5.6	0				X
	2.25	2.5	clayey SAND, brown	7.5	5.7	0				X
	2.5	2.75	clayey SAND, brown	7.5	5.6	0				X
	2.75	3	silty SAND, grey	7.2	6.2	0				X
	3	3.25	silty SAND, grey	7.4	6.0	0				X
	3.25	3.5	silty SAND, grey	7.5	6.3	0				X
	3.5	3.75	silty SAND, grey	7.6	6.3	0				X
	3.75	4	silty SAND, grey	7.5	5.9	0				X
	4	4.25	silty SAND, grey	7.3	5.9	0				X
	4.25	4.5	silty SAND, grey	7.5	6.1	0				X
	4.5	4.75	silty SAND, grey	8.3	6.1	0				X
	4.75	5	silty SAND, grey	8.5	5.8	0				X
GA_ASS115	0	0.25	silty SAND, brown	5.9	5.1	0				X
	0.25	0.5	silty SAND, brown	5.8	5.4	0				X
	0.5	0.7	silty SAND, brown	5.9	5.4	0				X
	0.7	1	clayey SAND, brown	5.8	5.7	X				X
	1	1.25	clayey SAND, brown	5.7	5.4	0				X
	1.25	1.5	clayey SAND, brown	6.2	5.4	0				X
	1.5	1.75	clayey SAND, brown	6.7	6.1	0				X
	1.75	2	clayey SAND, brown	6.7	5.7	0				X
	2	2.25	silty SAND, grey	6.5	5.8	0				X
	2.25	2.5	silty SAND, grey	6.7	5.8	0				X
	2.5	2.75	silty SAND, grey	6.8	5.9	0				X
	2.75	3	silty SAND, grey	6.8	5.7	0				X
	3	3.25	silty SAND, grey	6.7	5.6	0				X
	3.25	3.5	silty SAND, grey	6.8	5.7	0				X
	3.5	3.75	silty SAND, grey	7.0	5.5	0				X
	3.75	4	silty SAND, grey	6.9	5.7	0				X
	4	4.25	silty SAND, grey	7.5	5.7	0				X
	4.25	4.5	silty SAND, grey	7.4	6.0	0				X
	4.5	4.75	silty SAND, grey	7.2	5.9	0				X
	4.75	5	silty SAND, grey	6.9	6.0	0				X
GA_ASS116	0	0.25	silty SAND, brown	6.2	4.8	X				X
	0.25	0.5	silty SAND, brown	6.3	4.9	X				X
	0.5	0.7	silty SAND, brown	6.4	5.5	XXX				X
	0.7	1	clayey SAND, brown	6.2	5.5	0				X
	1	1.25	clayey SAND, brown	6.2	5.7	X				X
	1.25	1.5	clayey SAND, brown	6.4	5.5	0				X
	1.5	1.75	clayey SAND, brown	6.4	5.6	0				X
	1.75	2	clayey SAND, brown	6.5	5.6	X				X
	2	2.25	clayey SAND, brown	6.5	5.7	0				X
	2.25	2.5	clayey SAND, brown	6.5	5.6	0				X
	2.5	2.75	silty SAND, grey	7.5	6.9	XXX				X
	2.75	3	silty SAND, grey	7.7	6.2	XXX				X
	3	3.25	silty SAND, grey	7.7	5.5	0				X
	3.25	3.5	silty SAND, grey	7.8	5.6	0				X
	3.5	3.75	silty SAND, grey	7.8	5.6	0				X
	3.75	4	silty SAND, grey	7.9	5.9	X				X
	4	4.25	silty SAND, grey	7.6	5.5	0				X
	4.25	4.5	silty SAND, grey	7.7	6.1	0				X
	4.5	4.75	silty SAND, grey	8.2	5.9	0				X
	4.75	5	silty SAND, grey	8.7	5.8	0				X

pH FIELD TESTS

Method: As per the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998.

Client :	**DSDIP**	**Project Number :**	1525905
Project :	**Abbot Point Growth Gateway**	**Tested By/Date :**	OS & AB 1-3/06/2015
Location :	**Abbot Point**	**Checked By / Date :**	

pH Meter No. :	GAC501 & GAC502	**pH Peroxide :**	5.5
Date pH Meter Calibrated :	1-3/06/2015	**pH Distilled Water :**	6.2

Hole No.	Depth (m)		Soil Type	pH	pH fox	reaction	Potential AASS	PASS Potential high	medium	low
GA_ASS117	0	0.25	silty SAND, brown	6.4	5.4	0				X
	0.25	0.5	silty SAND, brown	6.3	5.4	0				X
	0.5	0.8	silty SAND, brown	6.3	5.7	0				X
	0.8	1	clayey SAND, brown	6.3	5.5	0				X
	1	1.25	clayey SAND, brown	6.1	5.5	0				X
	1.25	1.5	clayey SAND, brown	6.0	5.4	0				X
	1.5	1.75	clayey SAND, brown	6.5	5.4	0				X
	1.75	2	clayey SAND, brown	6.8	5.5	0				X
	2	2.25	clayey SAND, brown	7.1	5.5	0				X
	2.25	2.5	clayey SAND, brown	7.1	5.5	0				X
	2.5	2.75	clayey SAND, brown	7.1	5.5	0				X
	2.75	3	clayey SAND, brown	7.1	5.5	0				X
	3	3.25	clayey SAND, brown	7.6	5.6	0				X
	3.25	3.5	clayey SAND, brown	7.5	5.5	0				X
	3.5	3.75	silty SAND, grey	7.5	5.5	0				X
	3.75	4	silty SAND, grey	7.0	5.6	0				X
	4	4.25	silty SAND, grey	7.4	5.6	0				X
	4.25	4.5	silty SAND, grey	7.5	5.6	0				X
	4.5	4.75	silty SAND, grey	7.3	5.6	0				X
	4.75	5	silty SAND, grey	7.4	5.6	0				X
GA_ASS118	0	0.25	silty SAND, brown	6.0	5.2	0				X
	0.25	0.5	silty SAND, brown	5.9	5.6	0				X
	0.5	0.8	silty SAND, brown	6.0	5.5	0				X
	0.8	1	clayey SAND, brown	5.9	5.3	0				X
	1	1.25	clayey SAND, brown	5.5	5.3	0				X
	1.25	1.5	clayey SAND, brown	5.7	5.4	0				X
	1.5	1.75	clayey SAND, brown	5.9	5.5	0				X
	1.75	2	clayey SAND, brown	6.3	5.2	0				X
	2	2.25	silty SAND, grey	6.3	5.3	0				X
	2.25	2.5	silty SAND, grey	6.2	5.1	0				X
	2.5	2.75	silty SAND, grey	6.2	5.7	0				X
	2.75	3	silty SAND, grey	6.1	5.4	0				X
	3	3.25	silty SAND, grey	6.6	5.5	0				X
	3.25	3.5	silty SAND, grey	6.1	5.5	0				X
	3.5	3.75	silty SAND, grey	6.2	5.5	0				X
	3.75	4	silty SAND, grey	6.4	5.3	0				X
	4	4.25	silty SAND, grey	6.2	5.5	0				X
	4.25	4.5	silty SAND, grey	6.4	5.5	0				X
	4.5	4.75	silty SAND, grey	6.4	5.6	0				X
	4.75	5	silty SAND, grey	6.4	5.2	0				X
GA_ASS119	0	0.25	silty SAND, brown	6.0	5.3	0				X
	0.25	0.5	silty SAND, brown	5.8	5.3	0				X
	0.5	0.75	silty SAND, brown	5.8	5.3	0				X
	0.75	0.9	silty SAND, brown	5.6	5.6	0				X
	0.9	1.25	clayey SAND, brown	5.8	5.5	0				X
	1.25	1.5	clayey SAND, brown	5.8	5.5	0				X
	1.5	1.75	clayey SAND, brown	5.9	5.7	XX				X
	1.75	2	clayey SAND, brown	6.0	5.7	XX				X
	2	2.25	clayey SAND, brown	6.0	6.5	XXX				X
	2.25	2.5	clayey SAND, brown	6.2	5.5	0				X
	2.5	2.7	clayey SAND, brown	6.1	5.4	0				X
	2.7	3	silty SAND, brown	6.5	5.7	0				X
	3	3.25	silty SAND, brown	6.5	5.3	0				X
	3.25	3.5	silty SAND, brown	6.8	5.9	0				X
	3.5	3.75	silty SAND, brown	7.0	5.7	0				X
	3.75	4	silty SAND, brown	7.0	5.7	0				X
	4	4.25	silty SAND, grey	7.1	5.8	0				X
	4.25	4.5	silty SAND, grey	7.2	5.8	0				X
	4.5	4.75	silty SAND, grey	7.1	5.8	0				X
	4.75	5	silty SAND, grey	6.9	5.7	0				X
GA_ASS120	0	0.25	silty SAND, brown	6.5	4.6	0				X
	0.25	0.5	silty SAND, brown	6.4	5.2	0				X
	0.5	0.75	silty SAND, brown	6.3	5.4	0				X
	0.75	1	silty SAND, brown	6.5	5.6	0				X
	1	1.25	clayey SAND, brown	6.3	5.2	0				X
	1.25	1.5	clayey SAND, brown	6.4	5.2	0				X
	1.5	1.75	clayey SAND, brown	7.0	5.5	0				X
	1.75	2	clayey SAND, brown	7.4	5.5	0				X
	2	2.25	silty SAND, brown	8.6	5.6	0				X
	2.25	2.5	silty SAND, brown	8.6	5.8	0				X
	2.5	2.75	silty SAND, brown	8.5	5.5	0				X
	2.75	3	silty SAND, brown	8.8	5.5	0				X
	3	3.25	silty SAND, brown	7.8	5.3	0				X
	3.25	3.5	silty SAND, brown	7.8	5.3	0				X
	3.5	3.75	silty SAND, grey	6.9	5.7	0				X
	3.75	4	silty SAND, grey	7.6	5.8	0				X
	4	4.25	silty SAND, grey	7.8	5.5	0				X
	4.25	4.5	silty SAND, grey	7.5	5.6	0				X
	4.5	4.75	silty SAND, grey	7.8	5.8	0				X
	4.75	5	silty SAND, grey	7.9	5.8	0				X

pH FIELD TESTS

Method: As per the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998.

Client :	**DSDIP**	**Project Number :**	1525905
Project :	**Abbot Point Growth Gateway**	**Tested By/Date :**	OS & AB 1-3/06/2015
Location :	**Abbot Point**	**Checked By / Date :**	

pH Meter No. :	GAC501 & GAC502	**pH Peroxide :**	5.5
Date pH Meter Calibrated :	1-3/06/2015	**pH Distilled Water :**	6.2

Hole No.	Depth (m)		Soil Type	pH	pH fox	reaction	Potential AASS	PASS Potential high	medium	low
GA_ASS121	0	0.25	silty SAND, brown	6.3	5.5	0				X
	0.25	0.5	silty SAND, brown	5.9	5.3	0				X
	0.5	0.75	silty SAND, brown	5.9	5.2	0				X
	0.75	1	silty SAND, brown	5.9	5.2	0				X
	1	1.25	clayey SAND, brown	5.8	5.4	0				X
	1.25	1.5	clayey SAND, brown	5.9	5.4	0				X
	1.5	1.75	clayey SAND, brown	6.0	5.5	0				X
	1.75	2	clayey SAND, brown	5.9	5.3	0				X
	2	2.25	clayey SAND, brown	6.4	5.4	0				X
	2.25	2.5	clayey SAND, brown	6.0	5.3	0				X
	2.5	2.75	clayey SAND, brown	5.9	5.0	0				X
	2.75	3	clayey SAND, brown	6.0	5.4	0				X
	3	3.1	clayey SAND, brown	5.9	5.3	0				X
	3.1	3.5	silty SAND, brown	6.0	5.5	0				X
	3.5	3.7	silty SAND, brown	6.0	5.4	0				X
	3.7	4	silty SAND, grey	6.5	5.0	0				X
	4	4.25	silty SAND, grey	6.3	5.5	0				X
	4.25	4.5	silty SAND, grey	6.4	5.5	0				X
	4.5	4.75	silty SAND, grey	6.2	5.6	0				X
	4.75	5	silty SAND, grey	6.2	5.4	0				X
GA_ASS122	0	0.25	silty SAND, brown	6.3	5.5	0				X
	0.25	0.5	silty SAND, brown	5.9	5.4	0				X
	0.5	0.75	silty SAND, brown	5.9	5.3	0				X
	0.75	1.1	silty SAND, brown	5.9	5.6	0				X
	1.1	1.25	clayey SAND, brown	5.8	5.5	0				X
	1.25	1.5	clayey SAND, brown	6.2	5.4	0				X
	1.5	1.75	clayey SAND, brown	6.1	5.4	0				X
	1.75	2	clayey SAND, brown	6.1	5.6	0				X
	2	2.25	clayey SAND, brown	6.2	5.7	0				X
	2.25	2.5	clayey SAND, brown	6.2	5.6	0				X
	2.5	2.75	silty SAND, brown	6.0	5.3	0				X
	2.75	3	silty SAND, brown	6.2	5.6	0				X
	3	3.3	silty SAND, brown	6.6	5.3	0				X
	3.3	3.5	silty SAND, grey	6.5	5.5	0				X
	3.5	3.75	silty SAND, grey	6.7	6.1	0				X
	3.75	4	silty SAND, grey	6.6	5.4	0				X
	4	4.25	silty SAND, grey	6.7	5.6	0				X
	4.25	4.5	silty SAND, grey	6.8	5.6	0				X
	4.5	4.75	silty SAND, grey	6.8	5.7	0				X
	4.75	5	silty SAND, grey	6.8	5.7	0				X
GA_ASS123	0	0.25	silty SAND, brown	5.7	5.6	0				X
	0.25	0.5	silty SAND, brown	5.8	5.4	0				X
	0.5	0.75	clayey SAND, brown	5.7	5.6	0				X
	0.75	1	clayey SAND, brown	6.0	5.5	0				X
	1	1.25	clayey SAND, brown	5.9	5.6	0				X
	1.25	1.5	clayey SAND, brown	6.0	5.5	0				X
	1.5	1.75	clayey SAND, brown	5.9	5.6	0				X
	1.75	2	clayey SAND, brown	6.1	5.5	0				X
	2	2.25	clayey SAND, brown	6.2	5.3	0				X
	2.25	2.6	clayey SAND, brown	6.6	5.5	0				X
	2.6	2.75	silty SAND, brown	6.6	5.6	0				X
	2.75	3	silty SAND, brown	6.4	5.4	0				X
	3	3.25	silty SAND, brown	7.3	8.1	0				X
	3.25	3.5	silty SAND, brown	7.9	5.5	XXXX				X
	3.5	3.75	silty SAND, grey	8.7	5.8	0				X
	3.75	4	silty SAND, grey	8.7	5.7	0				X
	4	4.25	silty SAND, grey	9.0	5.9	0				X
	4.25	4.5	silty SAND, grey	8.9	6.0	0				X
	4.5	4.75	silty SAND, grey	8.7	6.0	0				X
	4.75	5	silty SAND, grey	8.7	6.4	0				X
GA_ASS124	0	0.25	silty SAND, brown	6.8	4.7	X				X
	0.25	0.5	silty SAND, brown	6.6	5.2	X				X
	0.5	0.75	silty SAND, brown	6.7	5.3	X				X
	0.75	1	silty SAND, brown	6.6	5.8	X				X
	1	1.25	clayey SAND, brown	6.5	5.7	X				X
	1.25	1.5	clayey SAND, brown	6.8	5.4	X				X
	1.5	1.75	clayey SAND, brown	6.8	6.6	XXXX				X
	1.75	2	clayey SAND, brown	6.8	6.3	XXXX				X
	2	2.25	clayey SAND, brown	6.8	6.7	XXXX				X
	2.25	2.5	clayey SAND, brown	6.9	6.8	X				X
	2.5	2.75	clayey SAND, brown	6.9	5.5	X				X
	2.75	3	clayey SAND, brown	7.1	6.7	XXXX				X
	3	3.2	clayey SAND, brown	7.1	6.7	XXXX				X
	3.2	3.5	silty SAND, brown	6.9	5.5	X				X
	3.5	3.75	silty SAND, brown	7.2	6.7	XXXX				X
	3.75	4	silty SAND, brown	7.4	5.4	X				X
	4	4.25	silty SAND, brown	7.7	5.6	0				X
	4.25	4.5	silty SAND, brown	7.1	5.7	0				X
	4.5	4.75	silty SAND, grey	9.3	6.2	0				X
	4.75	5	silty SAND, grey	8.2	6.4	0				X

pH FIELD TESTS

Method: As per the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998.

Client :	**DSDIP**	**Project Number :**	1525905
Project :	**Abbot Point Growth Gateway**	**Tested By/Date :**	OS & AB 1-3/06/2015
Location :	**Abbot Point**	**Checked By / Date :**	

pH Meter No. :	GAC501 & GAC502	**pH Peroxide :**	5.5
Date pH Meter Calibrated :	1-3/06/2015	**pH Distilled Water :**	6.2

Hole No.	Depth (m)		Soil Type	pH	pH fox	reaction	Potential AASS	PASS Potential high	medium	low
GA_ASS125	0	0.25	silty SAND, brown	6.2	5.1	0				X
	0.25	0.5	silty SAND, brown	6.1	5.2	0				X
	0.5	0.75	silty SAND, brown	6.0	5.4	0				X
	0.75	0.9	silty SAND, brown	6.0	5.3	0				X
	0.9	1.25	clayey SAND, brown	5.9	5.3	0				X
	1.25	1.5	clayey SAND, brown	5.7	5.3	0				X
	1.5	1.75	clayey SAND, brown	6.0	5.5	0				X
	1.75	2	clayey SAND, brown	6.0	5.2	0				X
	2	2.25	clayey SAND, brown	6.0	5.2	0				X
	2.25	2.5	clayey SAND, brown	5.9	5.3	0				X
	2.5	2.75	clayey SAND, brown	5.9	5.2	0				X
	2.75	3	silty SAND, grey	6.3	5.5	0				X
	3	3.25	silty SAND, grey	6.7	5.6	0				X
	3.25	3.5	silty SAND, grey	6.7	5.4	0				X
	3.5	3.75	silty SAND, grey	6.6	5.4	0				X
	3.75	4	silty SAND, grey	7.2	5.8	0				X
	4	4.25	silty SAND, grey	7.2	5.7	0				X
	4.25	4.5	silty SAND, grey	7.1	5.6	0				X
	4.5	4.8	silty SAND, grey	7.0	5.7	0				X
	4.8	5	silty SAND, grey	6.7	5.4	0				X

APPENDIX D

Laboratory Certificates

ANALYTICAL REPORT

WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Oscar Solvander	Manager	Jon Dicker
Client	GOLDER ASSOCIATES PTY LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 5823 216 DRAPER ST CAIRNS QLD 4870	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 7 4054 8200	Telephone	+61 07 4035 5111
Facsimile	+61 7 4054 8201	Facsimile	+61 07 4035 5122
Email	OSolvander@golder.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**1525905 - Bowen**	SGS Reference	**CE115452 R0**
Order Number	(Not specified)	Report Number	0000025634
Samples	6	Date Reported	01 Jun 2015
Date Started	27 May 2015	Date Received	27 May 2015

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

SIGNATORIES

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Maristela Ganzan
Metals Team Leader

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE115452.001 Water 24 May 2015 GA-ASS107	CE115452.002 Water 24 May 2015 GA-ASS109	CE115452.003 Water 24 May 2015 GA-ASS113	CE115452.004 Water 24 May 2015 GA-ASS125
pH in water Method: AN101 Tested: 27/5/2015							
pH**	pH Units	0.1		**7.3**	**6.9**	**7.0**	**7.1**
Alkalinity Method: ME-AU-ENVAN135 Tested: 27/5/2015							
Bicarbonate Alkalinity as HCO3	mg/L	5		**180**	**100**	**440**	**370**
Carbonate Alkalinity as CO3	mg/L	5		<5	<5	<5	<5
Hydroxide Alkalinity as OH	mg/L	5		<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5		**150**	**84**	**360**	**300**
Acidity and Free CO2 Method: AN140 Tested: 28/5/2015							
Acidity to pH 8.3	mg CaCO3/L	5		<5	<5	<5	<5
Chloride by Discrete Analyser in Water Method: AN274 Tested: 27/5/2015							
Chloride, Cl	mg/L	1		**120**	**5000**	**5000**	**86**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321 Tested: 28/5/2015							
Aluminium, Al	mg/L	0.02		**0.83**	**4.7**	**0.24**	**13**
Iron, Fe	mg/L	0.02		**0.64**	**1.9**	**0.22**	**20**
Sulphur as Sulphate, SO4	mg/L	0.5		**31**	**29**	**510**	**42**
Sulphur, S	mg/L	0.1		**10**	**9.6**	**170**	**14**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115452.005 Water 24 May 2015 MW01	CE115452.006 Water 24 May 2015 MW03
pH in water Method: AN101 Tested: 27/5/2015				
pH**	pH Units	0.1	**7.1**	**7.4**
Alkalinity Method: ME-AU-ENVAN135 Tested: 27/5/2015				
Bicarbonate Alkalinity as HCO3	mg/L	5	**230**	**300**
Carbonate Alkalinity as CO3	mg/L	5	<5	<5
Hydroxide Alkalinity as OH	mg/L	5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	**190**	**250**
Acidity and Free CO2 Method: AN140 Tested: 28/5/2015				
Acidity to pH 8.3	mg CaCO3/L	5	<5	<5
Chloride by Discrete Analyser in Water Method: AN274 Tested: 27/5/2015				
Chloride, Cl	mg/L	1	**260**	**2500**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321 Tested: 28/5/2015				
Aluminium, Al	mg/L	0.02	<0.02	<0.02
Iron, Fe	mg/L	0.02	**0.07**	<0.02
Sulphur as Sulphate, SO4	mg/L	0.5	**34**	**77**
Sulphur, S	mg/L	0.1	**11**	**26**

QC SUMMARY

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

Acidity and Free CO2 Method: ME-(AU)-[ENV]AN140

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Acidity to pH 8.3	LB026762	mg CaCO3/L	5	<5	0%

Alkalinity Method: ME-AU-ENVAN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Bicarbonate Alkalinity as HCO3	LB026723	mg/L	5	<5		
Carbonate Alkalinity as CO3	LB026723	mg/L	5	<5		
Hydroxide Alkalinity as OH	LB026723	mg/L	5	<5		
Total Alkalinity as CaCO3	LB026723	mg/L	5	<5	0%	105%

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride, Cl	LB026710	mg/L	1	<1	0 - 1%	106%

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

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB026736	mg/L	0.02	<0.02	0%	104%	110%
Iron, Fe	LB026736	mg/L	0.02	<0.02	0%	112%	114%
Sulphur as Sulphate, SO4	LB026736	mg/L	0.5	<0.5	0%	NA	
Sulphur, S	LB026736	mg/L	0.1	<0.1	0%	103%	

pH in water Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH**	LB026724	pH Units	0.1	5.6	3%	100%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN135	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.
AN140	Acidity by Tritration: The water sample is titrated with sodium hydroxide to designated pH end point. In a sample containing only carbon dioxide, bicarbonates and carbonates, titration to pH 8.3 at 25°C corresponds to stoichiometric neutralisation of carbonic acid to bicarbonate. Method reference APHA 2310 B.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
^	Performed by outside laboratory.	-	The sample was not analysed for this analyte
		NVL	Not Validated

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

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

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

SAMPLE RECEIPT ADVICE

CE115452

CLIENT DETAILS

Contact	Oscar Solvander
Client	GOLDER ASSOCIATES PTY LTD
Address	PO BOX 5823 216 DRAPER ST CAIRNS QLD 4870
Telephone	+61 7 4054 8200
Facsimile	+61 7 4054 8201
Email	OSolvander@golder.com.au
Project	**1525905 - Bowen**
Order Number	(Not specified)
Samples	6

LABORATORY DETAILS

Manager	Jon Dicker
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Wed 27/5/2015
Report Due	Wed 3/6/2015
SGS Reference	**CE115452**

SUBMISSION DETAILS

This is to confirm that 6 samples were received on Wednesday 27/5/2015. Results are expected to be ready by Wednesday 3/6/2015. Please quote SGS reference CE115452 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	6 Waters	Type of documentation received	COC
Date documentation received	27/5/2015	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Chilled
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	1

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

SAMPLE RECEIPT ADVICE

CE115452

CLIENT DETAILS

Client GOLDER ASSOCIATES PTY LTD

Project 1525905 - Bowen

SUMMARY OF ANALYSIS

No.	Sample ID	Acidity and Free CO2	Alkalinity	Chloride by Discrete Analyser in Water	Metals in Water (Dissolved) by ICPOES	pH in water
001	GA-ASS107	1	4	1	4	1
002	GA-ASS109	1	4	1	4	1
003	GA-ASS113	1	4	1	4	1
004	GA-ASS125	1	4	1	4	1
005	MW01	1	4	1	4	1
006	MW03	1	4	1	4	1

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

CHAIN OF CUSTODY/ANALYSIS REQUEST

Golder Associates

☐ **Townsville Location**
Level 1, 25 Sturt Street, TOWNSVILLE QLD 4810
Phone: (07) 4727 1700
Fax: (07) 4724 0511

☐ **Cairns Location**
216 Draper Street, CAIRNS QLD 4810
Phone: (07) 4054 8200
Fax: (07) 4054 8201

Project No.: 1525905
Location: Bowen
Golder Order No.:
Quote: ***SGS/Golder National Master Services Agreement***
Primary Contact: Oscar Solvander

CE115452

Sample Location	Sample No/Depth	No. of Jars/Bags	Sample Date	Dissolved Fe, Al	Chloride, ~~Fluoride~~, Sulphate	Total Acidity, Total Alkalinity				
GA-ASS107		3	24/05/15	X	X	X				
GA-ASS109		3	24/05/15	X	X	X				
GA-ASS113		3	24/05/15	X	X	X				
GA-ASS125		3	24/05/15	X	X	X				
MW01		3	24/05/15	X	X	X				
MW03		3	24/05/15	X	X	X				
TEST REFERENCE NO.										
TURN AROUND TIME										

bx500mlP
RXAW.

TO BE COMPLETED BY LABORATORY

Samples Received In:
(Please tick appropriate box)

Appropriate Containers ☐

Pretreated Containers ☐

Chilled State ☐

Other *(Comment)* ☐

PLEASE SEND RESULTS TO:
Name: Oscar Solvander
Email: osolvander@golder.com.au
Name: Paul Scells
Email: pscells@golder.com.au

PLEASE SEND INVOICE TO:
Name: Accounts Department
Email: auaccountspayable@golder.com.au

Special Instructions: *Nominated turn-around time from time of submission to SGS.* ***Penalty Rates to apply for late reports in accordance with National Master Services Agreement.***

Special Instructions: **Please Supply in ESDAT Format and DQO Report.**

Relinquished: Oscar Solvander Date: 26/05/2015 Received by: Date: 26/5/15

Organisation: Golder Associates Time: Organisation: Time: 16:00

ANALYTICAL REPORT

WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Oscar Solvander	Manager	Jon Dicker
Client	GOLDER ASSOCIATES PTY LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 5823 216 DRAPER ST CAIRNS QLD 4870	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 7 4054 8200	Telephone	+61 07 4035 5111
Facsimile	+61 7 4054 8201	Facsimile	+61 07 4035 5122
Email	OSolvander@golder.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**1525905 Bowen**	SGS Reference	**CE115596 R0**
Order Number	**Q001965**	Report Number	0000025822
Samples	50	Date Reported	11 Jun 2015
Date Started	11 Jun 2015	Date Received	05 Jun 2015

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

SIGNATORIES

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.001 Soil 23 May 2015 GA-ASS101_3.0-3.5m	CE115596.002 Soil 23 May 2015 GA-ASS101_4.0-4.5m	CE115596.003 Soil 22 May 2015 GA-ASS102_2.5-3.0m	CE115596.004 Soil 22 May 2015 GA-ASS102_4.0-4.5m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**14.5**	**13.0**	**8.0**	**14.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**6.2**	**6.3**	**6.2**	**6.0**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.005 Soil 22 May 2015 GA-ASS103_3.25-3.75m	CE115596.006 Soil 22 May 2015 GA-ASS103_4.5-5.0m	CE115596.007 Soil 21 May 2015 GA-ASS104_2.5-3.0m	CE115596.008 Soil 21 May 2015 GA-ASS104_4.5-5.0m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**13.0**	**13.0**	**7.0**	**15.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**6.2**	**6.3**	**6.0**	**6.3**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.009 Soil 23 May 2015 GA-ASS105_2.3-2.75m	CE115596.010 Soil 23 May 2015 GA-ASS105_3.3-3.75m	CE115596.011 Soil 23 May 2015 GA-ASS106_2.4-3.0m	CE115596.012 Soil 23 May 2015 GA-ASS106_3.7-4.0m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**6.0**	**2.0**	**4.0**	**4.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**5.7**	**6.2**	**6.1**	**6.2**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.013 Soil 21 May 2015 GA-ASS107_2.5-3.0m	CE115596.014 Soil 21 May 2015 GA-ASS107_3.5-4.0m	CE115596.015 Soil 22 May 2015 GA-ASS108_2.5-3.0m	CE115596.016 Soil 22 May 2015 GA-ASS108_4.2-4.75m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**9.0**	**12.0**	**8.0**	**15.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**6.1**	**5.9**	**6.2**	**6.6**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.017 Soil 19 May 2015 GA-ASS109_1.75-2.3m	CE115596.018 Soil 19 May 2015 GA-ASS109_3.25-3.75m	CE115596.019 Soil 20 May 2015 GA-ASS110_2.0-2.5m	CE115596.020 Soil 20 May 2015 GA-ASS110_3.5-4.0m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**6.0**	**9.0**	**20.0**	**15.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**5.7**	**6.0**	**5.8**	**5.9**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.021 Soil 20 May 2015 GA-ASS111_2.25-2.75m	CE115596.022 Soil 20 May 2015 GA-ASS111_4.5-5.0m	CE115596.023 Soil 20 May 2015 GA-ASS112_2.0-2.5m	CE115596.024 Soil 20 May 2015 GA-ASS112_3.5-4.0m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**3.0**	**16.0**	**6.0**	**16.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**6.1**	**6.3**	**6.0**	**6.1**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.025 Soil 19 May 2015 GA-ASS113_3.5-4.0m	CE115596.026 Soil 19 May 2015 GA-ASS113_4.5-5.0m	CE115596.027 Soil 22 May 2015 GA-ASS114_1.0-1.5m	CE115596.028 Soil 22 May 2015 GA-ASS114_2.75-3.25m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**10.0**	**16.0**	**8.0**	**17.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**6.3**	**6.8**	**5.8**	**6.2**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.029 Soil 20 May 2015 GA-ASS115_1.5-2.0m	CE115596.030 Soil 20 May 2015 GA-ASS115_2.75-3.25m	CE115596.031 Soil 20 May 2015 GA-ASS116_2.0-2.5m	CE115596.032 Soil 20 May 2015 GA-ASS116_4.0-4.5m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**30.0**	**14.0**	**5.0**	**17.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**6.6**	**6.9**	**6.0**	**6.1**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.033 Soil 19 May 2015 GA-ASS117_2.5-3.0m	CE115596.034 Soil 19 May 2015 GA-ASS117_3.5-4.0m	CE115596.035 Soil 20 May 2015 GA-ASS118_1.5-2.0m	CE115596.036 Soil 20 May 2015 GA-ASS118_3.0-3.5m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**9.0**	**17.0**	**13.0**	**12.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**5.9**	**5.8**	**6.0**	**5.9**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.037 Soil 21 May 2015 GA-ASS119_0.9-1.5m	CE115596.038 Soil 21 May 2015 GA-ASS119_4.0-4.6m	CE115596.039 Soil 21 May 2015 GA-ASS120_2.0-2.5m	CE115596.040 Soil 21 May 2015 GA-ASS120_3.5-4.0m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**8.0**	**10.0**	**14.0**	**18.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**5.8**	**6.0**	**6.3**	**6.4**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.041 Soil 21 May 2015 GA-ASS121_3.0-3.5m	CE115596.042 Soil 21 May 2015 GA-ASS121_3.7-4.25m	CE115596.043 Soil 23 May 2015 GA-ASS122_2.0-2.5m	CE115596.044 Soil 23 May 2015 GA-ASS122_3.75-4.25m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**6.0**	**14.0**	**6.0**	**12.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**6.0**	**5.9**	**5.8**	**5.9**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.045 Soil 23 May 2015 GA-ASS123_3.25-3.5m	CE115596.046 Soil 23 May 2015 GA-ASS123_3.75-4.25m	CE115596.047 Soil 23 May 2015 GA-ASS124_1.5-2.0m	CE115596.048 Soil 23 May 2015 GA-ASS124_2.75-3.2m
Moisture Content Method: AN002 Tested: 5/6/2015						
% Moisture	%	0.5	**8.0**	**12.0**	**4.0**	**6.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015						
pH KCl	pH Units	-	**6.5**	**6.6**	**6.0**	**6.1**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE115596.049 Soil 22 May 2015 GA-ASS125_2.25-2.75m	CE115596.050 Soil 22 May 2015 GA-ASS125_3.5-4.0m
Moisture Content Method: AN002 Tested: 5/6/2015				
% Moisture	%	0.5	**7.0**	**12.0**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 10/6/2015				
pH KCl	pH Units	-	**5.7**	**5.9**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 9/6/2015				
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5

QC SUMMARY

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

Chromium Reducible Sulphur (CRS) **Method: ME-(AU)-[ENV]AN217**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chromium Reducible Sulphur (Scr)	LB027026	%	0.005	<0.005	0%	89 - 101%
Chromium Reducible Sulphur (Scr)	LB027026	moles H+/T	5	<5		

TAA (Titratable Actual Acidity) **Method: ME-(AU)-[ENV]AN219**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH KCl	LB027035	pH Units	-	6.0	0 - 2%	103 - 106%
Titratable Actual Acidity	LB027035	kg H2SO4/T	0.25	<0.25	0%	NA
Titratable Actual Acidity (TAA) moles H+/tonne	LB027035	moles H+/T	5	<5	0%	92%
Titratable Actual Acidity (TAA) S%w/w	LB027035	%w/w S	0.01	<0.01	0%	92%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN004	Soils, sediments and sludges are pulverised using an LM2 ringmill. The dry sample is pulverised to a particle size of >90% passing through a -75µm sieve.
AN217	Dried pulped sample is mixed with acid and chromium metal in a rapid distillation unit to produce hydrogen sulphide (H2S) which is collected and titrated with iodine (I2(aq)) to measure SCR.
AN219	Dried pulped sample is extracted for 4 hours in a 1 M KCl solution. The ratio of sample to solution is 1:40. The extract is titrated for acidity. Calcium, magnesium, and sulphur are determined by ICP-AES.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
^	Performed by outside laboratory.	-	The sample was not analysed for this analyte
		NVL	Not Validated

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

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

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au/~/media/Local/Australia/Documents/ Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

SAMPLE RECEIPT ADVICE

CE115596

CLIENT DETAILS

Contact	Oscar Solvander
Client	GOLDER ASSOCIATES PTY LTD
Address	PO BOX 5823 216 DRAPER ST CAIRNS QLD 4870
Telephone	+61 7 4054 8200
Facsimile	+61 7 4054 8201
Email	OSolvander@golder.com.au
Project	**1525905 Bowen**
Order Number	**Q001965**
Samples	50

LABORATORY DETAILS

Manager	Jon Dicker
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Fri 5/6/2015
Report Due	Fri 12/6/2015
SGS Reference	**CE115596**

SUBMISSION DETAILS

This is to confirm that 50 samples were received on Friday 5/6/2015. Results are expected to be ready by Friday 12/6/2015. Please quote SGS reference CE115596 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	100 soils	Type of documentation received	COC
Date documentation received	5/6/2015	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Chilled
Sample container provider	SGS	Turnaround time requested	48hrs
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	na	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	1

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

Samples rec'd 4.40pm Thursday - deemed received the next day (friday)

98 soils composited to 50 samples
Samples frozen between sampling and delivery at lab

Paul S - confirmed by email - due date Friday 12/06

SAMPLE RECEIPT ADVICE

CE115596

CLIENT DETAILS

Client GOLDER ASSOCIATES PTY LTD

Project 1525905 Bowen

SUMMARY OF ANALYSIS

No.	Sample ID	Acid Neutralising Capacity (ANC)	Chromium Reducible Sulphur (CRS)	HCl Extractable S, Ca and Mg in Soil ICP OES	Moisture Content	TAA (Titratable Actual Acidity)
001	GA-ASS101_3.0-3.5m	4	2	1	1	5
002	GA-ASS101_4.0-4.5m	4	2	1	1	5
003	GA-ASS102_2.5-3.0m	4	2	1	1	5
004	GA-ASS102_4.0-4.5m	4	2	1	1	5
005	GA-ASS103_3.25-3.75m	4	2	1	1	5
006	GA-ASS103_4.5-5.0m	4	2	1	1	5
007	GA-ASS104_2.5-3.0m	4	2	1	1	5
008	GA-ASS104_4.5-5.0m	4	2	1	1	5
009	GA-ASS105_2.3-2.75m	4	2	1	1	5
010	GA-ASS105_3.3-3.75m	4	2	1	1	5
011	GA-ASS106_2.4-3.0m	4	2	1	1	5
012	GA-ASS106_3.7-4.0m	4	2	1	1	5
013	GA-ASS107_2.5-3.0m	4	2	1	1	5
014	GA-ASS107_3.5-4.0m	4	2	1	1	5
015	GA-ASS108_2.5-3.0m	4	2	1	1	5
016	GA-ASS108_4.2-4.75m	4	2	1	1	5
017	GA-ASS109_1.75-2.3m	4	2	1	1	5
018	GA-ASS109_3.25-3.75m	4	2	1	1	5
019	GA-ASS110_2.0-2.5m	4	2	1	1	5
020	GA-ASS110_3.5-4.0m	4	2	1	1	5
021	GA-ASS111_2.25-2.75m	4	2	1	1	5
022	GA-ASS111_4.5-5.0m	4	2	1	1	5
023	GA-ASS112_2.0-2.5m	4	2	1	1	5
024	GA-ASS112_3.5-4.0m	4	2	1	1	5

CONTINUED OVERLEAF

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

CE115596

CLIENT DETAILS

Client GOLDER ASSOCIATES PTY LTD

Project 1525905 Bowen

SUMMARY OF ANALYSIS

No.	Sample ID	Acid Neutralising Capacity (ANC)	Chromium Reducible Sulphur (CRS)	HCl Extractable S, Ca and Mg in Soil ICP OES	Moisture Content	TAA (Titratable Actual Acidity)
025	GA-ASS113_3.5-4.0m	4	2	1	1	5
026	GA-ASS113_4.5-5.0m	4	2	1	1	5
027	GA-ASS114_1.0-1.5m	4	2	1	1	5
028	GA-ASS114_2.75-3.25m	4	2	1	1	5
029	GA-ASS115_1.5-2.0m	4	2	1	1	5
030	GA-ASS115_2.75-3.25m	4	2	1	1	5
031	GA-ASS116_2.0-2.5m	4	2	1	1	5
032	GA-ASS116_4.0-4.5m	4	2	1	1	5
033	GA-ASS117_2.5-3.0m	4	2	1	1	5
034	GA-ASS117_3.5-4.0m	4	2	1	1	5
035	GA-ASS118_1.5-2.0m	4	2	1	1	5
036	GA-ASS118_3.0-3.5m	4	2	1	1	5
037	GA-ASS119_0.9-1.5m	4	2	1	1	5
038	GA-ASS119_4.0-4.6m	4	2	1	1	5
039	GA-ASS120_2.0-2.5m	4	2	1	1	5
040	GA-ASS120_3.5-4.0m	4	2	1	1	5
041	GA-ASS121_3.0-3.5m	4	2	1	1	5
042	GA-ASS121_3.7-4.25m	4	2	1	1	5
043	GA-ASS122_2.0-2.5m	4	2	1	1	5
044	GA-ASS122_3.75-4.25m	4	2	1	1	5
045	GA-ASS123_3.25-3.5m	4	2	1	1	5
046	GA-ASS123_3.75-4.25m	4	2	1	1	5
047	GA-ASS124_1.5-2.0m	4	2	1	1	5
048	GA-ASS124_2.75-3.2m	4	2	1	1	5

CONTINUED OVERLEAF

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

CE115596

CLIENT DETAILS

Client GOLDER ASSOCIATES PTY LTD

Project 1525905 Bowen

SUMMARY OF ANALYSIS

No.	Sample ID	Acid Neutralising Capacity (ANC)	Chromium Reducible Sulphur (CRS)	HCl Extractable S, Ca and Mg in Soil ICP OES	Moisture Content	TAA (Titratable Actual Acidity)
049	GA-ASS125_2.25-2.75m	4	2	1	1	5
050	GA-ASS125_3.5-4.0m	4	2	1	1	5

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

CHAIN OF CUSTODY/ANALYSIS REQUEST

Golder Associates

☐ **Townsville Location**
Level 1, 25 Sturt Street, TOWNSVILLE QLD 4810
Phone: (07) 4727 1700
Fax: (07) 4724 0511

☐ **Cairns Location**
216 Draper Street, CAIRNS QLD 4810
Phone: (07) 4054 8200
Fax: (07) 4054 8201

Project No.: 1525905
Location: Bowen
Golder Order No.: Q001965
Quote: ***SGS/Golder National Master Services Agreement***
Primary Contact: Oscar Solvander

CE115596

	Sample Location	Sample No/Depth	No. of Jars/Bags	Sample Date	Chromium Suite Analysis						
1	GA-ASS101	3.0-3.5m	2*	23/5/15	X						
2	GA-ASS101	4.0-4.5m	2*	23/5/15	X						
3	GA-ASS102	2.5-3.0m	2*	22/5/15	X						
4	GA-ASS102	4.0-4.5m	2*	22/5/15	X						
5	GA-ASS103	3.25-3.75m	2*	22/5/15	X						
6	GA-ASS103	4.5-5.0m	2*	22/5/15	X						
7	GA-ASS104	2.5-3.0m	2*	21/5/15	X						
8	GA-ASS104	4.5-5.0m	2*	21/5/15	X						
9	GA-ASS105	2.3-2.75m	2*	23/5/15	X						
10	GA-ASS105	3.3-3.75m	2*	23/5/15	X						
11	GA-ASS106	2.4-3.0m	2*	23/5/15	X						
12	GA-ASS106	3.7-4.0m	2*	23/5/15	X						
13	GA-ASS107	2.5-3.0m	2*	21/5/15	X						
14	GA-ASS107	3.5-4.0m	2*	21/5/15	X						
15	GA-ASS108	2.5-3.0m	2*	22/5/15	X						
16	GA-ASS108	4.2-4.75m	2*	22/5/15	X						
17	GA-ASS109	1.75-2.3m	2*	19/5/15	X						
18	GA-ASS109	3.25-3.75	2*	19/5/15	X						
	TEST REFERENCE NO.										
	TURN AROUND TIME	3 Day TAT	Wed COB								

TO BE COMPLETED BY LABORATORY

Samples Received In:
(Please tick appropriate box)

Appropriate Containers ☐

Pretreated Containers ☐

Chilled State ☐

Other *(Comment)* ☐

PLEASE SEND RESULTS TO:
Name: Oscar Solvander
Email: osolvander@golder.com.au
Name: Paul Scells
Email: pscells@golder.com.au

PLEASE SEND INVOICE TO:
Name: Accounts Department
Email: auaccountspayable@golder.com.au

Special Instructions: *Nominated turn-around time from time of submission to SGS.* ***Penalty Rates to apply for late reports in accordance with National Master Services Agreement.***

Special Instructions: **Please Supply in ESDAT Format and DQO Report. Samples marked with * are two samples to be combined. Samples to be combined have been rubber banded together.**

Relinquished: Oscar Solvander Date: 4/6/2015 Received by: Date: 4/6/15 - 4:40pm
Organisation: Golder Associates Time: Organisation: Time:

CHAIN OF CUSTODY/ANALYSIS REQUEST

Golder Associates

☐ **Townsville Location**
Level 1, 25 Sturt Street, TOWNSVILLE QLD 4810
Phone: (07) 4727 1700
Fax: (07) 4724 0511

☐ **Cairns Location**
216 Draper Street, CAIRNS QLD 4810
Phone: (07) 4054 8200
Fax: (07) 4054 8201

Project No.: 1525905
Location: Bowen
Golder Order No.: Q001965
Quote: ***SGS/Golder National Master Services Agreement***
Primary Contact: Oscar Solvander

	Sample Location	Sample No/Depth	No. of Jars/Bags	Sample Date	Chromium Suite Analysis						
19	GA-ASS110	2.0-2.5m	2*	20/5/15	X						
20	GA-ASS110	3.5-4.0m	2*	20/5/15	X						
21	GA-ASS111	2.25-2.75m	2*	20/5/15	X						
22	GA-ASS111	4.5-5.0m	2*	20/5/15	X						
23	GA-ASS112	2.0-2.5m	2*	20/5/15	X						
24	GA-ASS112	3.5-4.0m	2*	20/5/15	X						
25	GA-ASS113	3.5-4.0m	2*	19/5/15	X						
26	GA-ASS113	4.5-5.0m	2*	19/5/15	X						
27	GA-ASS114	1.0-1.5m	2*	22/5/15	X						
28	GA-ASS114	2.75-3.25m	2*	22/5/15	X						
29	GA-ASS115	1.5-2.0m	2*	20/5/15	X						
30	GA-ASS115	2.75-3.25m	2*	20/5/15	X						
31	GA-ASS116	2.0-2.5m	2*	20/5/15	X						
32	GA-ASS116	4.0-4.5m	2*	20/5/15	X						
33	GA-ASS117	2.5-3.0m	2*	19/5/15	X						
34	GA-ASS117	3.5-4.0m	2*	19/5/15	X						
35	GA-ASS118	1.5-2.0m	2*	20/5/15	X						
36	GA-ASS118	3.0-3.5m	2*	20/5/15	X						
	TEST REFERENCE NO.										
	TURN AROUND TIME										

TO BE COMPLETED BY LABORATORY

Samples Received In:
(Please tick appropriate box)

Appropriate Containers ☐

Pretreated Containers ☐

Chilled State ☐

Other *(Comment)* ☐

PLEASE SEND RESULTS TO:
Name: Oscar Solvander
Email: osolvander@golder.com.au
Name: Paul Scells
Email: pscells@golder.com.au

PLEASE SEND INVOICE TO:
Name: Accounts Department
Email: auaccountspayable@golder.com.au

Special Instructions: *Nominated turn-around time from time of submission to SGS.* ***Penalty Rates to apply for late reports in accordance with National Master Services Agreement.***

Special Instructions: **Please Supply in ESDAT Format and DQO Report. Samples marked with * are two samples to be combined. Samples to be combined have been rubber banded together.**

Relinquished: ..... Date: ..... Received by: ..... Date: .....
Organisation: Golder Associates Time: ..... Organisation: ..... Time: .....

CHAIN OF CUSTODY/ANALYSIS REQUEST

Golder Associates

☐ **Townsville Location**
Level 1, 25 Sturt Street, TOWNSVILLE QLD 4810
Phone: (07) 4727 1700
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☐ **Cairns Location**
216 Draper Street, CAIRNS QLD 4810
Phone: (07) 4054 8200
Fax: (07) 4054 8201

Project No.: 1525905
Location: Bowen
Golder Order No.: Q001965
Quote: ***SGS/Golder National Master Services Agreement***
Primary Contact: Oscar Solvander

	Sample Location	Sample No/Depth	No. of Jars/Bags	Sample Date	Chromium Suite Analysis						
37	GA-ASS119	0.9-1.5m	2*	21/5/15	X						
38	GA-ASS119	4.0-4.6m	2*	21/5/15	X						
39	GA-ASS120	2.0-2.5m	2*	21/5/15	X						
40	GA-ASS120	3.5-4.0m	2*	21/5/15	X						
41	GA-ASS121	3.0-3.5m	2*	21/5/15	X						
42	GA-ASS121	3.7-4.25m	2*	21/5/15	X						
43	GA-ASS122	2.0-2.5m	2*	23/5/15	X						
44	GA-ASS122	3.75-4.25m	2*	23/5/15	X						
45	GA-ASS123	3.25-3.5m	2*	23/5/15	X						
46	GA-ASS123	3.75-4.25m	2*	23/5/15	X						
47	GA-ASS124	1.5-2.0m	2*	23/5/15	X						
48	GA-ASS124	2.75-3.2m	2*	23/5/15	X						
49	GA-ASS125	2.25-2.75m	2*	22/5/15	X						
50	GA-ASS125	3.5-4.0m	2*	22/5/15	X						
TEST REFERENCE NO.											
TURN AROUND TIME	3 Day TAT										

TO BE COMPLETED BY LABORATORY

Samples Received In:
(Please tick appropriate box)

Appropriate Containers ☐

Pretreated Containers ☐

Chilled State ☐

Other *(Comment)* ☐

PLEASE SEND RESULTS TO:
Name: Oscar Solvander
Email: osolvander@golder.com.au
Name: Paul Scells
Email: pscells@golder.com.au

PLEASE SEND INVOICE TO:
Email: auaccountspayable@golder.com.au

Special Instructions: *Nominated turn-around time from time of submission to SGS.* ***Penalty Rates to apply for late reports in accordance with National Master Services Agreement.***

Special Instructions: **Please Supply in ESDAT Format and DQO Report. Samples marked with * are two samples to be combined. Samples to be combined have been rubber banded together.**

Relinquished: Oscar Solvander Date: 4/6/15 Received by: Date:
Organisation: Golder Associates Time: Organisation: Time:

APPENDIX E

Summary of Chromium Suite Test Results

Test Location	Depth Range (m - BGL)		Material Description	pH_{FIELD}	pH_{KCl}	TAA (kg H_2SO_4 /tonne)	sTAA Converted to %S*	S_{NAS} (if pH less than 4.5)	Existing Acidity %S (sTAA + 0.75 x S_{NAS})	Chromium Reducible Sulfur (S_{CR}) %S	Acid Neutralising Capacity %CaCO3 (if pH more than 6.5)	Net Acidity %S (S_{CR}+Existing Acidity - ANC/FF)	Is This AASS	Is This PASS	Liming Rate for Existing Acidity (Neutralises AASS only) (kg/m3)	Liming Rate for Net Acidity (Neutralises both AASS & PASS) (kg/m3)
GA-ASS101	3	3.5	silty SAND, grey	7.1	6.2	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	4	4.5	silty SAND, grey	7.6	6.3	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS102	2.5	3	clayey SAND, brown	6.1	6.2	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	4	4.5	silty SAND, grey	6.2	6.0	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS103	3.25	3.75	silty SAND, grey	6.8	6.2	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	4.5	5	silty SAND, grey	7.1	6.3	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS104	2.5	3	clayey SAND, brown	6.4	6.0	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	4.5	5	silty SAND, grey	6.7	6.3	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS105	2.3	2.75	silty SAND, brown	6.7	5.7	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.3	3.75	silty SAND, grey	6.9	6.2	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS106	2.4	3	silty SAND, brown	5.9	6.1	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.7	4	silty SAND, grey	6.1	6.2	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS107	2.5	3	silty SAND, brown	6.7	6.1	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.5	4	silty SAND, brown	6.7	5.9	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS108	2.5	3	silty SAND, brown	7.4	6.2	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	4.2	4.75	silty SAND, grey	8.5	6.6	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS109	1.75	2.3	clayey SAND, brown	6.5	5.7	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.25	3.75	silty SAND, grey	7.3	6.0	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS110	2	2.5	clayey SAND, brown	6.2	5.8	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.5	4	silty SAND, grey	6.4	5.9	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS111	2.25	2.75	clayey/silty SAND, brown	6.1	6.1	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	4.5	5	silty SAND, grey	8.2	6.3	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS112	2	2.5	clayey SAND, brown	7.1	6.0	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.5	4	silty SAND, grey	8.3	6.1	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS113	3.5	4	clayey SAND, grey	6.3	6.3	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	4.5	5	silty SAND, grey	6.8	6.8	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS114	1	1.5	clayey SAND, brown	7.7	5.8	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	2.75	3.25	silty SAND, grey	7.3	6.2	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS115	1.5	2	clayey SAND, brown	6.7	6.6	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	2.75	3.25	silty SAND, grey	6.8	6.9	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS116	2	2.5	clayey SAND, brown	6.5	6.0	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	4	4.5	silty SAND, grey	7.7	6.1	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS117	2.5	3	clayey SAND, brown	7.1	5.9	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.5	4	silty SAND, grey	7.3	5.8	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS118	1.5	2	clayey SAND, brown	6.1	6.0	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3	3.5	silty SAND, grey	6.4	5.9	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS119	0.9	1.5	clayey SAND, brown	5.8	5.8	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	4	4.6	silty SAND, grey	7.2	6.0	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS120	2	2.5	silty SAND, brown	8.6	6.3	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.5	4	silty SAND, grey	7.3	6.4	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS121	3	3.5	clayey/silty SAND, brown	6.3	6.0	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.7	4.25	silty SAND, grey	6.4	5.9	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS122	2	2.5	clayey SAND, brown	6.2	5.8	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.75	4.25	silty SAND, grey	6.7	5.9	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS123	3.25	3.5	silty SAND, brown	7.9	6.5	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.75	4.25	silty SAND, grey	8.9	6.6	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS124	1.5	2	clayey SAND, brown	6.8	6.0	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	2.75	3.2	clayey SAND, brown	7.1	6.1	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
GA-ASS125	2.25	2.75	clayey SAND, brown	6.5	5.7	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA
	3.5	4	silty SAND, grey	6.9	5.9	< 0.25	< 0.008		0.000	< 0.005		0.000	No	No	NA	NA

Note: * Equivalent oxidisable sulfur calculated as TAA/30.59

Liming rates assume a bulk density of 1.60 t/m3

Fineness Factor = 1.5

TABLE 1D

SUMMARY OF ACID SULFATE TEST RESULTS

Client: Department of State Development

Job Title: Abbot Point Growth Gateway Project

Location: Abbot Point

Input By: OS
Date: 12/06/15
Checked By: PKS
Date: 12/06/15

Z:\Brisbane\Jobs\Des\2015\1525905\Technical Doc\Tables\ASS Tables\ASS - Summary of Acid Sulfate Test Results (Chromium Suite) (2)

APPENDIX F

Limitations

LIMITATIONS

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Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

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