

Appendix K – Acid Sulfate Soils Assessment

PROJECT
**ACID SULFATE SOILS ASSESSMENT
TWEED SAND PLANT EXPANSION
CUDGEN, NEW SOUTH WALES**

PREPARED FOR
HANSON CONSTRUCTION MATERIALS PTY LTD

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SYNOPSIS This report describes the methodology and results of an acid sulfate soils assessment undertaken for the proposed expansion of the Hanson Construction Material's Tweed Sand Plant located in Cudgen, New South Wales. This report was prepared to satisfy the requirements of the Secretary's Environmental Assessment Requirements (SEARs) issued for the Project in December 2019.

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SUMMARY

Hanson Construction Materials Pty Ltd (Hanson) commissioned Gilbert & Sutherland Pty Ltd (G&S) to prepare an Acid Sulfate Soil Assessment (ASSA) for the proposed expansion of its Tweed Sand Plant (TSP) operation located in Cudgen, New South Wales.

This report was prepared to satisfy the relevant aspects of the Secretary's Environmental Assessment Requirements (SEARs) issued for the Project in December 2019.

In response to the SEARs an acid sulfate soil investigation was undertaken within the proposed expansion area from April to November 2020. Pacific Geotech Pty undertook the soil investigation using a combination of cased auger drilling (initial boreholes MB13A to MB18A) and vibrocore drilling (AS1 to AS44).

A total of 50 boreholes were drilled throughout the expansion area including six (6) groundwater monitoring wells (sampled for ASS purposes) and forty-four (44) dedicated ASS boreholes. Total depth within each bore reached one metre below the full depth of the sand resource approximately 20 metres below ground level (mbgl). All soil logging and sample collection was undertaken by qualified G&S staff.

Extensive drilling has been conducted in the immediate vicinity of the proposed expansion area including at the existing TSP site, the neighbouring lands to the east (Gales Holdings) and a number of locations within the separate ABLP and Cudgen Land owned properties as described in this report. These historic investigations have shown the sand resource to be highly consistent and these findings are supported by the results of this investigation.

At each borehole, samples were recovered at the surface and at depth intervals of 0.5 m (and every change in soil stratum) to the full depth of the soil profile drilled.

A total of 1597 samples were recovered, with all samples sealed in plastic geological sampling bags and frozen prior to being forwarded to ALS Laboratories for field screening (pH_{Field} and pH_{Fox} testing) and analysis via the Chromium Suite (Method 22B).

Field oxidised pH results ranged from 1.2 up to 7.1 with an average result Of 4.8. A total of 365 samples returned a pH_{Fox} of < 3 with the vast majority of samples also exhibiting a pH drop of greater than 1

unit from the pH_F result. These results provide a strong indication of the presence of sulfides throughout the site.

Based on the field screening results, a total of 476 samples were then selected for further laboratory analysis via the Chromium Suite at a rate of approximately one sample per five field samples.

For interpretation of the Chromium Suite results, the ASSMAC Guidelines stipulate an Action Threshold of 0.03%S for projects where more than 1000 tonnes of material is to be disturbed. Of the 476 samples analysed, a total of 366 samples returned a %S value of greater than 0.03%S.

Acid Neutralising Capacity (ANC) levels varied throughout the samples analysed ranging from 0.02 % CaCO_3 up to 15.4% CaCO_3 with an average level of 2.75% CaCO_3 . These high (ANC) concentrations in comparison to the materials' acid generating potential (i.e. SCR% results) indicate that the material is essentially self-neutralising, as demonstrated by the Net Acidity results which averaged 0.14% CaCO_3 with approximately 67% of results less than the 0.3 %S Action Threshold.

In order to calculate the total volume of ASS materials within the extraction footprint ASS modelling was undertaken using CivilCad 3D. The Net Acidity %S results from the Chromium Suite were used to classify the soils into the following six categories, ranging from materials which require no treatment to materials which would require extensive treatment:

Category 1 materials would generally be too costly for traditional lime treatment and therefore would be left in-situ or (depending on position in the soil profile) reinterred at depth below the watertable. Category 2 to 5 materials may require treatment. Category 6 materials would require no treatment.

The results of the modelling showed the majority of materials to be extracted (~76%) are Category 6 materials, requiring no lime treatment.

Of the remaining Category 1 to 5 materials, Category 1 made up 0.022%; Category 2 materials 0.465%; Category 3 materials 1.923%; Category 4 materials 6.994% and Category 5 materials 14.386%.

Given the high degree of similarity between the material currently being extracted by TSP and that within the proposed expansion

area, the existing approved approach to ASS Management will also be adopted for operations within the proposed expansion area. This methodology has proven successful over the life of the TSP operations with stable pH levels maintained in the lake and no evidence of the occurrence of acidic reactions in the insitu material surrounding the lake, the reinterred fines or the sands exported from the site.

Topsoils and overburden (material above the groundwater table) will be progressively removed via dry-excitation methods in advance of the extraction face. These materials will be analysed and, where required, treated through the addition of lime to neutralise any Net Acidity.

The sand resource contains a percentage of PASS fines which will be removed from the sand through the use of a hydrocyclone. The separated fines would then be returned to the dredge lake via a dedicated fines return system and released into the water column to achieve a final deposition depth of at least eight metres below the water surface. This process will achieve long-term management of the fines by placing them in a stable, low oxygen environment, thus preventing ongoing disturbance and minimising opportunities for oxidation.

Monitoring of extracted sands has been undertaken consistently at the site since at least 2006. Results of this sampling have been highly consistent over time reflecting the efficiency of the hydraulic separation method. No lime treatment of extracted sands has been required at the site owing to the high ratio of acid neutralising capacity (ANC) compared to its acid generating potential (AGP) within this sand resource.

Given the similarities between the resource at the existing TSP site and within the expansion area the success of the hydraulic separation and fines reinterment methodology is anticipated to continue for the expansion area.

Water quality monitoring would occur on a regular basis within the extraction lake and include vertical profile monitoring within the vicinity of the fines reinterment location to ensure dissolved oxygen levels remain suitable for the long-term stability of the fines.

Acid sulfate soils will be managed in accordance with the practices described above as detailed in the Soil and Water Management Plan (Gilbert & Sutherland, 2021).

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GLOSSARY

TERM	MEANING
ASS	Acid Sulfate Soils. This is the collective term for both Actual Acid Sulfate Soils and Potential Acid Sulfate Soils.
ANC	Acid Neutralising Capacity. The capacity of a soil to neutralize (wholly or partly) its acid generating potential.
PASS	Potential Acid Sulfate Soils. These soils contain pyrite and are usually undisturbed. When these soils are exposed the pyrite oxidises to produce sulfuric acid.
AASS	Actual Acid Sulfate Soils. These soils are formed when the pyrite in Potential Acid Sulfate Soils oxidises to produce sulfuric acid.
CRS	Chromium Reducible Sulfur (CRS) is an analytical method, which quantifies sulfur in an inorganic (i.e. pyritic) form. This method is a suitable test to determine whether the oxidisable sulfur is from organic material or if it is from pyrite, and therefore formed under estuarine conditions.
TAA	Titrateable Actual Acidity. TAA is a measure of a soil's acidity prior to the complete oxidation of sulfidic material, including both pyritic and organic acidity.

1 Introduction

Hanson Construction Materials Pty Ltd's (Hanson) Tweed Sand Plant (TSP) operation, located off Altona Road in Cudgen, New South Wales, has a total extraction footprint of approximately 46 hectares (ha). Sand extraction has been undertaken at this location since 1983 with Hanson assuming operation of the site in 2007.

TSP operates under Development Application (DA) DA 152-6-2006 issued on 31 July 2006, as modified on 20 August 2018 (Notice of Modification MOD 1). The current MOD 1 approval remains valid until 1 July 2036 and authorises TSP to produce and transport from the site up to 500,000 tonnes of quarry products per financial year. Drawing 12035_001 shows the location of the TSP site.

To meet ongoing demand for sand, Hanson is proposing to expand its existing operations into lands to the north and west of the TSP site. The footprint of the expansion area is approximately 190 ha, giving a total combined footprint of 236 ha for the existing and future extraction areas.

1.1 Expansion proposal

The TSP site is level to gently inclined, exhibits elevations of less than five metres Australian Height Datum (<5 mAHD) and has a current extraction footprint of approximately 46 ha. The proposed expansion would see TSP's operations extend into some 190 ha of lands to the north and west of the existing TSP site giving a total Project footprint of approximately 236 hectares. Drawing 12035_002 shows the footprint of the proposed expansion area and existing TSP site with respect to neighbouring operations and roadways.

The total sand resource within the expansion area is estimated to range from 30 to 35 million tonnes, extending to approximately 20 metres below ground level (mbgl). Overburden thickness (i.e. topsoils) is one metre, while minimal interburden is present throughout the resource.

Consistent with current TSP operations, sand would be extracted using a dredge and pumped to an onshore wash plant, where the target sands are separated from the finer clay and silt materials ('the fines') through a hydrocyclone. To minimise

potential environmental impacts associated with these materials, the fines would then be returned to the lake under controlled conditions.

Sand extraction rates would be market driven, but capped at an annual maximum limit of 950,000 tonnes with a proposed project life of some 30 years. As extraction proceeds, the site office, washplant, stockpiling area and weighbridge would be moved from their current locations on the eastern perimeter of the site to the northern end of Lot 2 DP1192506. Zone Planning Drawing Z19163-104 provides a conceptual overview of the progression of sand extraction throughout the proposed expansion area.

The nature and scale of the expansion classifies the proposal as a State Significant Development (SSD). In November 2019, a Scoping Study was completed for the project and submitted to the NSW Department of Planning, Industry and Environment (DPIE) for its consideration.

DPIE subsequently issued site-specific Secretary's Environmental Assessment Requirements (SEARs) on 17 December 2019. Those SEARs form the basis of the Tweed Sand Plant Expansion (SSD – 10398) Environmental Impact Study (EIS), of which this report is a part.

1.2 Scope of this report

Acid Sulfate Soils (ASS) are present within the TSP site. These materials are currently managed by separation of sulfidic fines from the sand through a hydrocyclone, followed by strategic reburial within the extraction lake at a depth which limits future disturbance.

Due to the similarities in soils, elevation (<RL 5.0 m AHD) and geology, the proposed expansion area is likely to also contain ASS material. Therefore the investigation and management of ASS is an important consideration to be addressed in the EIS.

The ASS investigation requirements detailed in the SEARS are reproduced in Table 1.2.1 (next page). For ease of reference, the table also cites where each requirement is addressed in this report. Where the requirements of the SEARs overlap between disciplines, a specific issue may be addressed under separate cover (as indicated in the table).

Table 1.2.1 – SEARS relevant to this ASSA

Department/Agency	Secretary's Environmental Assessment Requirement	Section
DPIE – Biodiversity and Conservation Division	<p>Acid sulfate soils</p> <p>1. The potential impacts of the development on acid sulfate soils must be assessed in accordance with the relevant guidelines in the Acid Sulfate Soils Manual (Stone et al. 1998) including the Assessment Guidelines 1998. Samples will be tested according to procedures in the Acid Sulfate Soils Laboratory methods Guidelines (Ahern et al 2004)</p>	Section 4
	<p>2. A sound conceptual model must be developed for the site, including an understanding of local hydrogeological conditions, of the stratigraphic and lateral distribution of sulphide minerals, and of the presence of sensitive environmental receptors. This must include:</p> <ul style="list-style-type: none"> a) Identifying whether sufficient pyrite is present in sediments to cause significant acidification on oxidation, b) Determining whether mining activities are likely to cause oxidation of pyrite and leach acidity and soluble metals into groundwater or surface waterways, c) Determining the likely extent and severity of groundwater or surface water contamination that may be caused by acidic leachate from oxidising sediments, and d) Identifying whether there are ecosystems or groundwater users in the vicinity of the mine site that are likely to be exposed to contamination from acidic leachate. 	Sections 5, 6 and 7
	<p>3. Describe mitigation and management measures that will be used to prevent, control, abate or minimise potential impacts from the disturbance of acid sulfate soils associated with the proposal and to reduce risks to human health and prevent the degradation of the environment. This must include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.</p>	Section 7 and the Soil & Water Management Plan (G&S 2021)
	<p>4. Describe the contingency plan, incorporating a commitment to appropriate monitoring.</p>	Section 7 and the Soil & Water Management Plan (G&S 2021)
Tweed Shire Council	<p>To support any future expansion proposal, the application would need to be supported by the following technical reports prepared by suitably qualified and experienced consultants.</p> <ul style="list-style-type: none"> o Air Quality Assessment o Surface water and Groundwater Assessment o Traffic Noise Assessment o Construction and Operational Noise Assessment o Acid Sulfate Soil Assessment o Contaminated Land Assessment o Environmental Management Plan: <ul style="list-style-type: none"> - Air - Construction Noise - Operational Noise 	This report and the Soil & Water Management Plan (G&S 2021)

Department/Agency	Secretary’s Environmental Assessment Requirement	Section
	<ul style="list-style-type: none"> - Surface Water - Groundwater - Acid Sulfate Soils 	
	<p>Acid sulfate soil management</p> <p>The site is identified as comprising Class 2 and Class 3 acid sulfate soils. Extraction is likely to intercept acid sulfate soils. The receiving waterway is the Tweed River. The excavation of actual and potential acid sulfate soils and management should be addressed in a site based acid sulfate soil investigation and management plan.</p>	<p>This report and the Soil & Water Management Plan (G&S 2021)</p>

1.3 Objectives

To address the SEARs with respect to ASS management, Hanson commissioned Gilbert & Sutherland (G&S) to undertake an Acid Sulfate Soils Assessment (ASSA) within the proposed expansion area. The investigation and analysis described in this report aims to adequately assess the ASS characteristics of material throughout the proposed expansion area, quantify the ASS-related risks of the proposal and determine suitable ASS management measures for the proposed expansion of TSP.

1.4 Relevant guidelines

Scoping, investigation and preparation of this ASSA considered the following guidelines and documents:

- Ahern C R, Stone, Y, and Blunden B (1998) Acid Sulfate Soils Assessment Guidelines August 1998. New South Wales Acid Sulfate Soil Management Advisory Committee (ASSMAC) (herein the ‘ASSMAC Guideline’).
- Queensland Department of Science, Information Technology, Innovation and the Arts (2014). Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines v4.0.
- Water Quality Australia, June 2018. National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Sampling and Identification Methods Manual.
- Water Quality Australia, June 2018. National Acid Sulfate Soils Guidance, Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management.
- Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al 2004).
- McDonald R. C., Isbell R. F., Speight J. G., Walker J. & Hopkins M. S. Australian Soil and Land Survey Field Handbook. Second Edition 1990, Inkata Press Pty Ltd.

2 Previous acid sulfate soil assessments

Several previous ASS investigations have been undertaken within the TSP site, the expansion area and the wider locale. These studies are briefly summarised in this section.

2.1 Coffey and Partners (1985 - 1986)

Coffey and Partners undertook a geotechnical investigation as part of an Environmental Impact Statement (EIS) for the Cudgen Sand Winning Project prepared by Keown and Drummond Pty Ltd in 1987 and 1994.

A total of six bores were drilled to approximately 23 m depth. The materials encountered included fine to medium sands with interbedded shelly and minor humic-rich materials to a depth of approximately 21 m. No ASS laboratory analyses were reported during this investigation.

2.2 Woodward-Clyde (1991 - 1992)

Woodward-Clyde undertook an assessment of potential acid producing sediments and groundwater quality in 1991 and 1992 as part of an EIS for a proposed extractive industry on an adjacent landholding (Lot 2 DPG11021 and Lot 2 DP216705).

Fifteen shallow bores were constructed by hand auger to approximately 1.3 m depth and tested for in situ pH and EC. Several samples were also recovered from drill returns during the installation of groundwater bores and were incubated over a two month period. Analysis for total iron, total sulfur and Net Acid Producing Potential (NAPP) was also undertaken on these samples.

Weathering tests were undertaken on bulk sand samples (~5 tonne stockpiles) recovered to a depth of 4 m from each of four test pits across the site and from selected sediment samples from the Phase 1 extraction area at Lot 2 DP777905.

Saturated paste pH measurements were made weekly during a three month period from November 1991 to February 1992 on the bulk

samples and on three occasions for the sand quarry samples. The results of the field pH and EC testing for the shallow sampling revealed in situ pH values ranging from 3.2 to approximately 7.0 with a mean pH of 5.6.

The results of the incubation tests for the drill return samples indicated no appreciable decrease in pH over the two month period for samples recovered below 4 m near-surface level (NSL). However, a general decrease in soil pH was noted for samples recovered from above 3 m NSL.

Total sulfide sulfur concentrations ranged from <0.01 to 0.05%S in the drill return samples, however a negative net acid producing potential (NAPP) was reported due to the significant CaCO₃ (shell) concentration present in all samples. These results were in general agreement with previous investigations where the majority of samples had %S concentrations between <0.02 and 0.05 and a carbonate source (i.e. shell) was evident in a number of samples.

The results of the incubation testing of the bulk samples revealed a general decrease in pH over the three month incubation period. The results of the incubation testing of the existing sand quarry samples revealed no marked changes in pH over the two month study period.

2.3 Gilbert and Sutherland/Woodward-Clyde (1996 - 1998)

Woodward-Clyde and Gilbert and Sutherland undertook periodic sampling of dredged sediments from the current extraction pit at Tweed Turf and Sand from 1996 to 1997 for petrographic analysis. Subsequent monthly monitoring was undertaken from March 1997 to June 1998 with analysis for %S (oxidisable) and ANC undertaken by Tweed Laboratory Centre.

The petrographic analysis revealed no pyrite by reaction in the samples tested. The results are presented in Appendix 6.

Monthly monitoring results over a 15-month period from 1996 to 1997, together with an additional sampling occasion in March 1999, indicated %S (oxidisable) concentrations ranging from <0.01 to 0.03 with ANC results ranging from

<0.1 to 2.8% CaCO₃. In all cases, there was a negative Net Acid Generating Potential (NAGP) for the samples tested. These results are also presented in Appendix 6.

2.4 Gilbert and Sutherland (1999)

Gilbert and Sutherland undertook sampling of surface soils within the adjacent landholding in 1999. Single samples from each of five boreholes were recovered to a depth of 0.5 m and analysed by the POCAS method. These results (presented in Appendix 6) showed %SPOS concentrations ranging from 0.02 to 0.17%S in the predominantly sandy materials tested.

2.5 Gilbert and Sutherland (2000)

Gilbert and Sutherland conducted an acid sulfate soil assessment (ASSA), agricultural land capability assessment and review of available surface and groundwater quality data as part of the previous application to the DEC (NSW EPA), DLWC (DIPNR) and TSC for the Phase 2 expansion works at the site.

As part of these ASSA works, 14 boreholes were constructed to an average depth of approximately 6.0m below NSL across the 6.38 ha area using a vibrocore to collect intact sample cores. Individual samples were recovered from each soil facies, or at a minimum interval of 0.5 m. A total of 172 samples were collected for petrographic analysis and screening using the Van Beers method. The results of this analysis were used to determine appropriate samples for further laboratory analysis. That determination resulted in 69 being selected and subject to further analysis using the POCAS (and for some samples, CRS) laboratory methods.

The screening results showed field pH (pH_F) ranged from 3.23 to 7.96, with 22 of the 172 samples exhibiting a pH_F of less than 4. Field oxidised pH (pH_{FOX}) results ranged from 1.56 to 6.89, with 72 of the 172 samples displaying a pH_{FOX} less than <3. Of the 69 POCAS results, 44 displayed a %SPOS concentration above the 0.03%S actionable criteria, indicating potential acid sulfate soils (PASS). The majority of results above the actionable threshold were associated with shallow grey-dark grey fine to medium grained sands.

2.6 Coffey Geosciences hydrogeological assessment (1999)

Coffey Geosciences undertook a hydrogeological assessment on behalf of Kelly Projects Pty Ltd for a proposed extractive industry on an adjacent landholding to the east of the subject site. Five monitoring bores were installed to a depth of approximately 6 m NSL, with logging undertaken of the materials encountered in each bore.

In the majority of boreholes, dark grey fine to medium grained sand was encountered from approximately 1.5 m NSL (consistent with the current investigation of the expansion area). However, no laboratory analysis for acid sulfate potential was undertaken on the materials sampled.

2.7 Gilbert and Sutherland (2004)

This further investigation of the site in 2004 was conducted in support of the 2005 EIS application (issued in 2005). The investigation assessed the extent, variability, acid generating potential and management options for acid sulfate materials within the site. Eleven boreholes were constructed and sampled to an average depth of 16 m, with a total of 363 samples recovered for screening and laboratory analysis.

Of the 353 samples screened, six exhibited a pH_F of <4, with 74 samples exhibiting a pH_{FOX} of <3. Based on the screening results, a total of 54 samples were subject to further CRS/TAA analysis. Of those 54 samples, 26 displayed actionable results (>0.03 %S). No samples recorded TAA concentrations above the recommended action threshold.

Results indicated that the acid generating potential of sediments within the proposed expansion area were variable. Materials with high acid producing potential were generally found to be dark grey fine to medium grained sands within the upper 5 m and basement of the soil stratum, with negligible acid generating potential associated with the silty sand below topsoil materials (0.0 to 1.0 m NSL) and the light grey, brown, yellow and orange sands between approximately 7.5 to 15.0 m.

The %S concentration of the light-medium grained sand stratum encountered between approximately 4 and 16 m below NSL in the northern and eastern portions of the site was variable, with exceedances of the 0.03 %S threshold typically associated with thin, relatively discontinuous sand layers containing trace silt, clay or charcoal fragments.

The investigation confirmed that soils were of negligible to low acid producing potential and generally contain carbonate concentrations in excess of the total acid risk.

2.8 Douglas Partners (2004)

Douglas Partners undertook a Preliminary Geotechnical and Acid Sulfates Soils Investigation¹ in 2004, within Lot 1 DP1250570 immediately to the west of the current TSP site and within the proposed expansion area. The ASS investigation included drilling and sampling of 10 boreholes to depths of 4.0 mbgl. Samples were analysed for pH_{Field} and pH_{Fox} and a limited number of samples were also subject to analysis via the Chromium Suite. The results indicated variable net acidity ranging from <0.02%S up to 0.27%S.

2.9 HMC Environmental Consulting (2008)

HMC drilled eight boreholes to 20 m and two boreholes to 6 m within the Cudgen Lakes Sand Extraction site directly to the east of the current TSP operation. Soil samples were collected with 148 subject to field screening and 79 subjected to SCR/TAA or POCAS analysis. A small number of POCAS tests were performed for confirmation.

Preliminary screening of soil and sediment samples indicated Potential Acid Sulfate Soils and Sediments (PASS) in all boreholes in the upper soil and sediment profile (<6 m depth). Minor existing acidity was identified in the soil and sediments with TAA levels in all samples below the action criteria (18 mol H⁺/tonne).

Oxidisable sulfur was recorded throughout the soil and sediment profile with action criteria (SCR 0.03%) exceeded at varying depths.

The maximum oxidisable sulfur level in the sand/silty sand was 0.58% (BH1, 2.5m). This result was approximately double the level of the next highest recorded level (0.33%). The average recorded SCR level in the sand/silty sand for each borehole varied from 0.11% to 0.20%.

Generally, with few exceptions, the buffering capacity in the sediments below 6 m depth exceeded the acid generating potential of the sediment. Evidence of shell and reaction to HCl helped confirm this observation.

¹ Douglas Partners Pty Ltd (2004). Report on Preliminary Geotechnical and Acid Sulfate Soils Investigation, Proposed

Bay Lobster Aquaculture Project 355 Cudgen Road, Cudgen NSW.

3 Site description

3.1 Property description and zoning

The project site comprises eight allotments with a total site footprint of approximately 236 ha (including the existing TSP operation) as shown on Drawing 12035_002. Table 3.1.1 summarises the property description, lot size and land zoning under Tweed Shire Council’s (TSC) Tweed Local Environmental Plan (LEP) 2014.

Table 3.1.1 Property description and land zoning*

Property description	Land zoning (LEP 2014)	Lot size (ha)
Lot 22 DP1082435	RU1 – Primary production	74.56
Lot 23 DP1077509	RU1 – Primary production	2.552
Lot 494 DP720450	RU1 – Primary production	0.1042
Lot 1 DP1250570	RU1 – Primary production RU2 – Rural landscape	90.00
Lot 2 DP1192506	RU1 – Primary production	11.12
Lot 3 DP1243752	RU1 – Primary production	1.612
Lot 51 DP1166990	RU1 – Primary production	55.13
Lot 50 DP1056966	RU1 – Primary production	1.094

*Source: NSW Planning Portal, 23 October 2020

3.2 Existing land uses

TSP is located within the Tweed Valley Floodplain and is surrounded by various land uses. Located immediately north of the site is TSC’s wastewater treatment facility and open grazing lands. Further to the north lies the Pacific Motorway, the township of Chinderah and the Tweed River.

To the north-east of the site is Chinderah Golf Course and some residential properties fronting the Tweed Coast Road.

Immediately to the east lies the Cudgen Lakes Sand Extraction. Further to the east is the townships of Cudgen and Kingscliff and the Pacific Ocean.

The Cudgen Plateau, located immediately south of the project site, is primarily used for agricultural purposes including cropping and orchards. The Cudgen residential area is located to the southeast and incorporates Cudgen Public School directly west of the residential area.

To the west of the site lies open grazing lands, the Australian Bay Lobster Producers Limited facilities and the Pacific Motorway.

3.3 Topography and local drainage

Local topographic mapping indicates that the elevation of the property is uniform, with an average relative level (RL) of 1.0 metres Australian Height Datum (mAHD). The site’s slopes are described as level (<1%) to very gently inclined (1-3%).² The project site abuts the Cudgen Plateau to the south, where elevations rise steeply to approximately 38 mAHD.

The site is located within the Tweed Valley Floodplain. Most runoff from the site passively infiltrates through the highly permeable sandy soils. Any remaining runoff is currently diverted towards the on-site extraction areas, or conveyed to a network of agricultural drains.

There are no natural water courses (including intermittent/ephemeral drainage lines) within the immediate vicinity of the expansion area. During high intensity rainfall events, the site becomes inundated and peak discharges may potentially flow toward the agricultural drainage lines constructed along the northern and western property boundaries. These drains convey runoff from the surrounding agricultural properties through flood gates to the Tweed River.

² McDonald R. C., Isbell R. F., Speight J. G., Walker J. & Hopkins M. S. Australian Soil and Land Survey Field Handbook. Second Edition 1990, Inkata Press Pty Ltd.

3.4 Regional drainage

The project site is located within the lower reaches of the Tweed River Floodplain. The Tweed River headwaters begin near Kunghur, approximately 50 km southwest of Chinderah and generally flow in a north-easterly direction. Numerous rivers, creeks and tributaries feed into the Tweed River, including the Oxley River approximately 5 km southwest of Murwillumbah, and the Rouse River west of Tumbulgum.

The Tweed River discharges into the Pacific Ocean at the Tweed River mouth, immediately east of Tweed Heads. The tidal influence of the Pacific Ocean extends just upstream of Murwillumbah (WBM, 2005).³

The floodplain is criss-crossed by a network of interconnecting agricultural drains and flood gates that convey water from the floodplain to the Tweed River. The main drain through the catchment ('the western drain', shown in blue on Figure 4.4) flows westwards from Tweed Coast Road parallel to Altona Drive. It then turns northwards adjacent to the TSP site before discharging into the Tweed River through culverts under the Pacific Highway and Chinderah Bay Drive. These culverts have flood gates installed on the River side, under Chinderah Bay Drive. Other minor drains run east-west and north-south across the floodplain and generally discharge into the western drain.

Both local catchment floods and Tweed River overbank floods cause floodplain inundation.

3.5 Soil landscapes

Soil Landscapes within the project site are described in the DPIE's Soil Landscapes of Central and Eastern NSW dataset 2020.⁴ The expansion area is within the 'Tweed landscape' (9541tw), which is described as an extensive marine plain of the lower Tweed catchment, consisting of deep Quaternary alluvium and estuarine sediments.

³ Flood Impact Assessment for the Proposed Sand Quarry Expansion at Crescent Street, Cudgen, WBM Oceanics Australia, 13 June 2005.

⁴ Department of Planning, Industry and Environment, 2020, Soil Landscapes of Central and Eastern NSW - v2.1, NSW Office of Environment and Heritage, Sydney.

The marine plain has been created by the in-filling of a large estuary or embayment during the Pleistocene era. Marine clays and muds have dominated these fill materials. Since this period of aggradation, the Tweed River has been creating a covered plain consisting of terrestrial sediments.

The eastern extents of the TSP site are mapped as a 'Tweed landscape variant b' (9541twb) (DPIE, 2020).⁵ This landscape is described as consisting of deep Quaternary alluvium and estuarine sediments with landscape variant 'twb', described as Pleistocene sands overlain by alluvial soil material.

The project site lies within the Cudgen 1:25 000 Acid Sulfate Soil Planning Map (DLWC 1997). This mapping indicates that there is a high probability of ASS material being encountered within 1 m to 3 m of the ground surface.

3.6 Geology

The 1:250,000 Geological Series SH56-3 (Tweed Heads) map indicates the site geology comprises of Quaternary sedimentary deposits of river gravel, alluvium, sand and clay. A hydrogeological investigation of the eastern neighbouring property described the regional bedrock as interbedded argillite and metagreywacke of the Neranleigh-Fernvale Beds of lower Palaeozoic age. The materials overlying this stratum were described as Quaternary organic clays, overlain in turn by Quaternary sands.⁶

The quaternary sands were described as poorly graded medium to fine grained quartzose sands with some coarse grains. These materials had a relatively uniform thickness of around 21 m across the site. The depositional environment for the Quaternary sands was identified as deltaic, with the presence of shell and organic fragments throughout the sequence, indicative of alternating marine and terrestrial influence.⁷

⁵ Ibid, 2020.

⁶ 'Cudgen Sand Extraction – Hydrogeological Assessment and Installation of Monitoring Bores', Coffey Geosciences 1999.

⁷ 'Geotechnical investigation for proposed extractive industry on Lot 2 DPG11021 and DP216705', Coffey and Partners (1985 - 1986).

3.7 Vegetation

The TSP site and proposed expansion area is characterised by open grazing lands which have been largely cleared of native vegetation. Within the TSP site an area of approximately 20 ha is currently cultivated under tea tree.

The agricultural drains that traverse the site contain some native vegetation, which is described in detail under separate cover.

4 Method

Between April and November 2020, an ASS investigation was undertaken within the proposed expansion area.

4.1 Guideline requirements

For a dredging development proposal of this size, the ASSMAC Guidelines require construction of boreholes at a rate of two boreholes per hectare to a depth of 1 metre below the proposed depth of extraction (in this case approximately 20m). For an expansion footprint of 190ha (excluding the 46 hectares of the current approved TSP operation) this would equate to 380 boreholes required to be constructed to a depth of 20 mbgl.

Extensive drilling has been conducted in the immediate vicinity of the proposed expansion area including at the existing TSP site, the neighbouring lands to the east (Gales Holdings) and a number of locations within the separate ABLP and Cudgen Land owned properties as described in Section 2. These investigations have shown the materials to be highly consistent and this is supported by the results of quarterly sampling of dredged sands undertaken at the existing TSP operation.

Given the considerable amount of existing data available for the site and surrounds and the significant cost and timing considerations associated with the intensive drilling campaign indicated by the ASSMAC Guidelines, a reduced sampling intensity is justified, noting that further ASS assessments or sampling of dredged sands (during extraction) could form part of the Project's approval conditions to be conducted on a stage by stage basis as dredging progresses.

⁸ Isbell, R.F. (1996) The Australian Soil Classification. CSIRO publishing.

⁹ The Chromium Reducible Sulfur (CRS) technique utilises the conversion of inorganic S to H₂S by a hot CrCl₂ solution. The H₂S generated is trapped in a zinc acetate solution and may be quantified by iodometric titration (Sullivan et al, 1998). CRS is an alternative to the Peroxide Oxidisable Sulfur (S_{POS} %) method of the POCAS technique and unlike S_{POS} % is not

4.2 Drilling

Between April and November 2020, Pacific Geotech Pty constructed the boreholes using a combination of cased auger drilling (initial boreholes MB13A to MB18A) and vibracore drilling (AS1 to AS44).

All soil logging and sample collection was undertaken by qualified G&S staff. A total of 50 boreholes were drilled throughout the expansion area including six (6) groundwater monitoring wells (sampled for ASS purposes) and forty-four (44) dedicated ASS boreholes. Total depth within each bore aimed to achieve a depth of one metre below the full depth of the sand resource (approximately 20mbgl).

4.3 Soil profile logging

Soil sampling and profile description was undertaken in accordance with the Australian Soil and Land Survey Field Handbook (McDonald et al, 1990) with the soils classified according to the Australian Soil Classification (Isbell, 1996).⁸ The soil borelogs are provided in Appendix 2.

4.4 Sample analysis

At each borehole, samples were recovered at the surface and at depth intervals of 0.5 m (and every change in soil stratum) to the full depth of the soil profile drilled.

A total of 1597 samples were recovered, with all samples sealed in plastic geological sampling bags and frozen prior to being forwarded to ALS Laboratories for field screening purposes (pH_{Field} and pH_{Fox} testing).

Based on the field screening results, a total of 464 samples were then selected for further laboratory analysis by the Chromium Suite (Method 22B)^{9 10} at a rate of approximately one sample per five field samples.

subject to significant interference from sulfur in either organic matter or sulfate minerals (Sullivan et al. 1998).

¹⁰ Sullivan, L.A., Bush, R., McConchie, D., Lancaster, G., Clark, M., Norris, N., Southon, R. and Saenger, P. (1998) 'Chromium Reducible Sulfur S_{CR} – Method 22B', in Stone, Y. Ahern, CR and Blunden, B. *Acid Sulfate Soil Manual 1998*. Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW.

5 Results

This section summarises the findings of the 2020 G&S ASS assessment of the proposed expansion area. Attached as Appendix 2 are the borelogs, whilst summary results tables are attached as Appendix 3 and laboratory analysis certificates attached as Appendix 4.

5.1 Soil descriptions

Logging of cores collected during the investigation was undertaken with reference to the *Australian Soil and Land Survey Field Handbook* (McDonald et.al, 1990).

Materials recovered within the site consisted predominantly of the following:

- Black to dark brown 10YR 2/1 to 10YR 2/2 light to medium clay commonly overlying grey (10YR 5/1; 2.5Y 5/1) to greyish brown (10YR 5/2; 2.5Y 5/2) and brownish yellow (10YR 6/8) to yellow (10YR 7/8) mottled loamy sand to sandy loam, overlying
- Variable layers of very dark grey (3/N), dark grey (7.5YR 4/1) and grey (5Y 5/1) loamy sand to clayey sand with variable shell fragments, extending to,
- Very dark greenish grey (10Y 3/1) to greenish black (10Y 2.5/1) clay loam sandy to heavy clay (marine) and less commonly;
- Greyish brown (10YR 5/2) to dark yellowish brown (10YR 4/4) and brown (10YR 5/3) sands to clayey sands and pale olive (10Y 6/4) to reddish yellow (7.5YR 6/8) medium/heavy (Pleistocene) clays.

The site surface soils were predominantly classified in accordance with the Australian Soil Classification as grey and brown Tenosols and Podosols.

The groundwater table was encountered in all boreholes at a depth of approximately 0.35 to 1.5mBGL (median 0.9mBGL).

Where encountered, sulfidic horizons occurred from between 2.0mBGL up to the full sampling

depth (23.0mBGL) within the northern portion of the site (AS1 – AS13), from between 0.4mBGL and 18.7mBGL within the middle portion of the site (AS14 – AS27), from 0.30mBGL to up to the full sampling depth (20.0mBGL) in the southern portion of the site (AS28 – AS38), and from between 0.3mBGL and 19.8mBGL within the eastern portion of the site (AS39 – AS44).

This combination of groundwater and sulfidic horizon means the soils may further be described in some cases as ‘Sulfidic Hydrosols’ under the Australian Soil Classification. These are soils in which the major part of the profile is inundated for two to three months in most years and in which sulfidic materials occur within the upper 1.5 m of the profile.

5.2 Field Screening

Samples returning a field pH (pH_F) of < 4 may indicate past oxidation of sulfides and therefore the presence of an Actual Acid Sulfate Soil (AASS).

A total of 1597 samples were submitted to ALS Laboratory for Field Screen analysis. Field pH results ranged from a minimum of 4.2 up to a maximum of 9.6. The average pH_F across the site was 7.8. None of the samples analysed returned a pH_F of <4 indicating that historic oxidation of sulfides is unlikely to have occurred at the site and no AASS is present.

A field oxidized pH (pH_{FOX}) of < 3 with a moderate or higher strength of reaction and drop of at least 1 pH unit from pH_F is a strong indication of the presence of sulfides.

Field oxidised pH results ranged from 1.2 up to 7.1 with an average result of 4.8. A total of 365 samples returned a pH_{FOX} of < 3 with the vast majority of samples also exhibiting a pH drop of greater than 1 unit from the pH_F result. These results provide a strong indication of the presence of sulfides throughout the site. Where there was a strong reaction to H_2O_2 but the pH_{FOX} result was >3, this indicated in most cases a high Acid Neutralising Capacity (ANC) typically in the form of fine shell.

5.3 Chromium suite results

A total of 476 samples were selected for analysis via the Chromium Suite. The Chromium suite includes a number of individual analyses of which the chromium reducible sulfur ($S_{CR}\%$), acid neutralizing capacity ($CaCO_3$ as %S equivalent) and Net Acidity (NA %S equivalent) are most relevant for this assessment.

As more than 1000 tonnes of materials will be disturbed on the site a Net Acidity (CRS + TAA) action level of 0.03%S¹¹ (or 18 mol H⁺/t) was adopted as stipulated by the ASSMAC Guidelines.

Of the 476 samples analysed, a total of 366 samples returned a chromium reducible sulfur value of greater than 0.03%S. These results were associated predominantly with the dark grey

(marine) sands to clayey sands and to a lesser extent (in terms of quantities encountered) the medium to heavy (marine) clays found at basement depth below the limit of the sand resource.

ANC levels varied throughout the samples analysed ranging from 0.02 % $CaCO_3$ up to 15.4% $CaCO_3$ with an average level of 2.75% $CaCO_3$.

Net Acidity for all materials sampled ranged from <0.02 to 3.44 %S, with the highest results associated with the medium to heavy (marine) clays below the limit of the sand resource. Given the large amount of ANC present, the majority (approximately 67%) of Net Acidity results were below the 0.03 %S Action Threshold.

¹¹ Table 4.4 from NSW ASSMAC Guidelines (1998).

6 Acid sulfate soil modelling

6.1 Methodology

The Net Acidity %S results from the Chromium Suite were used to classify the soils into the following six categories, ranging from materials which require no treatment to materials which would require extensive treatment:

Category 1 >0.64 %S

Category 2 0.48 to 0.64 %S

Category 3 0.32 to 0.48 %S

Category 4 0.16 to 0.32 %S

Category 5 0.03-0.16 %S

Category 6 <0.03 %S

Category 1 materials would generally be too costly to treat and therefore would be left in-situ or (depending on position in the soil profile) reinterred at depth below the watertable. Category 2 to 5 materials may require lime treatment. Category 6 materials would require no treatment.

To facilitate modelling of the data, a database was first created using the G&S borelogs and the laboratory results and then imported to CivilCad 3D. The database included the assignment of a soil texture per layer (according to McDonald et al, 1990) and an ASS category (as indicated above) to each 100mm interval of soil profile.

Following importation into CivilCad 3D, a Triangulated Irregular Network (TIN) surface was generated by linear interpolation. A TIN is a vector-based representation of a surface made up of irregular distributed nodes and lines with three dimensional coordinates arranged into a network of overlapping triangles.

The modelling assumptions were:

- Upper and lower surfaces of each soil category were created in the digital surface model.
- The basement excavation depths for each borehole were based on the lower extents of the sand resource encountered (approximately 5.7 mBGL to 21.1 mBGL and -4.9 mAHD to -20.1 mAHD across the expansion area).
- Where more than one layer of a particular soil category was found in a borehole, the upper

strata was notionally fused to the top of the lower strata to form a single strata.

- All excavations were assumed (for modelling purposes) to have vertical walls.
- Where sampling depth was limited, the soils category of the deepest layer in the borelog was extended to the proposed excavation depth at that location.
- Where results were not available for a particular horizon, the result immediately above or below the horizon (depending on the closest match for soil texture, colour etc) was extended.
- Where core loss was experienced, the modelling assumed the Net Acidity result from the sample immediately above.
- Where limited data was available to provide a spatial match to the pit boundaries, additional data points were added using the closest bore data to extrapolate a full spread of data across the extraction area.

6.2 Model results

The results of the ASS modelling showing the extrapolated thickness of each ASS category as contours across the site are presented in Drawings 12035.203 to 12035.208, with the calculated volume of each category summarised in Table 6.2.1.

Table 6.2.1 Acid sulfate soil modelling results

ASS Category	Volume m ³	% of Total Soil	%S (average)
1	6,401.2	0.022	1.020
2	136,520.4	0.465	0.550
3	564,626.7	1.923	0.385
4	2,053,171.9	6.994	0.228
5	4,223,305.6	14.386	0.098
6	22,373,333.6	76.210	0.027
Total*	29,357,359.4		

Based on the sampling, testing and modelling undertaken by G&S, the majority of materials to be excavated (~76%) are Category 6 materials requiring no lime treatment. Of the remaining Category 1 to 5 materials requiring lime treatment, Category 1 made up 0.022%; Category 2 materials 0.465%; Category 3 materials 1.923%; Category 4 materials 6.994% and Category 5 materials 14.386%.

7 Acid sulfate soil management

Given the high degree of similarity between the material that is currently being extracted by TSP and that within the proposed expansion area, the existing approved ASS Management approach will also be adopted for operations within the proposed expansion area. This methodology has proven successful over the life of the TSP operations with stable pH levels maintained in the lake and no evidence of the occurrence of acidic reactions in the insitu material surrounding the lake, the reinterred fines or the sands exported from the site.

ASS Management will be divided into two separate methodologies based on the mode of disturbance (being either dry excavation or wet excavation (dredging)). A brief description of these approaches is provided below.

7.1 Dry-excavation

Topsoils and overburden (material above the groundwater table) will be progressively removed via dry-excavation methods in advance of the extraction face. These materials will be analysed and, where required, treated through the addition of lime to neutralise any Net Acidity.

7.2 Dredging and fines management

The sand resource contains a percentage of PASS fines which will be removed from the sand through the use of a hydrocyclone located onshore, immediately adjacent to the extraction lake. This method of hydraulic separation is widely used in sand and gravel extraction industries and is one of the most effective mineral separation methods for uniform feeds.¹²

The process works by separating the larger particles (i.e. sand) from the finer silt and clay fractions (<2.0 mm) through centrifugal forces within the rotating hydrocyclone. The larger sand

particles move to the outside wall of the cyclone and are then discharged to form a sand stockpile. Smaller particles (including the sulfidic fines) stay within suspension and are returned to the dredge lake via a dedicated, fines return system.

The return system releases the fines into the water body at a depth of at least three metres below the water surface to minimise the generation of turbid plumes at the surface of the waterbody.

The release location would be selected to ensure a final fines deposition depth of at least eight metres below the water surface. This depth (equating to approximately -7.5m AHD) greatly exceeds the minimum acceptable safety margin for strategic reburial of '*at least one metre below the permanent water table*'¹³ which has been measured at approximately 0.37 mAHD¹⁴ over the course of monitoring at the site. Adoption of this final deposition depth also avoids issues associated with resuspension due to wind, wave, regional flooding or other surface turbulence such as powered boats.

The release location would be monitored to ensure the required depths are achieved and the returns pipe is periodically relocated as required. Hydrographic surveys of lake bathymetry would be undertaken annually to track final fines deposition depths and vertical profile monitoring of water quality would occur to ensure the fines reinterment location(s) remain suitable in terms of oxygen levels.

This process will achieve long-term management of the fines by placing them in a stable, low-oxygen environment, thus preventing ongoing disturbance and minimising opportunities for oxidation.

In accordance with the guidelines, the extracted sands would be sampled and laboratory analysed to ensure the relevant performance criteria are met. Monitoring of extracted sands has been undertaken consistently at the site since at least 2006. Results of this sampling have been highly

¹² Queensland Department of Science, Information Technology, Innovation and the Arts (2014). Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines v4.0.

¹³ Ibid.

¹⁴ Gilbert & Sutherland (2021), Surface Water Assessment, Tweed Sand Plant Expansion, Cudgen, New South Wales.

consistent over time, reflecting the efficiency of the hydraulic separation method.

No lime treatment of extracted sands has been required at the site owing to the sand resource's high ratio of acid neutralising capacity (ANC) compared to its acid generating potential (AGP).

Given the similarities between the resource at the existing TSP site and within the expansion area, the success of the hydraulic separation and fines reinterment methodology is anticipated to continue for the expansion area.

7.3 Water quality management

The existing processing area will be utilised for the initial phases of the development and then be relocated to the northern perimeter of Lot 2 DP1192506 in accordance with the phasing plan Z19163-104. All processing and stockpiling areas will be graded toward the extraction lake to ensure runoff is captured and managed onsite.

Water quality monitoring would occur on a regular basis within the extraction lake and include vertical profile monitoring within the vicinity of the fines reinterment location to ensure dissolved oxygen levels remain suitable for the long-term stability of the fines.

The dredging process can result in the release of nutrients or other toxicants contained within pore waters into the dredge lake with resulting water quality issues such as algal blooms. Long-term groundwater monitoring of the existing TSP site and recent monitoring within the expansion area has recorded elevated nutrient levels within the site's groundwater environment likely related to the historic agricultural uses of the land.

Whilst elevated nutrient levels have been recorded within the TSP lake, dilution from rainfall typically results in those levels being substantially lower than within the groundwater environment and similar to those recorded within the nearby Tweed River.

Long-term cyanobacteria monitoring has also been undertaken at TSP. The comprehensive

data set indicates that seasonal algal blooms were frequently recorded at the site from 2006 to early 2017. Since 2017, the concentration of algal cells within the lake has not reached 'bloom' levels and in most instances has been below the National Health and Medical Research Council's Recreational Guideline¹⁵ for primary contact (<4 mm³/L). The reduction in algal numbers is likely due to the gradual increase in lake size (as sand is removed) making the influx of nutrients from the dredging process proportionately smaller. This proportional reduction in nutrient influx limits the size of the algal population that can be sustained, resulting in lower concentrations of algal cells in the waterbody.

Further discussion of cyanobacteria monitoring and management is provided in the Gilbert & Sutherland (2021), Surface Water Assessment, Tweed Sand Plant Expansion, Cudgen, New South Wales and the Soil and Water Management Plan (Gilbert & Sutherland, 2021).

7.4 Soil and water management plan

Acid sulfate soils and associated water quality considerations will be managed in accordance with the practices described above and as detailed in the Soil and Water Management Plan (Gilbert & Sutherland, 2021).

¹⁵ National Health and Medical Research Council, 2008, Guidelines for Managing Risks in Recreational Water.

8 Discussion and conclusions

This report constitutes the ASSA for the proposed expansion of Hanson's Tweed Sand Plant operation, addressing the relevant aspects of the SEARs issued for the Project in December 2019.

It is acknowledged that the ASSMAC Guidelines require construction of boreholes at a rate of two per hectare for developments of greater than 4 ha and that in this instance 380 boreholes would be required to align with the guideline. However in this case, extensive soils investigations have been conducted in the immediate vicinity of the proposed expansion area. These include drilling and testing at the existing TSP site, neighbouring lands to the east (Gales Holdings) and a number of locations within the separate lands owned by ABLP and Cudgen Land (described in Section 2 of this report). These investigations demonstrate the homogeneity of the materials, concurring with the results of quarterly sampling of dredged sands undertaken at the existing TSP operation.

The volume of existing data, the consistency of the resource across the site and the track record of successful PASS management at the existing TSP operation justified a reduced investigation rate commensurate with the level of risk proposed by the expansion. This meant a total of 50 boreholes were drilled throughout the expansion area to a depth of one metre below the base of the sand resource (approximately 20 mbgl).

A total of 1597 samples were recovered and forwarded to ALS Laboratories for field screening (pH_{Field} and pH_{Fox} testing). Field oxidised pH results ranged from 1.2 up to 7.1 with an average result of 4.8. A total of 365 samples returned a pH_{Fox} of < 3 with the vast majority of samples also exhibiting a pH drop of greater than 1 unit from the pH_{F} result. These results strongly indicate the presence of sulfides throughout the site.

Based on the field screening results, a total of 476 samples were then selected for further laboratory analysis by the Chromium Suite (Method 22B) at a rate of approximately one sample per five field samples.

Of the 476 samples analysed, a total of 366 samples returned a chromium reducible sulfur value of greater than 0.03%S.

Acid Neutralising Capacity (ANC) levels varied throughout the samples analysed, ranging from 0.02 % CaCO_3 up to 15.4% CaCO_3 with an average level of 2.75% CaCO_3 . These high ANC concentrations in comparison to the materials' acid generating potential (i.e. $\text{SCR}\%$ results) indicate that the material is essentially self-neutralising, as demonstrated in the Net Acidity results where approximately 67% were less than the 0.3 %S Action Threshold.

In order to calculate the total volume of ASS materials within the extraction footprint, ASS modelling was undertaken using CivilCad 3D. The results of the modelling showed the majority of materials to be extracted (~76%) are Category 6 materials, requiring no lime treatment. Of the remaining Category 1 to 5 materials, Category 1 made up 0.022%; Category 2 materials 0.465%; Category 3 materials 1.923%; Category 4 materials 6.994% and Category 5 materials 14.386%.

Given the high degree of similarity between the material currently being extracted by TSP and that within the proposed expansion area, the existing approved approach to ASS Management will also be adopted for operations within the proposed expansion area. This methodology has proven successful over the life of the TSP operations with stable pH levels maintained in the lake and no evidence of acidic reactions in the insitu material surrounding the lake, the reinterred fines or the sands exported from the site.

Acid sulfate soils and associated water quality considerations will be managed in accordance with the practices described in this assessment and as detailed in the Soil and Water Management Plan (Gilbert & Sutherland, 2021).

9 Limitations of reporting

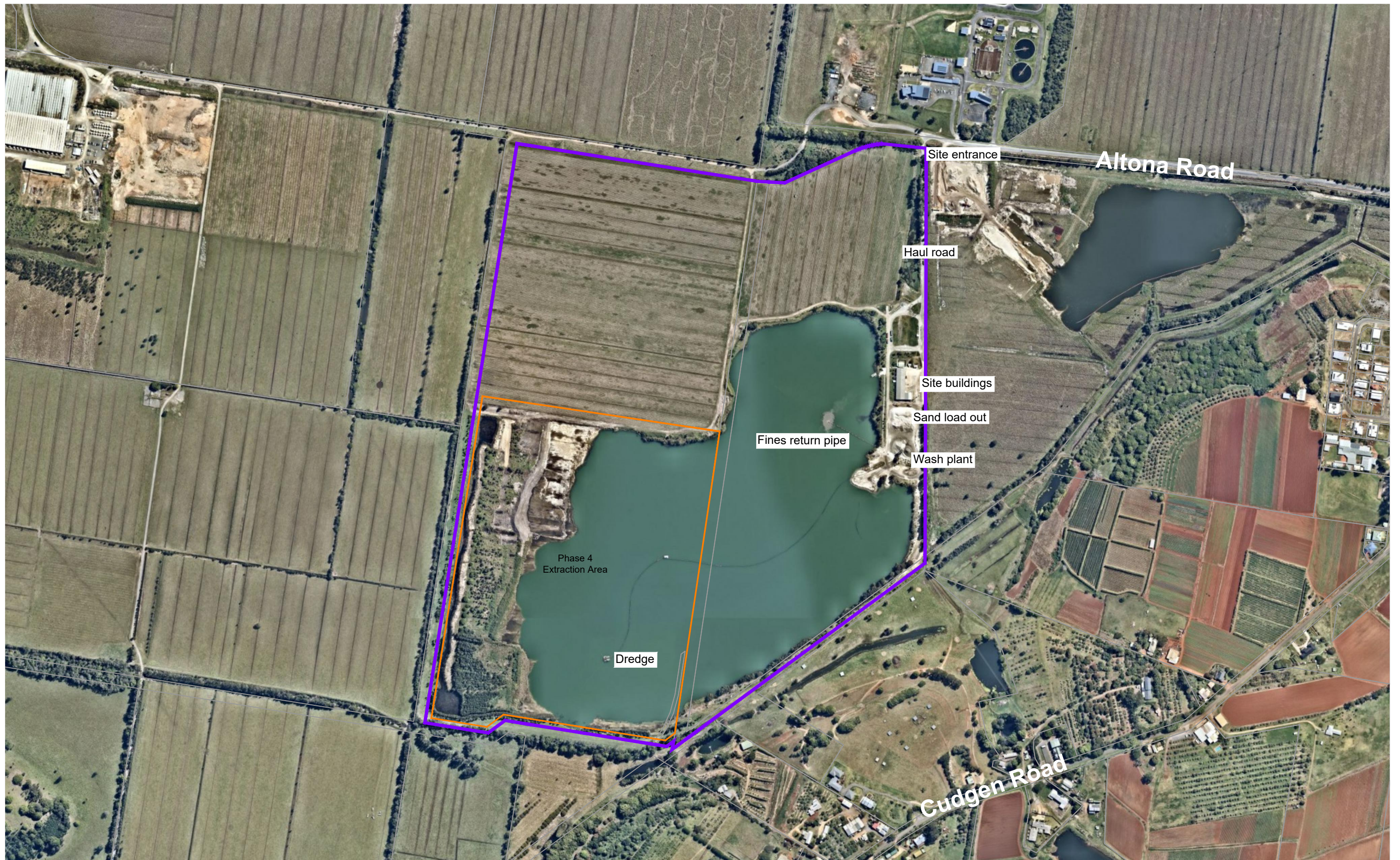
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10 Appendix 1 – Drawings



ORIENTATION

SCALE
 50 100 150 200 250 300
 metres
ROBINA
 PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND
 Site Boundary
 Phase 4 Extraction Area (indicative only)

SOURCES
 Image: Nearmap 2020. Image date: 14/09/2020

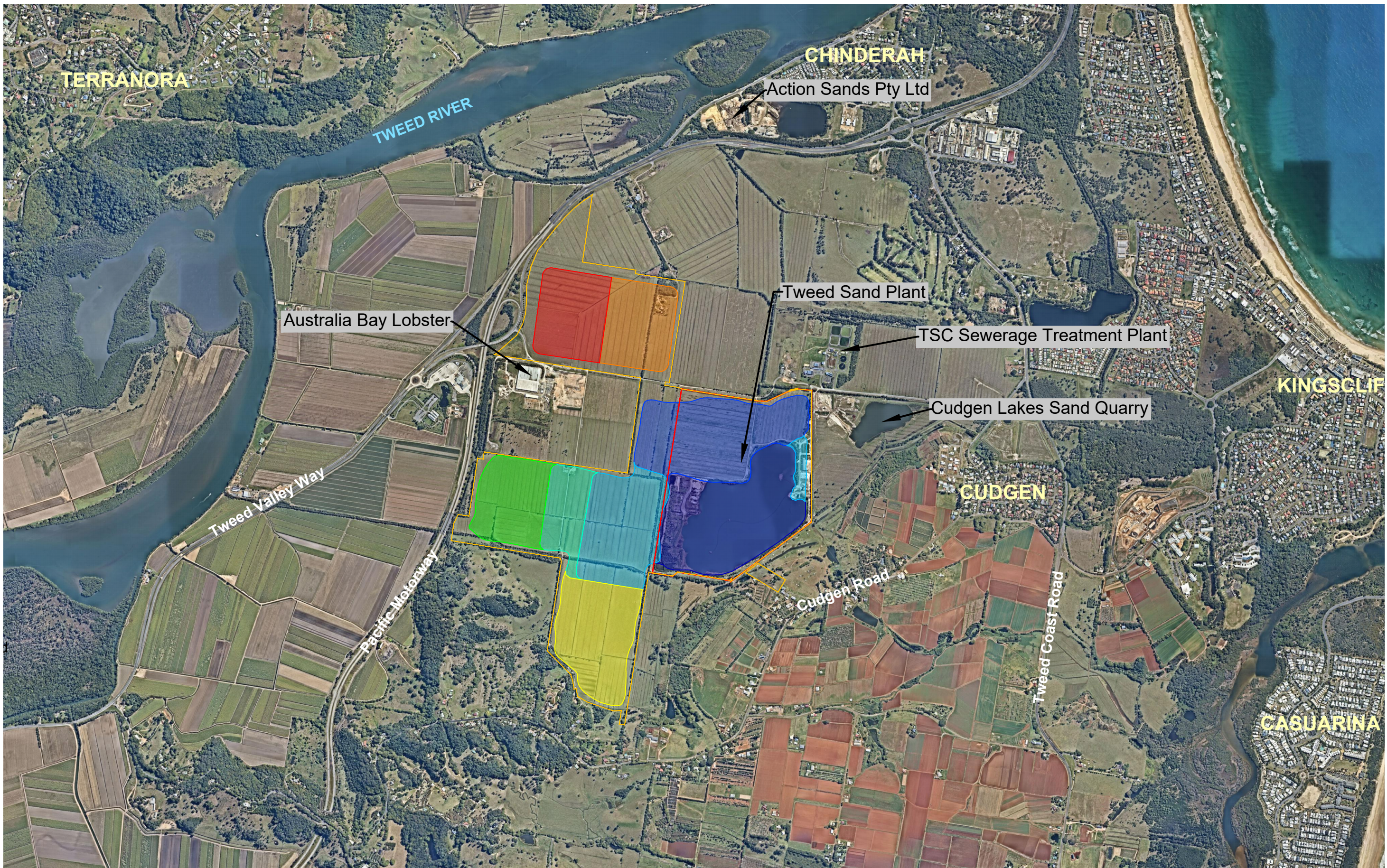
PROJECT
 TWEED SAND
 PLANT
 EXPANSION

CLIENT
 HANSON
 CONSTRUCTION
 MATERIALS

DRAWING
 EXISTING TWEED SAND
 PLANT OPERATION

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:6 250@A3	1/12/2020	AJF	ELH	12035	001	-

**+GILBERT
 SUTHERLAND**



ORIENTATION

SCALE
 200 400 600 800 1000 metres

ROBINA
 PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND		INDICATIVE EXPANSION AREA PHASES	
	Site boundary - existing		Phases 1-4 (approved)
	Site boundary - expansion area		Phase 5
			Phase 6
			Phase 7
			Phase 8
			Phase 9
			Phase 10
			Phase 11

SOURCES
 Image: Nearmap 2020. Image date: 14/09/2020

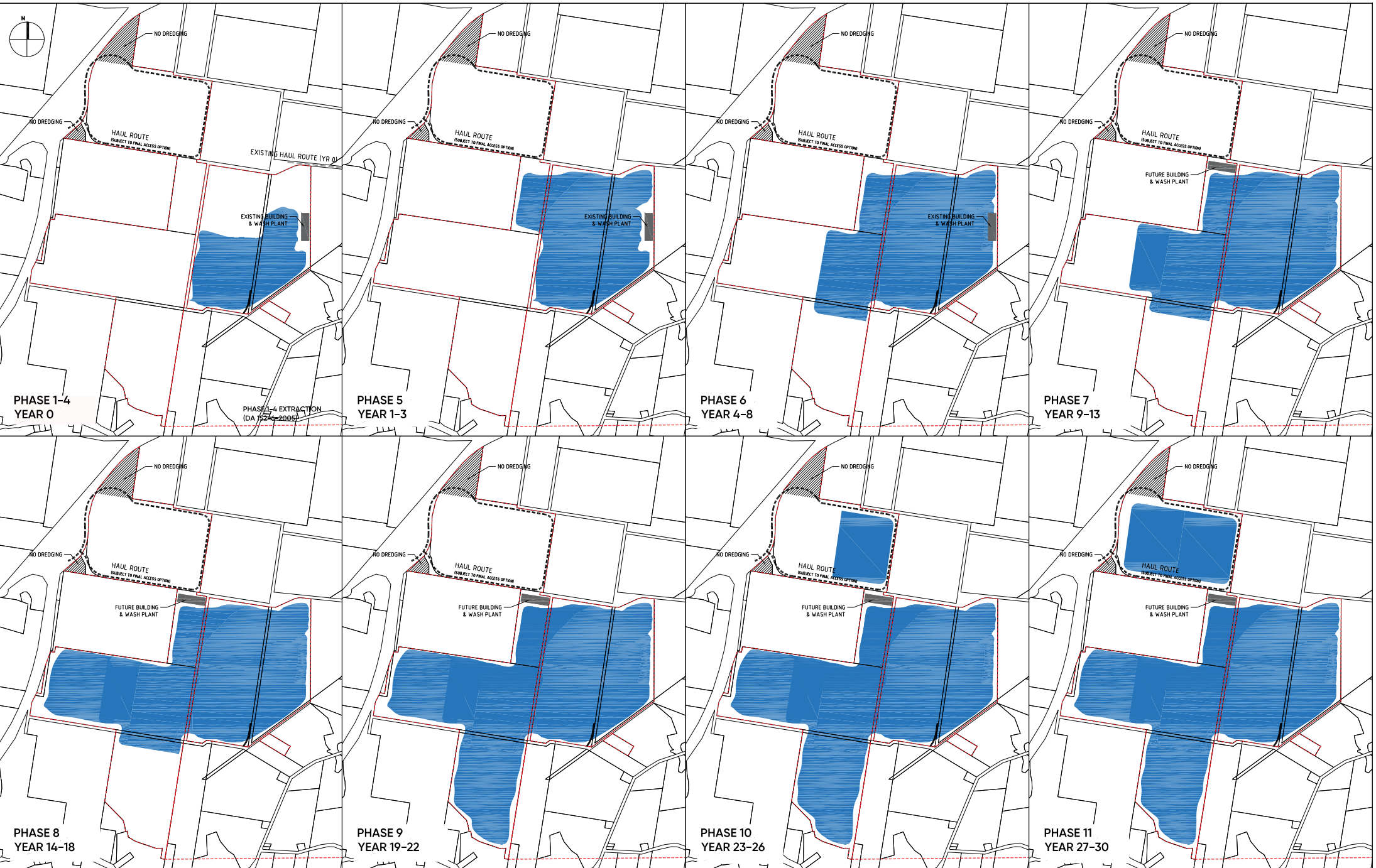
PROJECT
 TWEED SAND PLANT EXPANSION

CLIENT
 HANSON CONSTRUCTION MATERIALS

DRAWING
 PROPOSED TWEED SAND PLANT EXPANSION

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:20,000@A3	29/01/2021	AJF	ELH	12035	002	-





PHASE 1-4
YEAR 0

PHASE 4 EXTRACTION
(DA 1524-2005)

PHASE 5
YEAR 1-3

PHASE 6
YEAR 4-8

PHASE 7
YEAR 9-13

PHASE 8
YEAR 14-18

PHASE 9
YEAR 19-22

PHASE 10
YEAR 23-26

PHASE 11
YEAR 27-30

PROJECT TITLE
HANSON TWEED SAND PLANT
PHASE 5-11

DRAWING TITLE
CONCEPT DEVELOPMENT PHASING

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	PHASING ARRANGEMENT CHANGES - REG. PLANNER	25.01.2021	ZP	LN	LN	LN

ISSUE:	PRELIMINARY	CLIENT:	HANSON CONSTRUCTION MATERIALS PTY LTD
BASE PROVIDED BY:	SERMAPS DCDB	MANAGER:	LANCE NEWLEY

ZONE PLANNING GROUP
GOLD COAST
1636 Tweed Street, Burleigh Heads QLD 4220
PO Box 3905, Burleigh Town QLD 4220


GLADSTONE
2/172 Goodenoon St, Gladstone, QLD 4680
PO Box 5332, Gladstone QLD 4680
zoneplanning.com.au | 07 55622303






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SHEET 01 OF 01

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ORIENTATION
 SCALE 1:20 000
 200 400 600 800 1000 metres
ROBINA
 PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND	
	Site Boundary
	ASS Class 1 ASS likely to be found on and below the natural ground surface
	ASS Class 2 ASS likely to be found below the natural ground surface
	ASS Class 3 ASS likely to be found beyond 1 metre below the natural ground surface
	ASS Class 4 ASS likely to be found beyond 2 metres below the natural ground surface
	ASS Class 5 ASS are not typically found in class 5 areas

SOURCES
 Image: Nearmap 2020. Image date: 14/09/2020
 ASS Class Mapping: Department of Planning, Industry and Environment - Acid Sulfate Soils. Accessed on SEED Maps. Last updated: 09/12/2019.

PROJECT
 TWEED SAND PLANT EXPANSION
 SCALE 1:20 000@A3
 DATE 04/12/2020

CLIENT
 HANSON CONSTRUCTION MATERIALS
 DRAWN RMB
 CHECKED GLH

DRAWING
 ACID SULFATE SOIL CLASS MAP
 PROJECT 12035
 DRAWING 200
 REVISION -





ORIENTATION

SCALE 1:12 500

100 200 300 400 500 600 metres

ROBINA

PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND

- Lot Boundary
- ⊕ ASS Boreholes (G&S 2020)

SOURCES

Image: Nearmap 2020. Image date: 14/09/2020

PROJECT

TWEED SAND PLANT EXPANSION

CLIENT

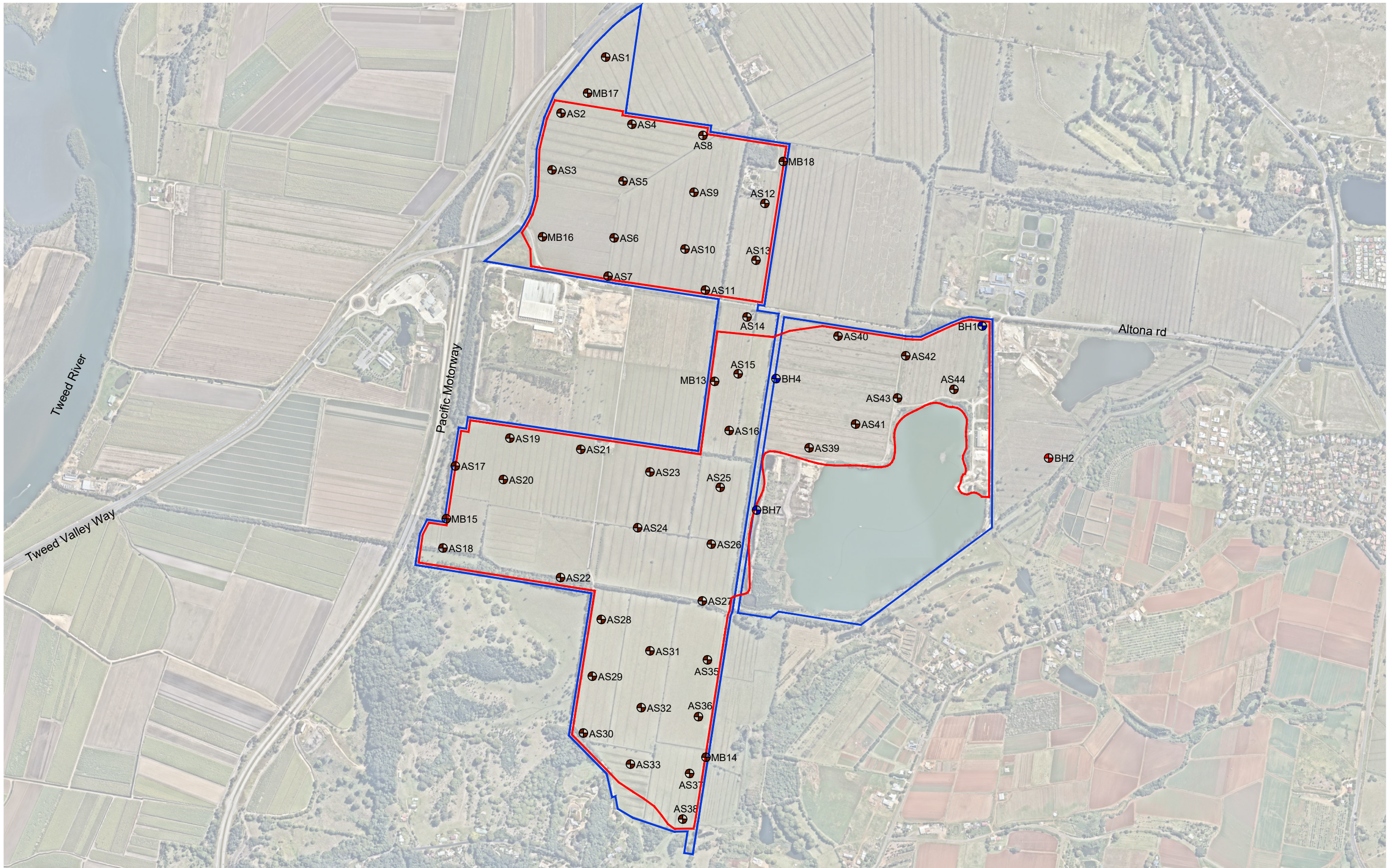
HANSON CONSTRUCTION MATERIALS

DRAWING

ACID SULFATE SOIL BOREHOLE LOCATIONS

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:12 500@A3	17/12/2020	SWP	ELH	12035	201	-





ORIENTATION

SCALE 1:12 500

100 200 300 400 500 600 metres

ROBINA

PO Box 4115 Robina QLD4230 07 5578 9944
Email robina@access.gs www.access.gs

LEGEND

- Lot Boundary
- Assessment Boundary
- ⊕ ASS Boreholes (G&S 2020)
- ⊕ ASS Boreholes (G&S 2004)
- ⊕ ASS Boreholes (HMC 2005)

SOURCES

Image: Nearmap 2020. Image date: 14/09/2020

PROJECT

TWEED SAND PLANT EXPANSION

CLIENT

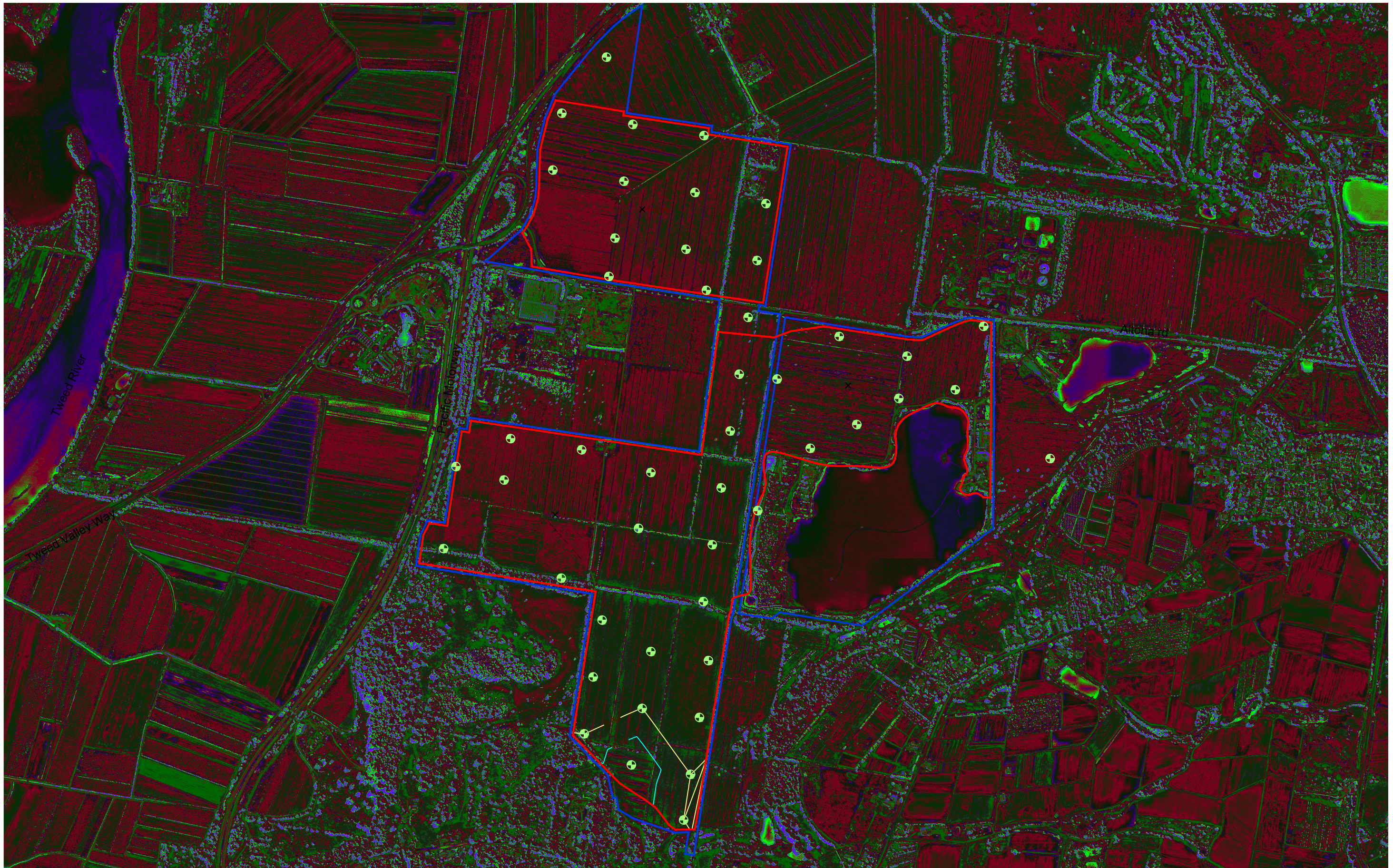
HANSON CONSTRUCTION MATERIALS

DRAWING

ACID SULFATE SOIL BOREHOLES USED IN MODELLING

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:12 500@A3	17/12/2020	SWP	ELH	12035	202	-





ORIENTATION
 SCALE 1:12 500
 100 200 300 400 500 600 metres
ROBINA
 PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND
 — Lot Boundary
 — Assessment Boundary
 ⊕ Boreholes

NOTES
 Contour Interval - 0.1m

SOURCES
 Image: Nearmap 2020. Image date: 14/09/2020

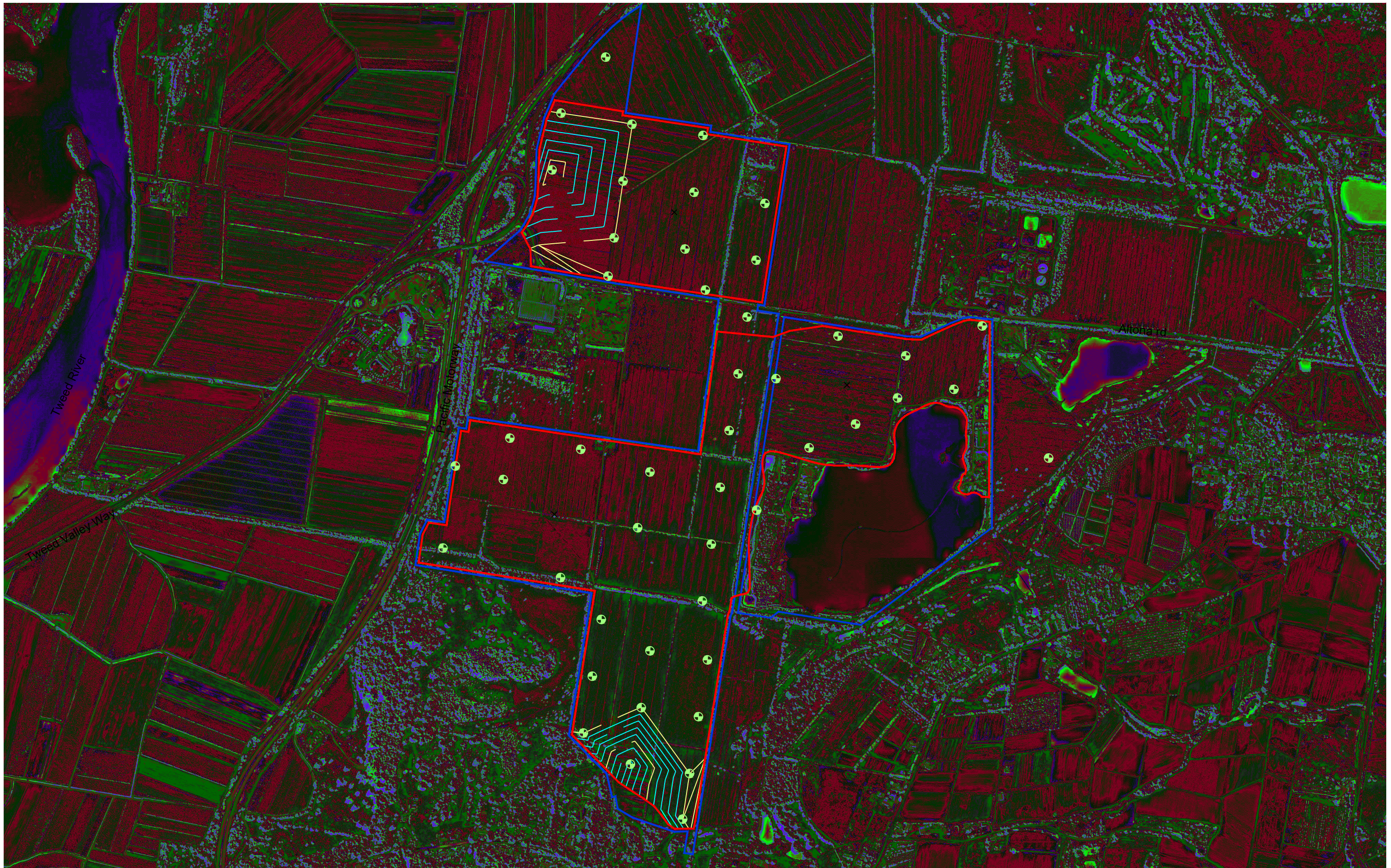
PROJECT
 TWEED SAND
 PLANT
 EXPANSION

CLIENT
 HANSON
 CONSTRUCTION
 MATERIALS

DRAWING
 EXTRAPOLATED
 THICKNESS OF
 CATEGORY 1 SOILS

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:12 500@A3	17/12/2020	SWP	ELH	12035	203	-





ORIENTATION
 SCALE 1:12 500
 100 200 300 400 500 600 metres
ROBINA
 PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND
 — Lot Boundary
 — Assessment Boundary
 ⊕ Boreholes

NOTES
 Contour Interval - 0.25m

SOURCES
 Image: Nearmap 2020. Image date: 14/09/2020

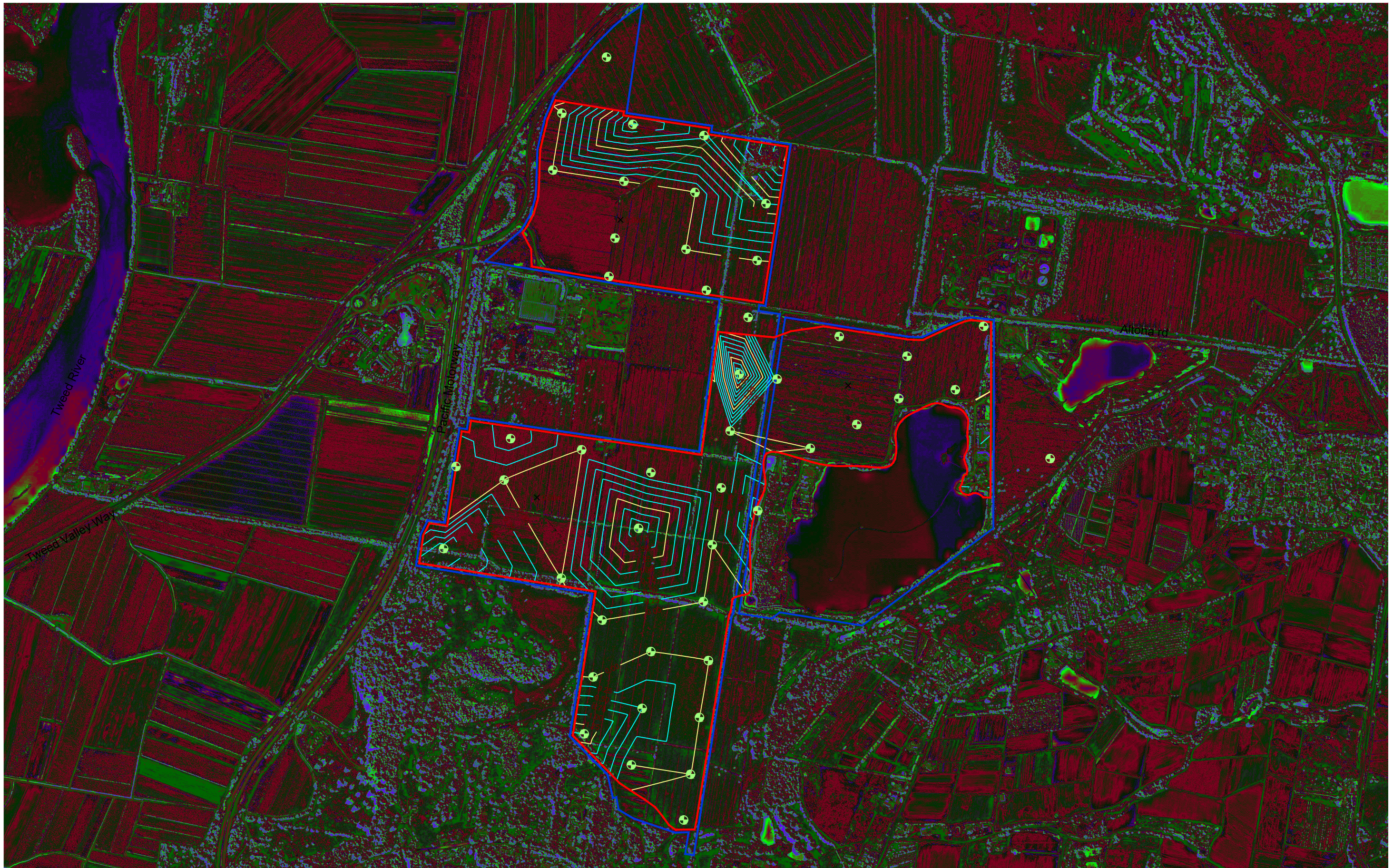
PROJECT
 TWEED SAND
 PLANT
 EXPANSION

CLIENT
 HANSON
 CONSTRUCTION
 MATERIALS

DRAWING
 EXTRAPOLATED
 THICKNESS OF
 CATEGORY 2 SOILS



SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:12 500@A3	17/12/2020	SWP	ELH	12035	204	-



ORIENTATION
 SCALE 1:12 500
 100 200 300 400 500 600 metres
ROBINA
 PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND
 — Lot Boundary
 — Assessment Boundary
 ⊕ Boreholes

NOTES
 Contour Interval - 0.25m

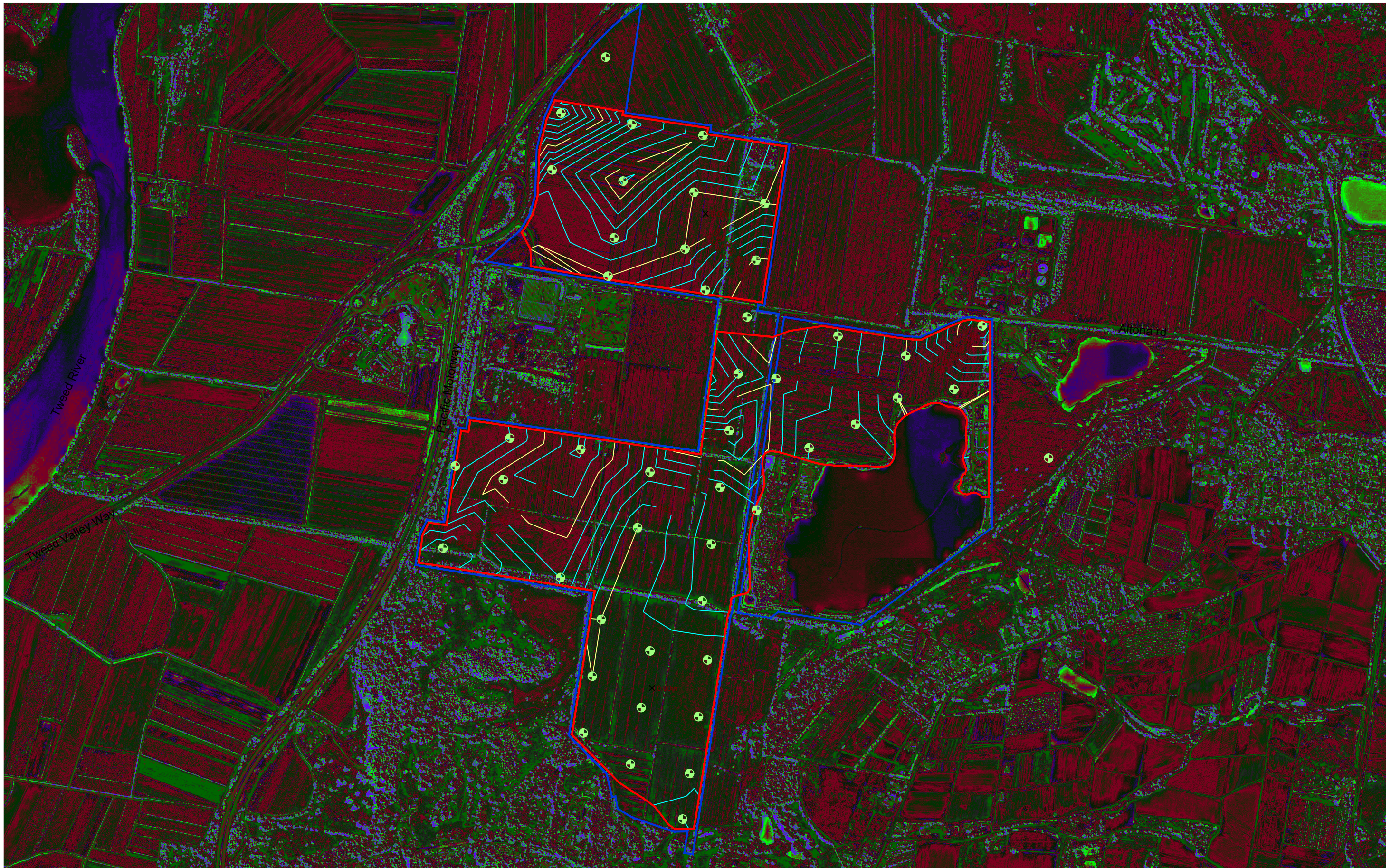
SOURCES
 Image: Nearmap 2020. Image date: 14/09/2020

PROJECT
 TWEED SAND
 PLANT
 EXPANSION
SCALE
 1:12 500@A3

CLIENT
 HANSON
 CONSTRUCTION
 MATERIALS
DATE
 17/12/2020
DRAWN
 SWP
CHECKED
 ELH

DRAWING
 EXTRAPOLATED
 THICKNESS OF
 CATEGORY 3 SOILS
PROJECT
 12035
DRAWING
 205
REVISION
 -





ORIENTATION
 SCALE 1:12 500
 100 200 300 400 500 600 metres
ROBINA
 PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND
 — Lot Boundary
 — Assessment Boundary
 ⊕ Boreholes

NOTES
 Contour Interval - 0.5m

SOURCES
 Image: Nearmap 2020. Image date: 14/09/2020

PROJECT
 TWEED SAND PLANT EXPANSION
CLIENT
 HANSON CONSTRUCTION MATERIALS

DRAWING
 EXTRAPOLATED THICKNESS OF CATEGORY 4 SOILS
 SCALE 1:12 500@A3 DATE 17/12/2020 DRAWN SWP CHECKED ELH PROJECT 12035 DRAWING 206 REVISION -





ORIENTATION
 SCALE 1:12 500
 100 200 300 400 500 600 metres
ROBINA
 PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND
 — Lot Boundary
 — Assessment Boundary
 ⊕ Boreholes

NOTES
 Contour Interval - 0.75m

SOURCES
 Image: Nearmap 2020. Image date: 14/09/2020

PROJECT
 TWEED SAND PLANT EXPANSION
CLIENT
 HANSON CONSTRUCTION MATERIALS

DRAWING
 EXTRAPOLATED THICKNESS OF CATEGORY 5 SOILS
 SCALE 1:12 500@A3 DATE 17/12/2020 DRAWN SWP CHECKED ELH PROJECT 12035 DRAWING 207 REVISION -





ORIENTATION
 SCALE 1:12 500
 100 200 300 400 500 600 metres
ROBINA
 PO Box 4115 Robina QLD4230 07 5578 9944
 Email robina@access.gs www.access.gs

LEGEND
 — Lot Boundary
 — Assessment Boundary
 ⊕ Boreholes

NOTES
 Contour Interval - 1.0m

SOURCES
 Image: Nearmap 2020. Image date: 14/09/2020

PROJECT
 TWEED SAND
 PLANT
 EXPANSION



CLIENT
 HANSON
 CONSTRUCTION
 MATERIALS

DRAWING
 EXTRAPOLATED
 THICKNESS OF
 CATEGORY 6 SOILS

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:12 500@A3	17/12/2020	SWP	ELH	12035	208	-



11 Appendix 2 – Borelogs

DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Dark brown (10YR 3/3) light clay ; no coarse fragments; dry; moderate platy structure; change to;	Natural
0.2				
0.4			Reddish grey (2.5YR 5/1) loamy sand ; very few, fine shell fragments; moderately moist; change to;	Natural
0.6				
0.8			Brown (7.5YR 5/2) loamy sand with diffuse transitions to many, medium sized, distinct, reddish yellow (7.5YR 6/6) mottles; very few, fine shell fragments; moist to wet; change to;	Natural
1	▼			
1.2			Grey (5Y 5/1) loamy sand ; very few, fine shell fragments; wet; change to;	Natural
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4			Very dark greenish grey (10Y 3/1) sandy loam ; very few, fine shell fragments; wet; change to;	Natural
4.2				
4.4				

BOREHOLE

AS1

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552363.7417

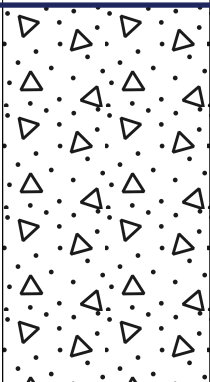
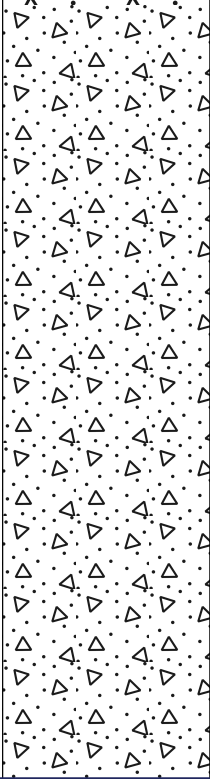
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6875032.984



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6				
6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			<p>Olive (5Y 5/4) loamy sand; very few, fine, shell fragments; wet; change to;</p>	<p>Natural</p>

BOREHOLE

AS1

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552363.7417

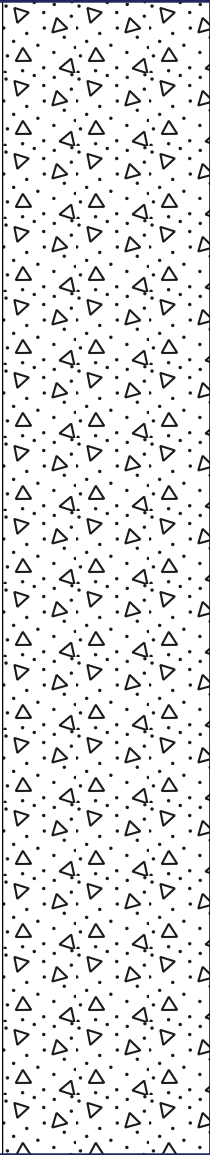
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6875032.984



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS1

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552363.7417

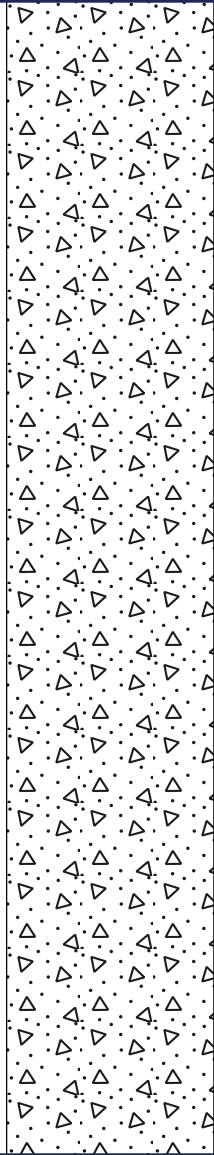
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6875032.984



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS1

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552363.7417

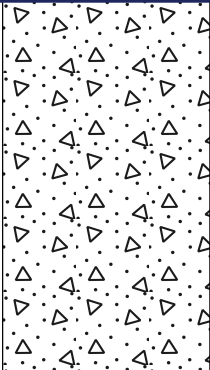
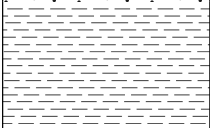
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6875032.984



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4				
19.6 19.8 20			Greenish black (10Y 2.5/1) medium heavy clay ; no coarse fragments; wet; borehole terminated at 20mBGL.	Natural
20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

AS1

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552363.7417



LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6875032.984



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (7.5YR 2.5/1) silty clay loam-light clay ; no coarse fragments; dry to moderately moist; change to;	Natural
0.2				
0.4	▼		Dark grey (10YR 4/1) sandy loam ; no coarse fragments; moderately moist to moist; change to;	Natural
0.6			Reddish brown (2.5YR 4/3) loamy sand ; very few, fine shell fragments @0.9m; moist to wet; change to;	Natural
0.8				
1				
1.2			Dark greenish grey (10Y 4/1) loamy sand ; few, fine shell fragments @ 1.8m; wet; change to;	Natural
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS2

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 19-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552208.2734

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874838.251



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			<p>Grey (2.5Y 6/1) loamy sand; few, fine shell fragments @8.5m; wet; change to;</p>	<p>Natural</p>

BOREHOLE

AS2

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 19-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552208.2734

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874838.251



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS2

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 19-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552208.2734

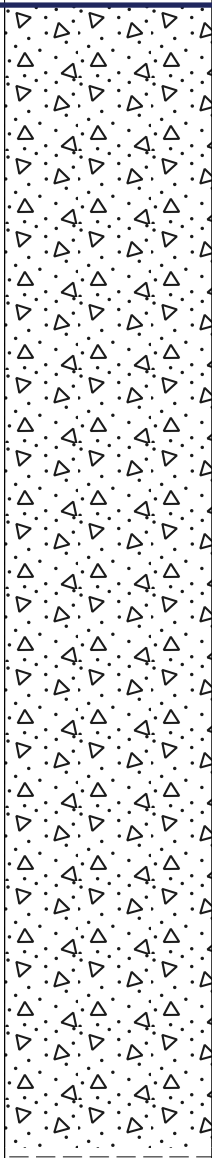
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874838.251



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS2

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 19-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552208.2734

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874838.251



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2			Greenish black (10Y 2.5/1) light clay ; no coarse fragments; wet; change to;	Natural
18.4			Greenish black (10Y 2.5/1) medium heavy clay ; no coarse fragments; wet; borehole terminated at 19mBGL.	Natural
18.6				
18.8				
19				
19.2				
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS2

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 19-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552208.2734

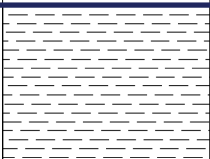

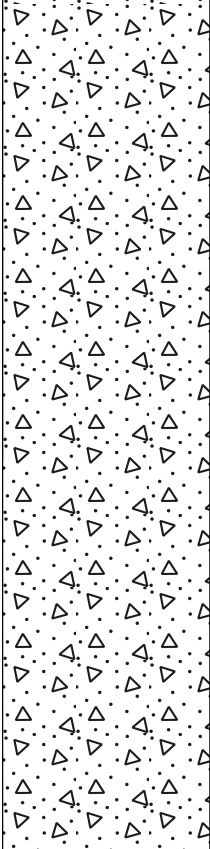
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874838.251



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0 0.2 0.4			Black (10YR 2/1) light clay ; no coarse fragments; dry; change to;	Natural
0.6 0.8 1 1.2	▼		Greyish brown (10YR 5/2) loamy sand with diffuse transitions to many, coarse sized, faint, grey (2.5Y 5/1) mottles; no coarse fragments; moderately moist to moist; change to;	Natural
1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8 4 4.2 4.4			Dark grey (5Y 4/1) loamy sand ; very few, fine shell fragments @4-4.5m and few, fine to medium shell fragments @ 5-6m; wet; change to;	Natural

BOREHOLE

AS3

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552177.1643

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874640.686



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8				
8.2 8.4 8.6 8.8 9			Grey (5Y 5/1) loamy sand-sand ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS3

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552177.1643

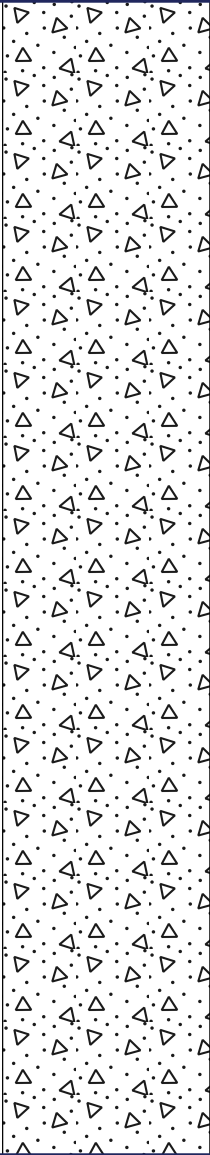
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874640.686

**+ GILBERT
SUTHERLAND**

DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS3

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552177.1643

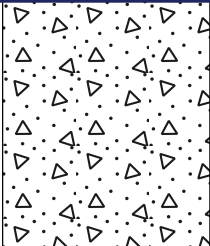
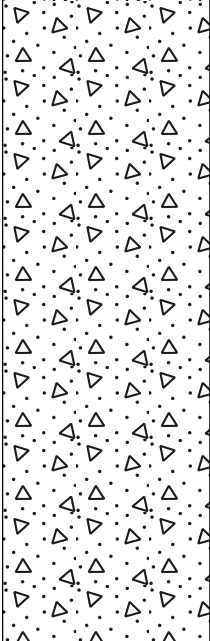
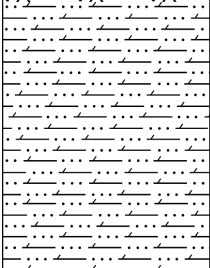
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874640.686



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4				
14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8			Dark grey (5Y 4/1) loamy sand ; no coarse fragments; wet; change to;	Natural
17 17.2 17.4 17.6 17.8 18			Very dark greenish grey (10Y 3/1) clay loam, sandy ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS3

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552177.1643

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874640.686



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2				
18.4				
18.6				
18.8				
19				
19.2				
19.4			Greenish black (10G 2.5/1) medium heavy to heavy clay ; few, fine shell fragments @19.4-20m; wet; borehole terminated at 20mBGL.	Natural
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS3

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552177.1643


LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874640.686



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (2.5Y 2.5/1) light clay ; very few, fine gravelly fragments; dry; change to;	Natural
0.2				
0.4			Grey (10YR 5/1) loamy to clayey sand ; few, fine gravelly fragments; moderately moist; change to;	Natural
0.6			Reddish yellow (7.5YR 7/8) loamy to clayey sand ; few, fine gravelly rock and shell fragments; moist; change to;	Natural
0.8	▼		Grey (5Y 5/1) clayey to loamy sand ; very few, fine shell fragments; wet; change to;	Natural
1				
1.2				
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2			Grey (5Y 5/1) loamy sand ; few, fine shell fragments; wet; change to;	Natural
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS4

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552455.2306

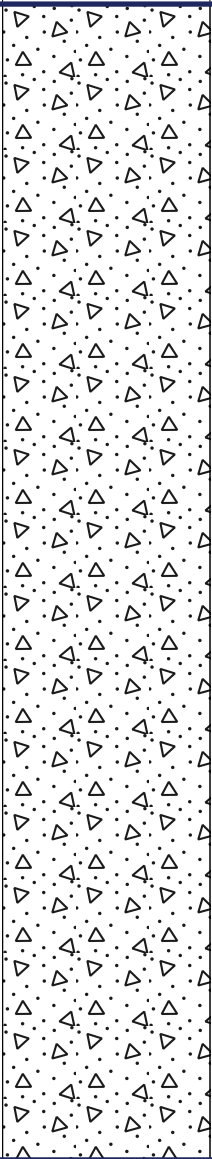
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874799.365



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS4

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552455.2306

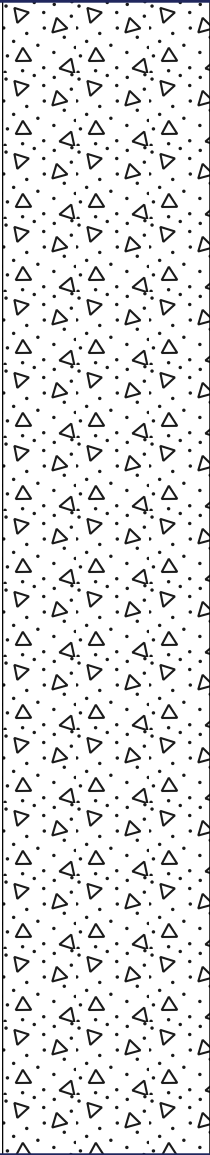
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874799.365

**+ GILBERT
SUTHERLAND**

DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS4

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552455.2306

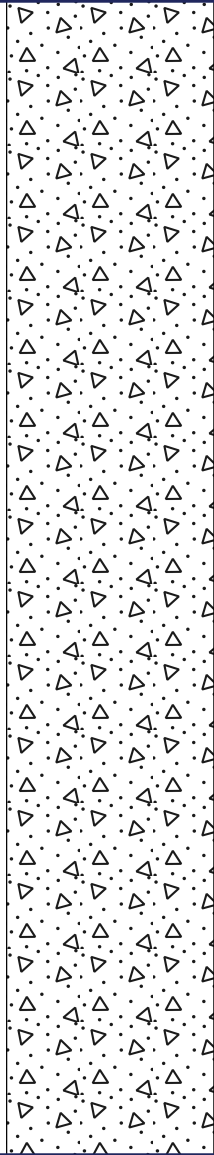
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874799.365



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS4

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552455.2306

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874799.365



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2				
18.4			Greenish black (10Y 2.5/1) heavy clay ; no coarse fragments; wet; borehole terminated at 19mBGL.	Natural
18.6				
18.8				
19				
19.2				
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS4

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19mBGL

DRILL DATE 20-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552455.2306

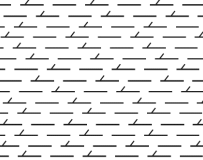
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874799.365



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) silty clay loam with a lens of very dark greyish brown (10YR 3/2) sandy clay loam from 0.45-0.7m; no coarse fragments; dry; change to;	Natural
0.2				
0.4				
0.6				
0.8	▼		Pinkish grey (7.5YR 6/2) loamy sand with diffuse transitions to very few, fine sized, distinct, reddish yellow (7.5YR 6/8) mottles; no coarse fragments; moist; change to;	Natural
1				
1.2			Very dark grey (3/N) loamy sand ; no coarse fragments; wet; change to;	Natural
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2			Dark grey (4/N) loamy sand with a lens of Reddish yellow (7.5YR 6/8) light clay with diffuse transitions to very few, fine sized, distinct, very dark grey (10YR 3/1) mottles; few, fine shell fragments @ 4.7-12m; wet; change to;	Natural
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS5

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.6mBGL

DRILL DATE 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552424.1215

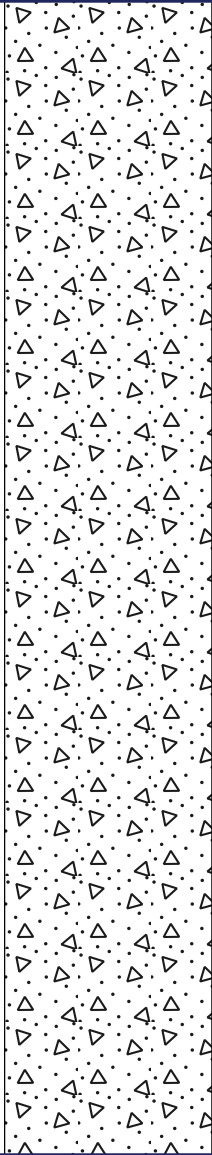
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874601.799



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS5

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.6mBGL

DRILL DATE 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552424.1215

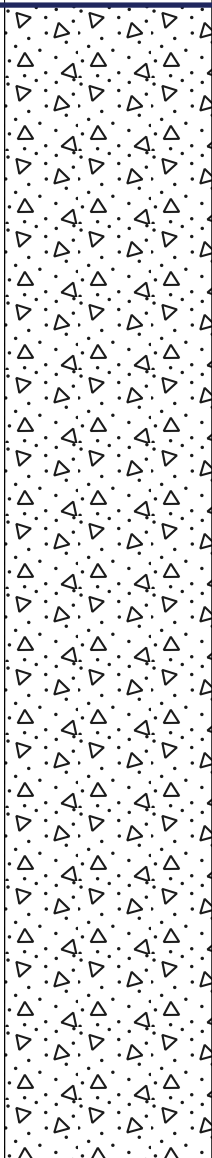
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874601.799



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS5

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.6mBGL

DRILL DATE 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552424.1215

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874601.799



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6				
15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18			Greenish black (10Y 2.5/1) clay loam, sandy with a lens of black (2.5Y 2.5/1) medium clay from 18.3-18.7m; very few, fine charcoal/wood fragments; wet; change to;	Natural

BOREHOLE

AS5

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.6mBGL

DRILL DATE 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552424.1215

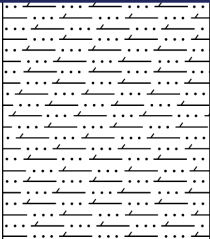
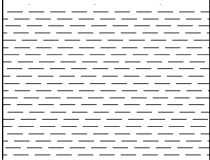
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874601.799



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19				
19.2 19.4 19.6			Greenish black (5GY 2.5/1) medium heavy clay ; very few, medium shell fragments @19.25m; wet; borehole terminated at 19.6mBGL.	Natural
19.8 20 20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

AS5

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.6mBGL

DRILL DATE 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552424.1215

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874601.799



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Dark brown (7.5YR 3/2) silty clay loam ; no coarse fragments; dry; change to;	Natural
0.2				
0.4				
0.6	▼		Greyish brown (10YR 5/2) sand to loamy sand with diffuse transitions to common, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; moist; change to; NR.	Natural Natural
0.8				
1				
1.2				
1.4				
1.6				
1.8				
2			Grey (5Y 6/1) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
2.2				
2.4				
2.6			Dark grey (2.5Y 4/1) sand to loamy sand with diffuse transitions to very few, fine sized, distinct, brown (7.5YR 4/4) mottles; no coarse fragments; wet; change to;	Natural
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS6

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18.5mBGL **DRILL DATE** 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552393.0125

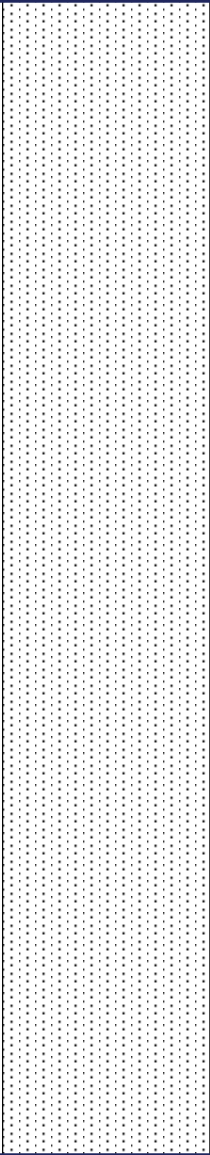
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874404.234



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			Grey (5Y 5/1) sand to loamy sand ; very few, fine shell fragments @5m and very few fine to medium shell fragments @ 7.0-8.5m; wet; change to;	Natural

BOREHOLE

AS6

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18.5mBGL

DRILL DATE 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552393.0125

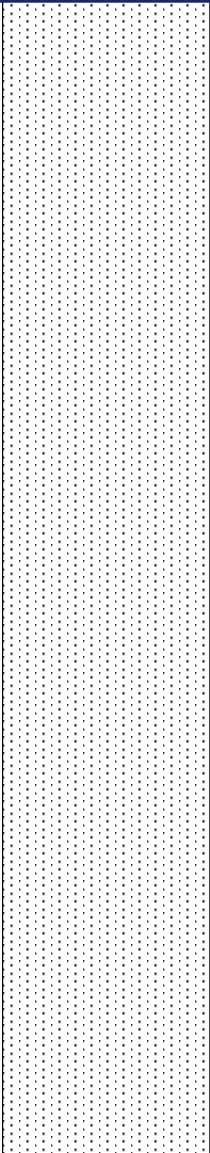
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874404.234



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS6

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18.5mBGL

DRILL DATE 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552393.0125

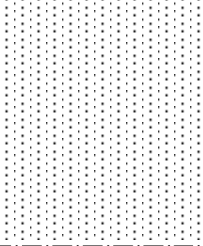
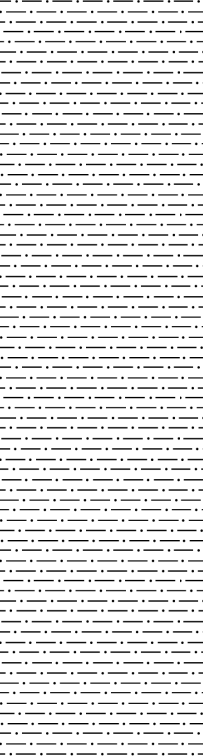
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874404.234



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6			Dark grey (5Y 4/1) loamy sand to clayey sand ; very few, medium shell fragments throughout; wet; change to;	Natural
14.8				
15				
15.2				
15.4				
15.6				
15.8				
16				
16.2				
16.4				
16.6				
16.8				
17				
17.2				
17.4				
17.6			Very dark greenish grey (10Y 3/1) medium heavy clay ; few, fine to medium shell fragments; wet; borehole terminated at 18.5mBGL.	Natural
17.8				
18				

BOREHOLE

AS6

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 18.5mBGL

DRILL DATE 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552393.0125

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874404.234



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4 19.6 19.8 20 20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

AS6

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18.5mBGL

DRILL DATE 15-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552393.0125

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874404.234



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) heavy sandy clay loam ; no coarse fragments; dry to moderately moist; change to;	Natural
0.2				
0.4				
0.6	▼		Grey (10YR 6/1) sandy loam with diffuse transitions to common, fine to medium sized, distinct, yellow (10YR 7/8) mottles; no coarse fragments; moist to wet; change to;	Natural
0.8				
1				
1.2				
1.4				
1.6				
1.8			Dark greenish grey (10Y 4/1) clayey sand ; no coarse fragments; wet; change to;	Natural
2				
2.2				
2.4				
2.6				
2.8				
3			Grey (5Y 5/1) loamy sand ; few, shell fragments @ 4.5m and throughout 6-9m; wet; change to;	Natural
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS7

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.25mBGL **DRILL DATE** 14-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552372.0354

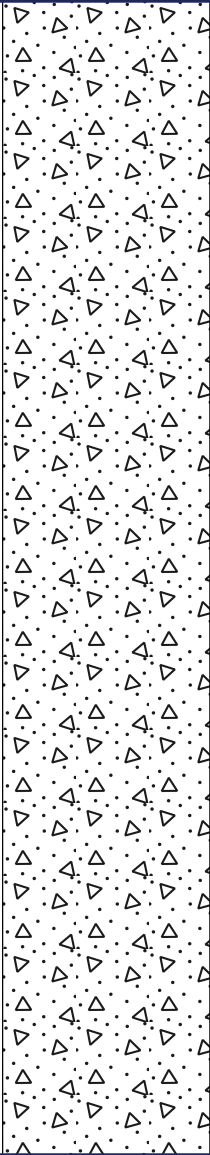
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874271.013



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS7

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.25mBGL

DRILL DATE 14-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552372.0354

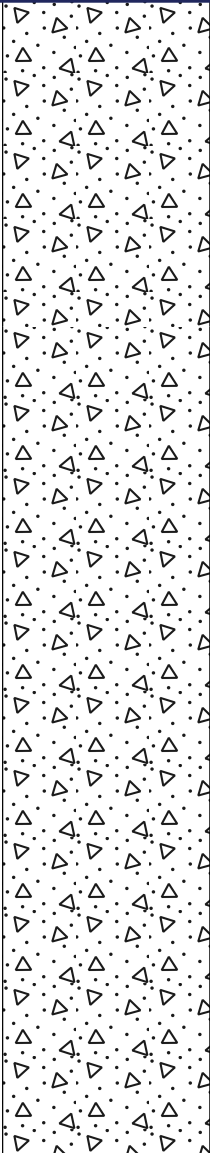
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874271.013



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			Dark grey (4/N) loamy sand ; very few, medium shell fragments and cemented sand peds @ 12m; wet; change to;	Natural

BOREHOLE

AS7

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.25mBGL **DRILL DATE** 14-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552372.0354

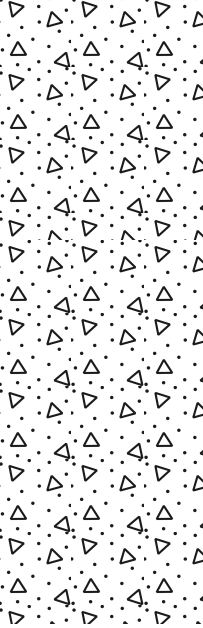












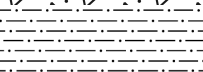
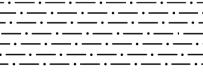
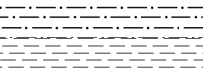



LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874271.013



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6			Very dark greenish grey (10G 3/1) loamy to clayey sand ; crab leg @ 15m; wet; change to;	Natural
14.8				
15				
15.2				
15.4				
15.6				
15.8				
16			Dark greenish grey (10Y 4/1) clayey sand ; few, fine shell fragments and charcoal/wood pieces throughout; wet; change to;	Natural
16.2				
16.4				
16.6			Very dark greenish grey (10Y 3/1) medium heavy clay ; few, fine to medium shell fragments; wet; borehole terminated at 17.25mBGL.	Natural
16.8				
17				
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

AS7

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.25mBGL

DRILL DATE 14-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552372.0354

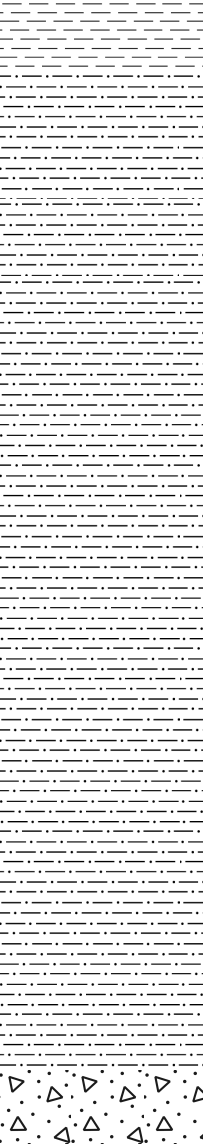

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874271.013



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark grey (2.5Y 3/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2			Greyish brown (2.5Y 5/2) clayey sand to sandy loam ; no coarse fragments; moist to wet; change to;	Natural
0.4				
0.6				
0.8	▼		Greyish brown (2.5Y 5/2) clayey sand to sandy loam ; no coarse fragments; wet; change to;	Natural
1				
1.2			Very dark greenish grey (10Y 3/1) clayey sand to sandy loam ; no coarse fragments; wet; change to;	Natural
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4			Grey (5Y 5/1) loamy sand ; few, fine shell fragments @ 5.5-6m; wet; change to;	Natural

BOREHOLE

AS8

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20.25mBGL **DRILL DATE** 21-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552702.1878

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6874760.479



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8				
6 6.2 6.4 6.6 6.8			grey (5/N) sand ; few, fine shell fragments; wet; change to;	Natural
7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			Grey (5Y 5/1) sand to loamy sand ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS8

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20.25mBGL **DRILL DATE** 21-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552702.1878

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6874760.479



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			<p>Dark grey (5Y 4/1) loamy sand; no coarse fragments; wet; change to;</p>	<p>Natural</p>

BOREHOLE

AS8

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20.25mBGL

DRILL DATE 21-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552702.1878

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6874760.479



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14			Grey (5Y 5/1) loamy sand ; no coarse fragments; wet; change to;	Natural
14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4			Dark grey (5Y 4/1) loamy sand ; no coarse fragments; wet; change to;	Natural
17.6 17.8 18				

BOREHOLE

AS8

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20.25mBGL **DRILL DATE** 21-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552702.1878

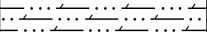
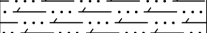
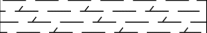
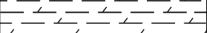
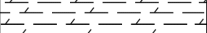
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6874760.479



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2			Very dark greenish grey (10Y 3/1) clay loam, sandy to silty clay loam ; no coarse fragments; wet; change to;	Natural
18.4				
18.6				
18.8				
19			Greenish black (10Y 2.5/1) silty clay loam ; no coarse fragments; wet; change to;	Natural
19.2				
19.4				
19.6				
19.8			Greenish black (10Y 2.5/1) heavy clay ; no coarse fragments; wet; borehole terminated at 20.25mBGL.	Natural
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS8

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20.25mBGL **DRILL DATE** 21-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552702.1878

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6874760.479



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0 0.2 0.4 0.6			Black (5Y 2.5/1) light clay ; no coarse fragments; dry; change to;	Natural
0.8 1	▼		Light yellowish brown (10YR 6/4) loamy to clayey sand ; no coarse fragments; moist to wet; change to;	Natural
1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8 4 4.2 4.4			Dark grey (4/N) loamy sand ; few to common, fine to medium shell fragments throughout from 2m; wet; change to;	Natural

BOREHOLE

AS9

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 22-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552671.0787

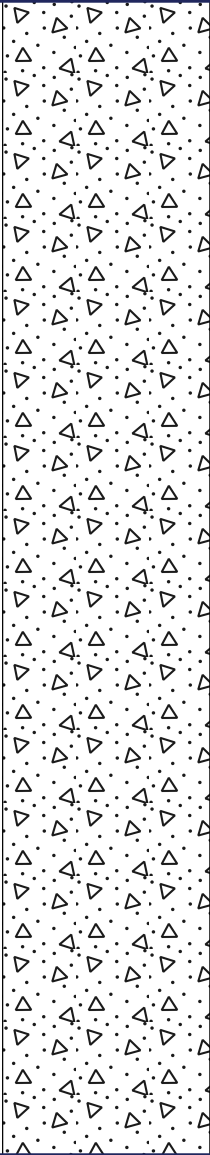
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874562.913



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS9

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 22-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552671.0787

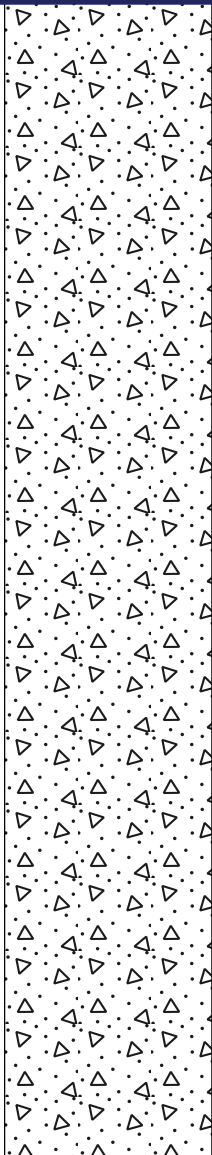
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874562.913



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS9

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 22-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552671.0787

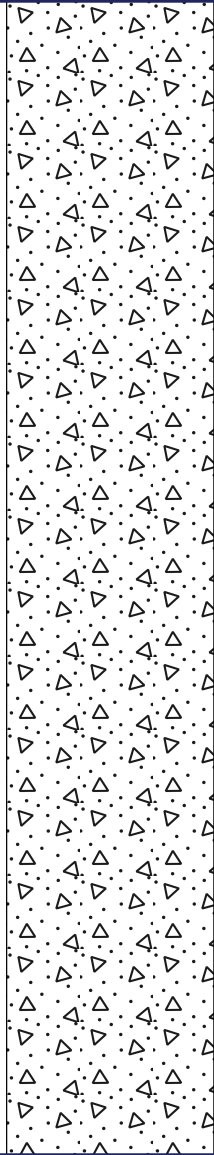
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874562.913



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS9

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 22-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552671.0787


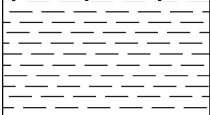
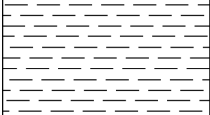







LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874562.913



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2				
18.4				
18.6			Very dark grey (3/N) medium clay ; few, fine shell fragments; wet; change to;	Natural
18.8				
19				
19.2				
19.4				
19.6			Dark grey (4/N) loamy sand ; no coarse fragments; wet; borehole terminated at 20mBGL due to rig issue with hose MHC expected in next run.	Natural
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS9

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 22-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552671.0787


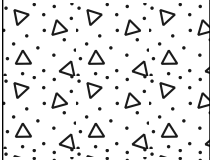
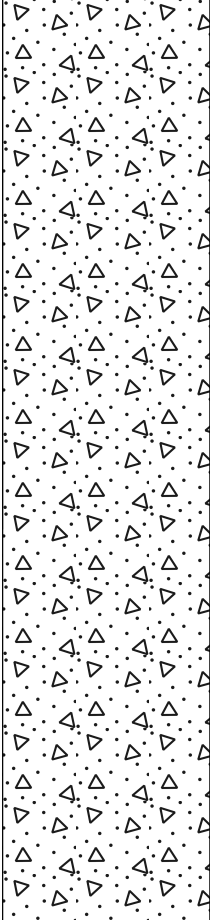


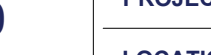


LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874562.913



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (5Y 2.5/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2			Yellowish brown (10YR 5/4) loamy sand with diffuse transitions to very few, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; moist to wet; change to;	Natural
0.4	▼		Grey (5/N) loamy sand ; few, fine to medium shell fragments @ 2.3-3.5m; wet; change to;	Natural
0.6				
0.8				
1				
1.2				
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS10

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18.5mBGL

DRILL DATE 22-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552639.9697

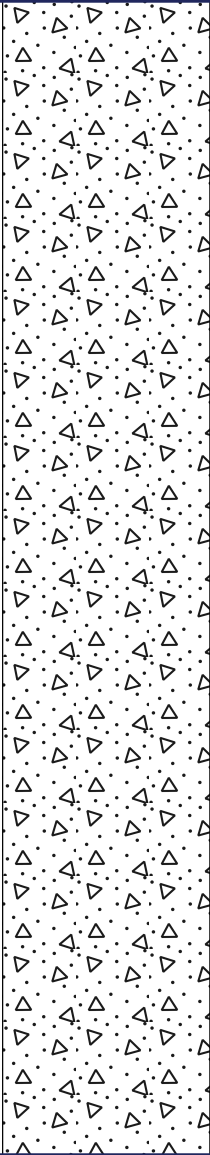
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874365.347



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS10

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18.5mBGL

DRILL DATE 22-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552639.9697

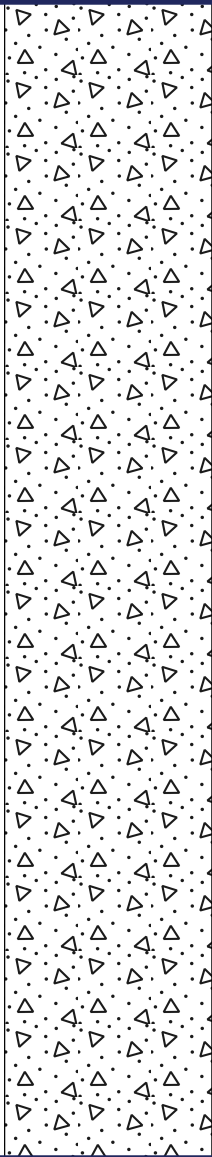
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874365.347



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS10

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18.5mBGL

DRILL DATE 22-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552639.9697

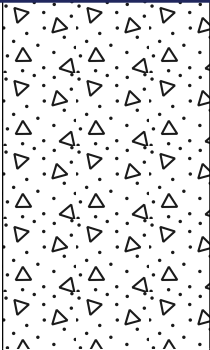
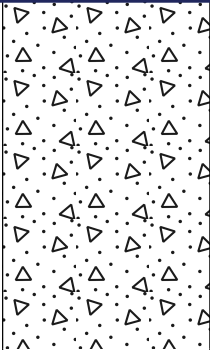
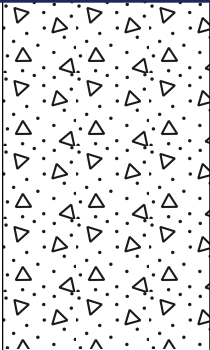
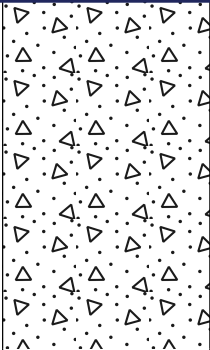
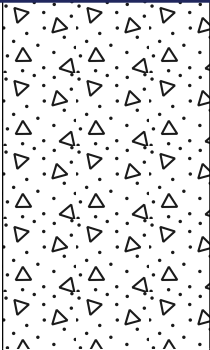
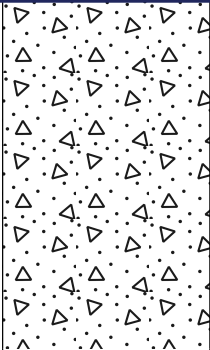
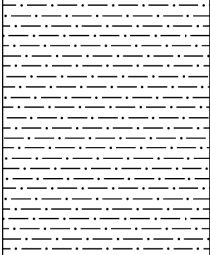
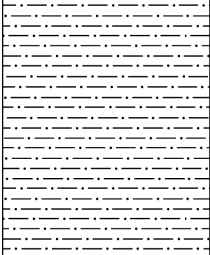
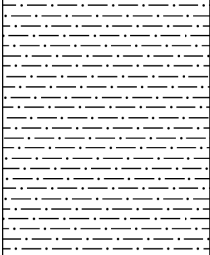
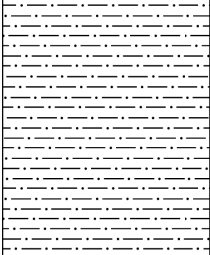
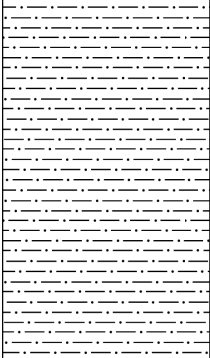
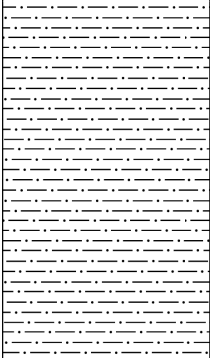
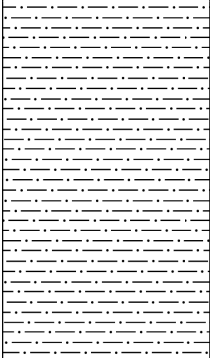
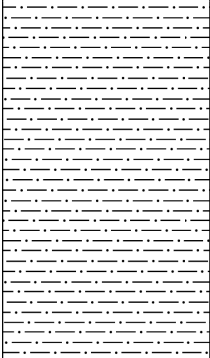
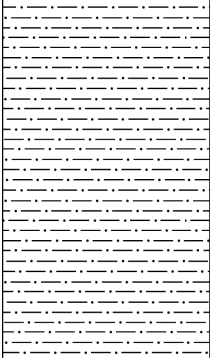
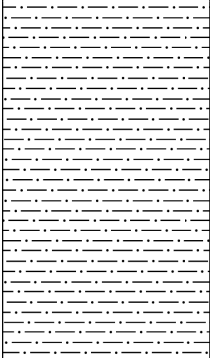
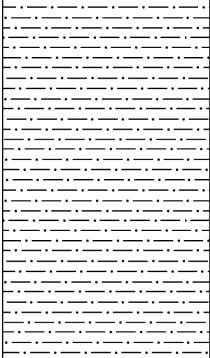
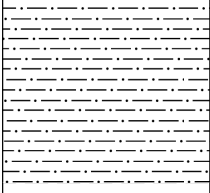
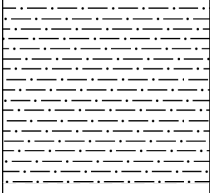
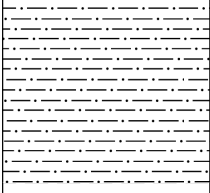
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874365.347



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6				
14.8				
15			Dark grey (4/N) clayey sand ; no coarse fragments; wet; change to;	Natural
15.2				
15.4				
15.6				
15.8				
16			Very dark greenish grey (10Y 3/1) clayey sand ; no coarse fragments; wet; change to;	Natural
16.2				
16.4				
16.6				
16.8				
17				
17.2				
17.4			Dark greenish grey (10Y 4/1) clayey sand ; no coarse fragments; wet; change to;	Natural
17.6				
17.8				
18				

BOREHOLE

AS10

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18.5mBGL **DRILL DATE** 22-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552639.9697

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874365.347






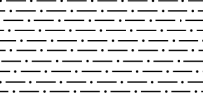

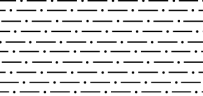







DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2			Greenish black (10Y 2.5/1) medium clay ; no coarse fragments; wet; borehole terminated at 18.5mBGL.	Natural
18.4				
18.6				
18.8				
19				
19.2				
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS10

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 18.5mBGL	DRILL DATE 22-Oct-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552639.9697
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY RMB	NORTHING 6874365.347



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) silty clay loam to light clay ; no coarse fragments; moderately moist; change to;	Natural
0.2			Light olive grey (5Y 6/2) sandy loam with diffuse transitions to common, medium sized, distinct, yellowish brown (10YR 5/8) mottles; no coarse fragments; moist; change to;	Natural
0.4				
0.6				
0.8	▼		Greyish brown (2.5Y 5/2) loamy sand with diffuse transitions to few, fine sized, distinct, yellowish brown (10YR 5/8) mottles; no coarse fragments; wet; change to;	Natural
1				
1.2			Dark greenish grey (10GY 4/1) clayey sand ; no coarse fragments; wet; change to;	Natural
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3			Dark greenish grey (5GY 4/1) loamy sand ; no coarse fragments; wet; change to;	Natural
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS11

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 23-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552710.7957

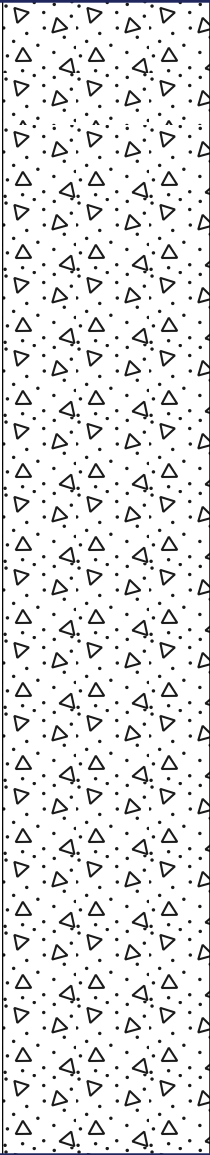
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6874222.792



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			Dark grey (4/N) loamy sand ; very few, medium shell fragments shells @ 6-9m, 9-11m; wet; change to;	Natural

BOREHOLE

AS11

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 23-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552710.7957

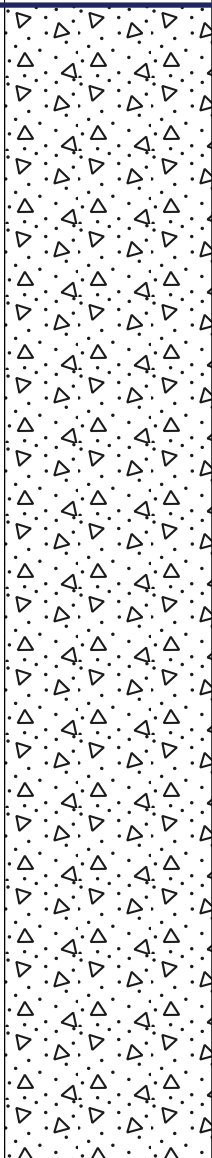
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6874222.792



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS11

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 23-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552710.7957

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6874222.792



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18			<p>Very dark grey (3/N) medium heavy clay; few, medium shell fragments @ 17.85m; wet; borehole terminated at 18mBGL.</p>	<p>Natural</p>

BOREHOLE

AS11

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 23-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552710.7957


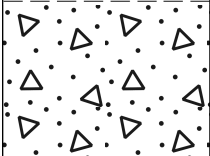
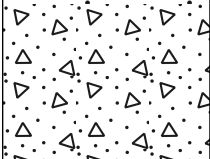






LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6874222.792



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) light clay to silty clay loam ; no coarse fragments; dry; change to;	Natural
0.2				
0.4			Grey (5Y 6/1) sandy loam with diffuse transitions to few, fine sized, distinct, yellowish brown (10YR 5/8) mottles; no coarse fragments; moist to wet; change to;	Natural
0.6				
0.8	▼			
1			Dark grey (4/N) loamy sand ; few, fine to medium shell fragments from 3-9m; wet; change to;	Natural
1.2				
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS12

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 23mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552918.0359

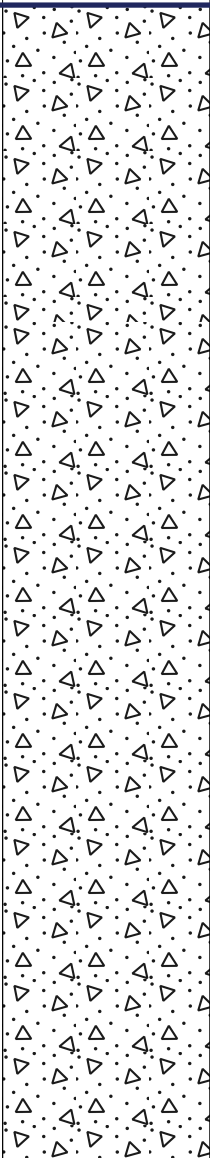
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874524.027



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			Dark greenish grey (10Y 4/1) loamy sand ; few, fine to medium shell fragments up to 9m; wet; change to;	Natural

BOREHOLE

AS12

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 23mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552918.0359

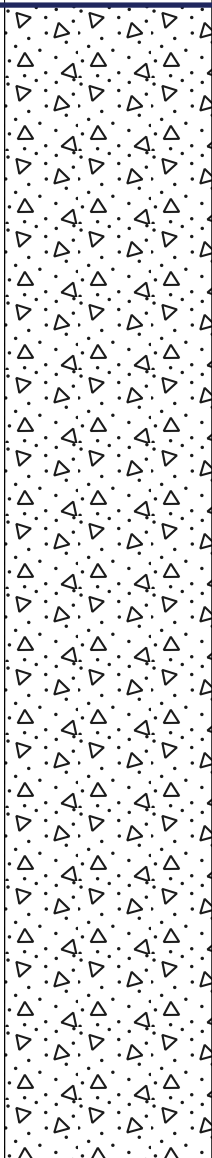
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874524.027



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS12

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 23mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552918.0359

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874524.027



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4				
16.6 16.8 17 17.2 17.4 17.6 17.8 18			<p>Very dark greenish grey (10Y 3/1) clayey to loamy sand; very few, fine shell fragments intermittently to 13m ; wet; change to;</p>	<p>Natural</p>

BOREHOLE

AS12

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 23mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552918.0359

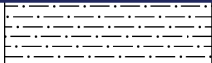
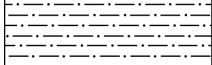

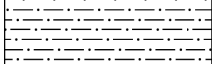
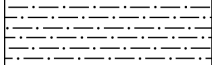
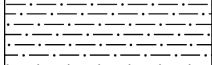

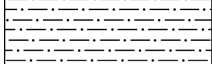
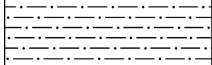
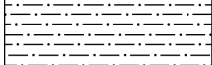
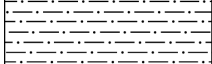
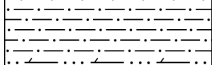
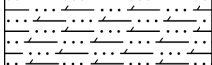
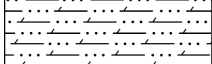
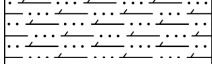
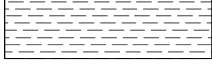






LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874524.027



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2				
18.4				
18.6				
18.8				
19				
19.2				
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21			Greenish black (10Y 2.5/1) clay loam, sandy ; very few, fine shell fragments; wet; change to;	Natural
21.2				
21.4				
21.6				
21.8			Greenish black (5GY 2.5/1) medium to heavy clay ; very few, fine to medium shell fragments; wet; borehole terminated at 23mBGL.	Natural
22				
22.2				
22.4				

BOREHOLE

AS12

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 23mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552918.0359

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874524.027



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0 0.2 0.4			Black (10YR 2/1) light clay ; no coarse fragments; dry to moderately moist; weak, blocky structure; change to;	Natural
0.6 0.8 1 1.2 1.4 1.6 1.8 2	▼		Grey (7.5YR 5/1) sandy loam with diffuse transitions to few, medium sized, distinct, reddish yellow (7.5YR 7/6) mottles; no coarse fragments; moist; change to;	Natural
2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8 4 4.2 4.4			grey (5/N) loamy sand ; few, fine shell fragments from 1.5-14.9m; wet; change to;	Natural

BOREHOLE

AS13

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL **DRILL DATE** 3-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552886.9269

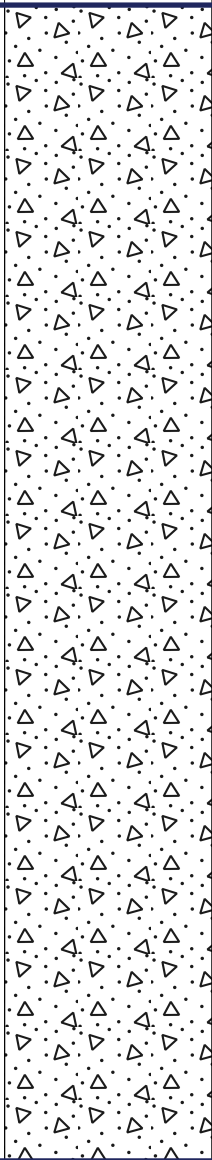
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874326.461



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS13

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 3-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552886.9269

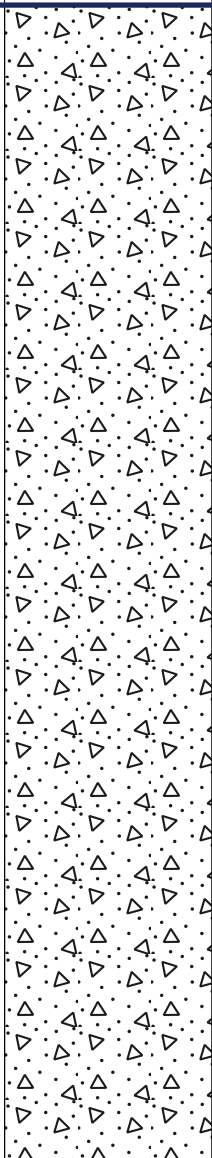
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874326.461



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS13

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 3-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552886.9269

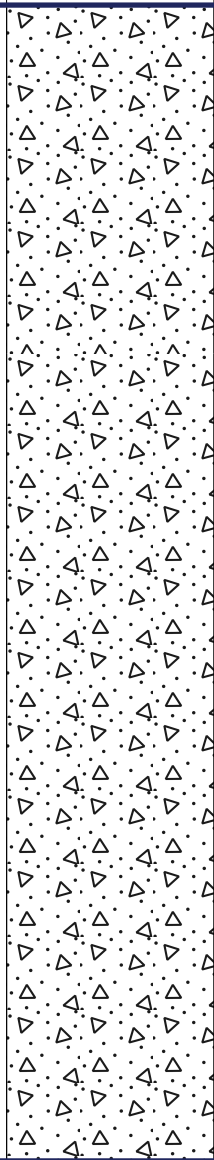
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874326.461



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18			Dark greenish grey (10Y 4/1) loamy sand ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS13

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 3-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552886.9269


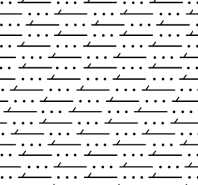
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874326.461



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6				
18.8 19 19.2 19.4			<p>Very dark greenish grey (10G 3/1) clay loam, sandy; very few, fine shell fragments; wet; borehole terminated at 19.5mBGL as the vibrocore will not penetrate, MHC expected in next .5m.</p>	Natural
19.6 19.8 20 20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

AS13

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL **DRILL DATE** 3-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552886.9269


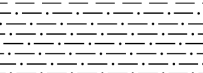

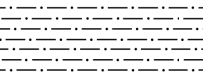
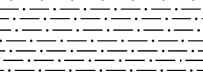
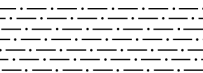
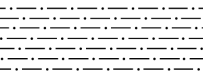
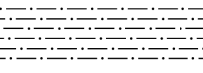



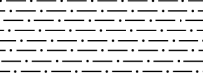
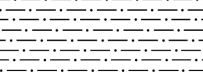
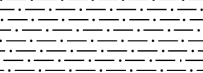
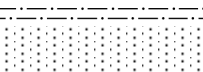
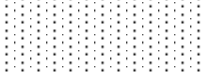




LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874326.461



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2			Greyish brown (10YR 5/2) clayey sand ; no coarse fragments; moist to wet; change to;	Natural
0.4			Greyish brown (10YR 5/2) clayey to loamy sand with diffuse transitions to few, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; wet; change to;	Natural
0.6	▼			
0.8				
1				
1.2			Very dark greenish grey (10Y 3/1) clayey sand to sandy loam ; no coarse fragments; wet; change to;	Natural
1.4				
1.6				
1.8				
2				
2.2				
2.4			NR.	Natural
2.6				
2.8				
3			Dark greyish olive (10Y 4/2) clayey sand to loamy sand ; no coarse fragments; wet; change to;	Natural
3.2				
3.4				
3.6				
3.8				
4			grey (5/N) sand ; few, fine shell fragments; wet; change to;	Natural
4.2				
4.4				

BOREHOLE

AS14

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 18mBGL

DRILL DATE 13-Oct-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552855.8179

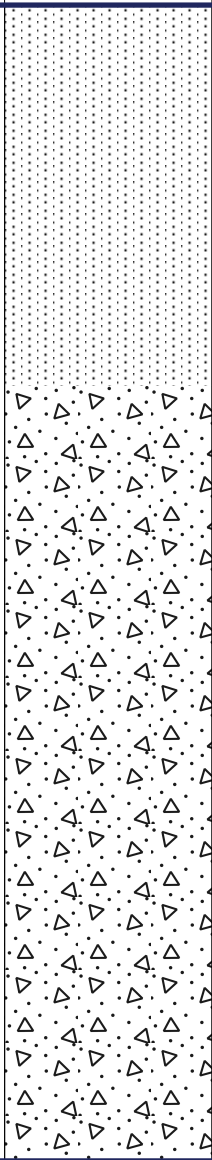
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6874128.895



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			<p>Grey (5Y 5/1) sand to loamy sand; few, fine to medium shell fragments and a piece of charcoal; wet; change to;</p>	<p>Natural</p>

BOREHOLE

AS14

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 13-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552855.8179

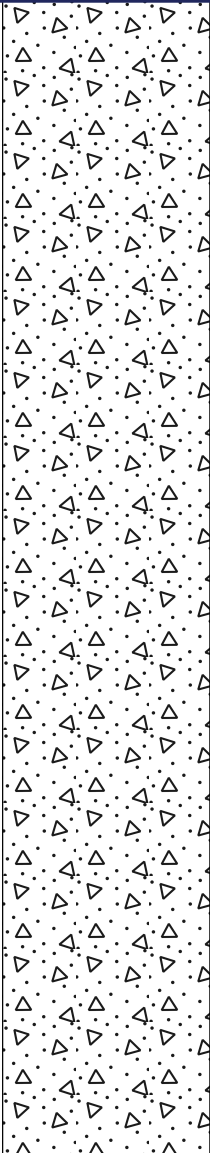
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6874128.895



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS14

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 13-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552855.8179

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6874128.895



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6				
14.8				
15				
15.2				
15.4				
15.6				
15.8				
16				
16.2				
16.4				
16.6				
16.8				
17				
17.2				
17.4				
17.6				
17.8			Dark grey (5Y 4/1) clayey sand ; no coarse fragments; wet; change to;	Natural
18			Very dark grey (5Y 3/1) heavy sandy loam ; very few, fine to medium shell fragments; wet; borehole terminated at 18mBGL in heavy silt, assumed medium clay in next metre.	Natural

BOREHOLE

AS14

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 13-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552855.8179


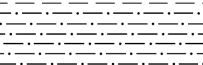
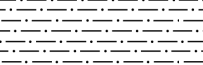
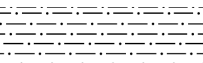
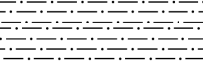
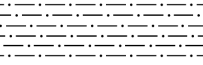
















LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6874128.895



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark grey (7.5YR 3/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2			Grey (2.5Y 5/1) clayey sand with diffuse transitions to few, fine sized, distinct, very dark grey (7.5YR 3/1) mottles; no coarse fragments; moist; change to;	Natural
0.4				
0.6				
0.8	▼		Greyish brown (2.5Y 5/2) clayey sand to loamy sand ; no coarse fragments; wet; change to;	Natural
1				
1.2			Grey (5Y 5/1) clayey sand ; no coarse fragments; wet; change to;	Natural
1.4			Very dark greenish grey (10Y 3/1) clayey sand ; no coarse fragments; wet; change to;	Natural
1.6			NR.	Natural
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2			Dark greenish grey (10Y 4/1) loamy sand to clayey sand ; no coarse fragments; wet; change to;	Natural
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS15

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 13-Oct-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552824.7089

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873931.33



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4			grey (5/N) sand ; few, fine shell fragments; wet; change to;	Natural
6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			Grey (5Y 5/1) sand ; few to common, fine to medium shell fragments; wet; change to;	Natural

BOREHOLE

AS15

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 13-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552824.7089

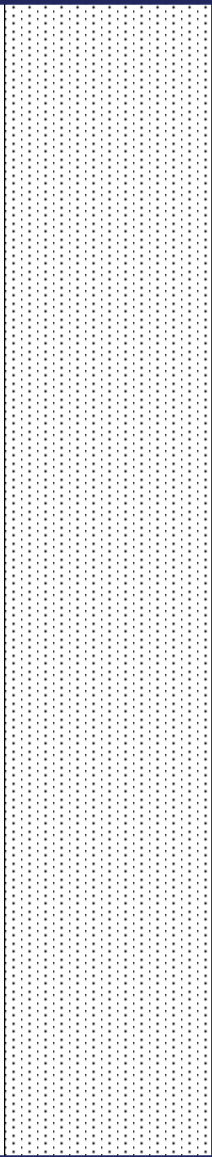
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873931.33



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS15

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 13-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552824.7089

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873931.33



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				
17.2			Greenish black (10Y 2.5/1) heavy clay ; few, fine to medium shell fragments; wet; borehole terminated at 17.5mBGL.	Natural
17.4				

BOREHOLE

AS15

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 13-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552824.7089

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873931.33



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN		
0	▼		Black (10YR 2/1) light clay ; no coarse fragments; dry; change to;	Natural		
0.2			Brown (10YR 5/3) clayey sand to sandy loam with diffuse transitions to few, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; wet; change to;	Natural		
0.4				Dark grey (2.5Y 4/1) clayey sand to sandy loam ; no coarse fragments; wet; change to;	Natural	
0.6					Very dark grey (5Y 3/1) clayey sand to loamy sand ; no coarse fragments; wet; change to;	Natural
0.8						
1						
1.2						
1.4			NR.	Natural		
1.6						
1.8						
2						
2.2						
2.4						
2.6						
2.8						
3						
3.2						
3.4		Dark greenish grey (10Y 4/1) loamy sand ; no coarse fragments; wet; change to;	Natural			
3.6						
3.8						
4						
4.2						
4.4						

BOREHOLE

AS16

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL **DRILL DATE** 12-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552793.5998

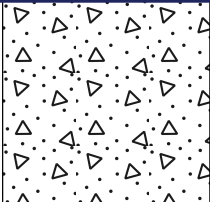
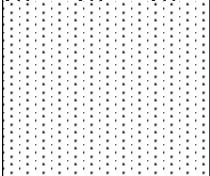
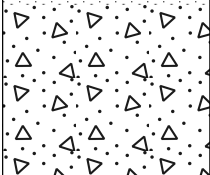
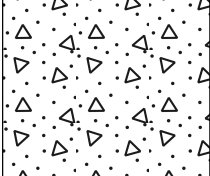
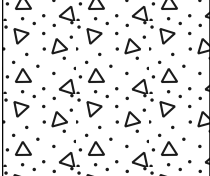
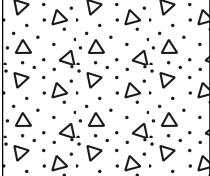


LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873733.764



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6				
4.8				
5				
5.2				
5.4			grey (5/N) sand ; no coarse fragments; wet; change to;	Natural
5.6				
5.8				
6			Grey (5Y 5/1) loamy sand to sand ; very few, fine shell fragments; wet; change to;	Natural
6.2				
6.4				
6.6				
6.8				
7				
7.2				
7.4				
7.6				
7.8				
8				
8.2				
8.4				
8.6				
8.8				
9				

BOREHOLE

AS16

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL **DRILL DATE** 12-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552793.5998

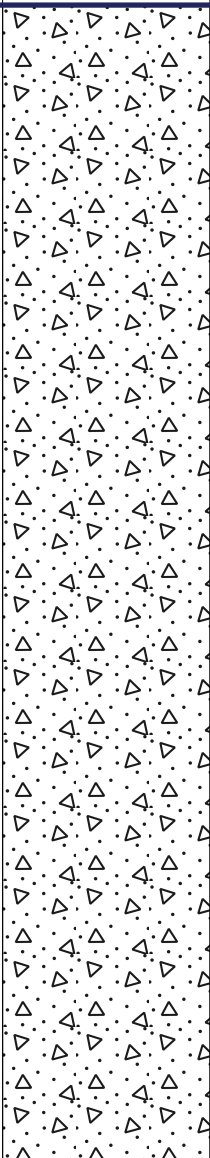
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873733.764



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS16

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 12-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552793.5998

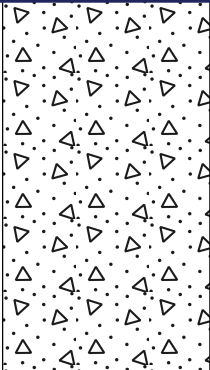









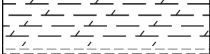









LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873733.764



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6				
14.8				
15			Grey (5Y 5/1) loamy sand ; very few, fine shell fragments; wet; change to;	Natural
15.2				
15.4				
15.6				
15.8				
16				
16.2				
16.4				
16.6			Dark grey (5Y 4/1) sandy loam ; no coarse fragments; wet; change to;	Natural
16.8			Very dark grey (5Y 3/1) silty clay loam ; no coarse fragments; wet; change to;	Natural
17			Very dark grey (5Y 3/1) heavy clay ; no coarse fragments; wet; borehole terminated at 17.5mBGL.	Natural
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

AS16

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL **DRILL DATE** 12-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552793.5998


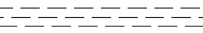
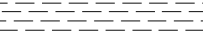
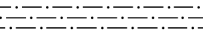
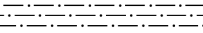
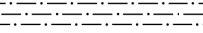
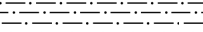
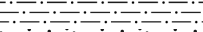

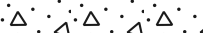













LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873733.764



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) light clay ; no coarse fragments; moderately moist; no segregations; change to;	Natural
0.2				
0.4			Grey (2.5Y 5/1) clayey sand with diffuse transitions to very few, fine sized, distinct, very dark grey (2.5Y 3/1) mottles; no coarse fragments; moist; change to;	Natural
0.6				
0.8				
1	▼		Light grey (2.5Y 7/1) loamy sand with diffuse transitions to many, medium sized, distinct, reddish yellow (7.5YR 6/8) mottles; no coarse fragments; wet; change to;	Natural
1.2				
1.4				
1.6			Grey (2.5Y 5/1) loamy sand with diffuse transitions to few, fine sized, distinct, olive yellow (2.5Y 6/6) mottles; no coarse fragments; wet; change to;	Natural
1.8				
2			Dark grey (4/N) fine-medium sand ; shell fragments @ 4.4, medium shells @ 4.9; wet; change to;	Natural
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS17

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 29-Sep-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 551840

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873610



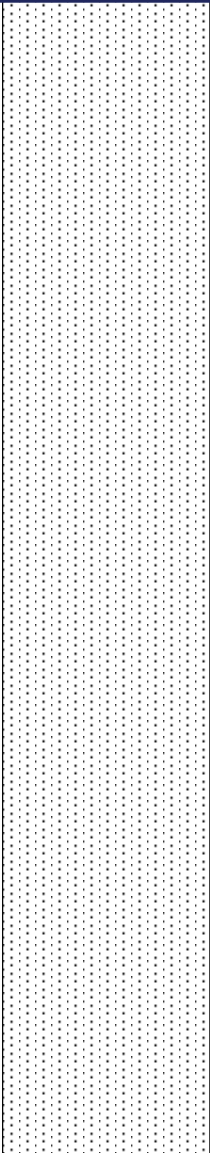
DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			<p>grey (6/N) fine-medium sand; no coarse fragments; wet; change to;</p> <p>Dark grey (4/N) clayey sand; no coarse fragments; wet; change to;</p>	<p>Natural</p> <p>Natural</p>

BOREHOLE

AS17

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.5mBGL	DRILL DATE 29-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 551840
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873610



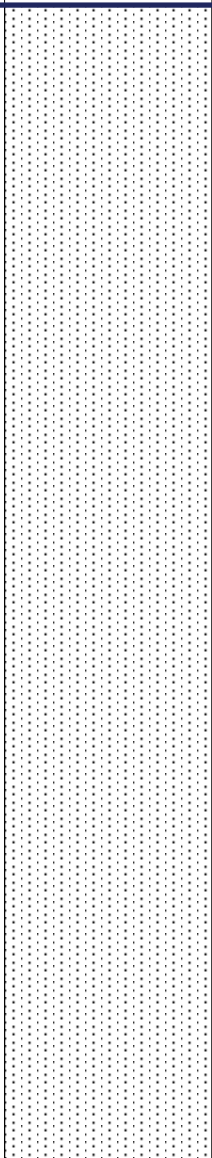
DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			grey (5/N) sand; shell clusters @ 9.5, 10.1 and 11.3m; wet; no segregations; change to;	Natural

BOREHOLE

AS17

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.5mBGL	DRILL DATE 29-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 551840
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873610




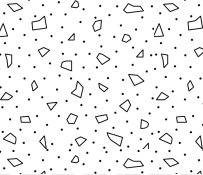
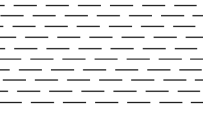
DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS17

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.5mBGL	DRILL DATE 29-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 551840
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873610



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2				
18.4			Very dark greenish grey (5GY 3/1) sandy clay loam ; Bark pieces @18.6m and shell fragments throughout; wet; change to;	Natural
18.6				
18.8				
19			Greenish black (5GY 2.5/1) medium clay ; no coarse fragments; wet; borehole terminated at 19.5mBGL.	Natural
19.2				
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS17

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.5mBGL	DRILL DATE 29-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 551840
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873610



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN	
0	▼		Dark grey (10YR 4/1) medium heavy clay with diffuse transitions to few to common, fine sized, distinct, very dark grey (7.5YR 3/1) mottles; no coarse fragments; moist; change to;	Natural	
0.2					
0.4					
0.6				Light brownish grey (10YR 6/2) clayey sand with diffuse transitions to very few, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; moist to wet; change to;	Natural
0.8				No return, lost sample;	Natural
1					
1.2					
1.4				Dark grey (4/N) clayey sand with diffuse transitions to few to common, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; wet; change to;	Natural
1.6					
1.8				Dark grey (4/N) clayey sand ; no coarse fragments; wet; change to;	Natural
2					
2.2					
2.4					
2.6					
2.8					
3					
3.2			Dark grey (4/N) sand ; no coarse fragments; wet; small lumps of clayey sand throughout; change to;	Natural	
3.4					
3.6					
3.8					
4					
4.2					
4.4					

BOREHOLE

AS18

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 15mBGL

DRILL DATE 28-Sep-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 551797

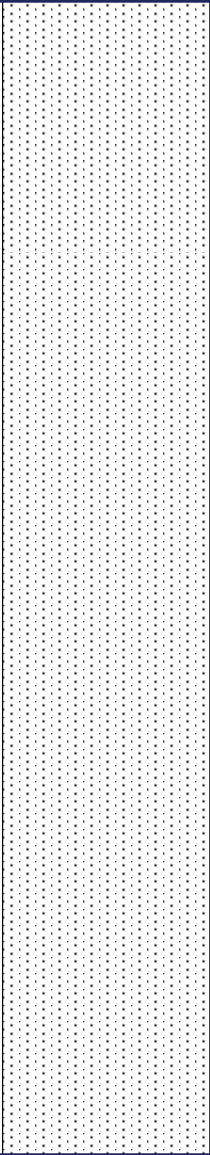
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873325



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			<p>grey (6/N) sand; common to many, fine to medium Shell fragments @ 12-12.6m; wet; change to;</p>	<p>Natural</p>

BOREHOLE

AS18

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 15mBGL

DRILL DATE 28-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 551797

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873325



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				
			Very dark greenish grey (10Y 3/1) clayey sand ; no coarse fragments; wet; no segregations; change to;	Natural

BOREHOLE

AS18

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 15mBGL

DRILL DATE 28-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 551797



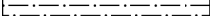
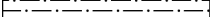
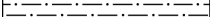
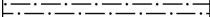

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873325



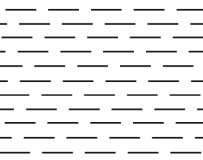
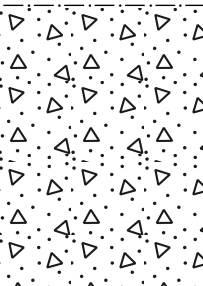
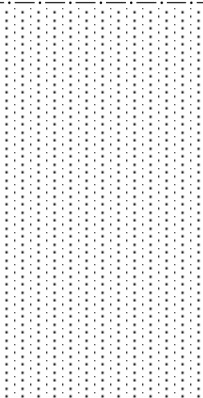
DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6			Dark greyish olive (10Y 4/2) medium heavy clay with diffuse transitions to many, medium sized, distinct, brown (7.5YR 4/4) mottles; no coarse fragments; wet; borehole terminated at 15mBGL.	Natural
14.8				
15				
15.2				
15.4				
15.6				
15.8				
16				
16.2				
16.4				
16.6				
16.8				
17				
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

AS18

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 15mBGL	DRILL DATE 28-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 551797
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873325



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN	
0	▼		Very dark brown (10YR 2/2) light medium clay ; no coarse fragments; moderately moist; change to;	Natural	
0.2					
0.4					
0.6					
0.8				Grey (10YR 5/1) clayey sand with diffuse transitions to very few, fine sized, distinct, very dark grey (10YR 3/1) mottles; no coarse fragments; moist; change to;	Natural
1.0			Grey (10YR 5/1) loamy sand with diffuse transitions to many, medium sized, distinct, yellow (10YR 7/8) mottles; no coarse fragments; wet; change to;	Natural	
1.2					
1.4			grey (5/N) loamy sand ; no coarse fragments; wet; change to;	Natural	
1.6					
1.8					
2.0			Very dark grey (3/N) clayey sand ; no coarse fragments; wet; change to;	Natural	
2.2			Dark grey (4/N) sand ; no coarse fragments; wet; change to;	Natural	
2.4					
2.6					
2.8					
3.0					
3.2					
3.4					
3.6			grey (5/N) sand ; Shell fragments @ 6-8.3m and few, large shells @ 8.1m; wet; change to;	Natural	
3.8					
4.0					
4.2					
4.4					

BOREHOLE

AS19

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 29-Sep-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552030

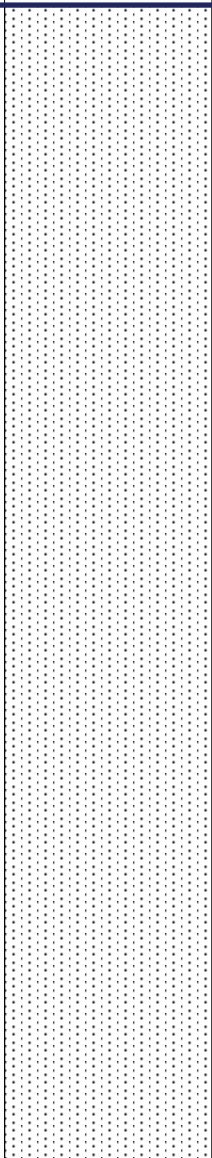
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873707



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS19

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 29-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552030

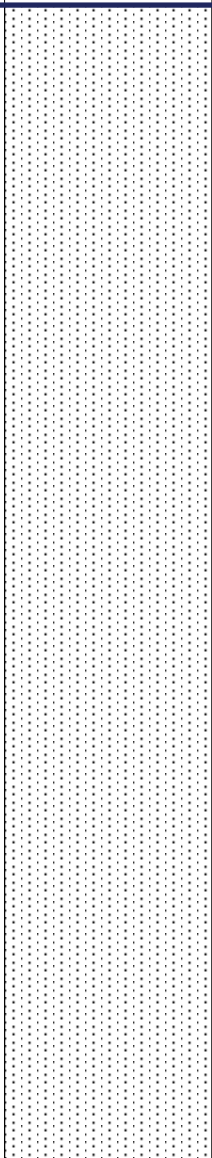
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873707



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS19

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 29-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552030

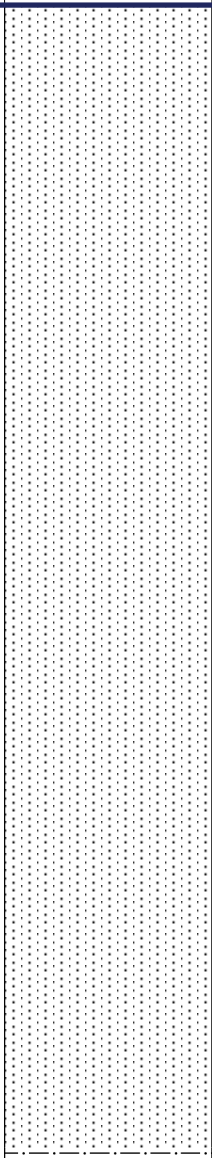
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873707



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS19

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 29-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552030

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873707





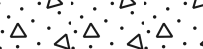
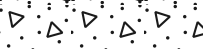

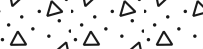
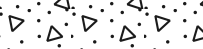
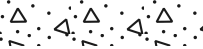
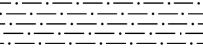
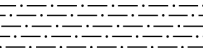
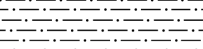
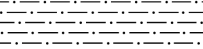
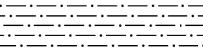








DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2			Very dark greenish grey (10Y 3/1) clayey sand ; no coarse fragments; wet; change to;	Natural
18.4				
18.6			Greenish black (10Y 2.5/1) medium clay ; no coarse fragments; wet; borehole terminated at 19.5mBGL.	Natural
18.8				
19				
19.2				
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS19

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.5mBGL	DRILL DATE 29-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552030
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873707



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark grey (10YR 3/1) light clay ; no coarse fragments; moist; moderate, 2mm angular blocky structure; very weak consistence; no segregations; common, very fine roots; clear change to;	Natural
0.2				
0.4			Light brownish grey (10YR 6/2) loamy sand with diffuse transitions to common, medium sized, distinct, reddish yellow (7.5YR 6/8) mottles; no coarse fragments; moist; weak, 2mm angular blocky structure; very weak consistence; no segregations; cahnge to;	Natural
0.6				
0.8	▼		Grey (10YR 6/1) loamy sand with diffuse transitions to many, coarse sized, prominent, brownish yellow (10YR 6/8) mottles; no coarse fragments; wet; moderate, 3mm angular blocky structure; loose consistence; no segregations; diffuse change to;	Natural
1				
1.2				
1.4				
1.6			Dark greenish grey (5GY 4/1) clayey sand ; no coarse fragments; wet; no segregations; change to;	Natural
1.8				
2				
2.2				
2.4				
2.6				
2.8			grey (5/N) sand ; shell fragments and clay balls @ 10m; wet; no segregations; change to;	Natural
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS20

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 30-Sep-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552008

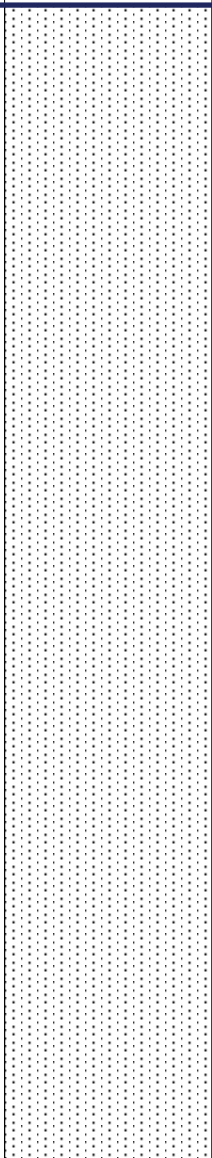
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873564



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS20

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 30-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552008

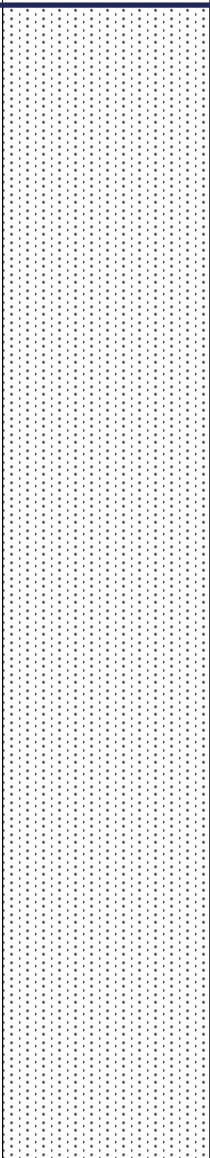
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873564



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS20

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 30-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552008

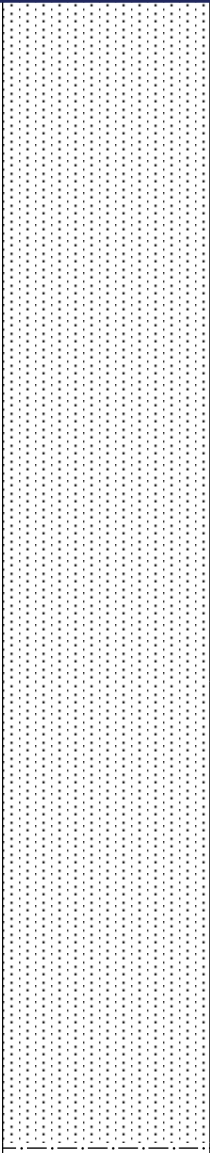
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873564



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18			<p>Light grey (7/N) sand; no coarse fragments; wet; no segregations; change to;</p>	<p>Natural</p>

BOREHOLE

AS20

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 30-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552008

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873564



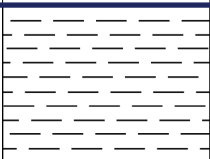
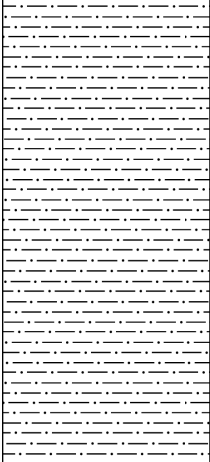
DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19			Very dark greenish grey (10Y 3/1) clayey sand ; no coarse fragments; wet; no segregations; change to;	Natural
19.2 19.4			Greenish black (10Y 2.5/1) medium clay ; no coarse fragments; wet; no segregations; borehole terminated at 19.5mBGL.	Natural
19.6 19.8 20 20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

AS20

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.5mBGL	DRILL DATE 30-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552008
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873564



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0 0.2 0.4			Black (10YR 2/1) light medium clay ; no coarse fragments; moist; change to;	Natural
0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2	▼		Light yellowish brown (2.5Y 6/3) clayey sand with diffuse transitions to few, fine sized, distinct, very dark grey (2.5Y 3/1) mottles; no coarse fragments; wet; change to;	Natural
2.4 2.6 2.8 3 3.2 3.4 3.6 3.8 4 4.2 4.4			Dark greenish grey (10Y 4/1) loamy sand ; no coarse fragments; wet; segregations of lighter CS (10YR 6/3) throughout; change to;	Natural

BOREHOLE

AS21

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 14.6mBGL

DRILL DATE 30-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552277

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873669



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6			Dark grey (4/N) loamy sand ; no coarse fragments; wet; change to;	Natural
6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			Dark grey (4/N) fine-medium sand ; shell fragments throughout; wet; change to;	Natural

BOREHOLE

AS21

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 14.6mBGL

DRILL DATE 30-Sep-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552277

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873669



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			grey (6/N) fine-medium sand ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS21

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 14.6mBGL

DRILL DATE 30-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552277

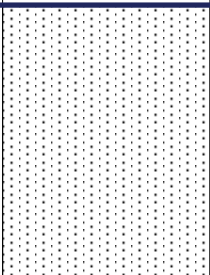
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873669



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6				
14.8 15			Light greenish grey (10Y 7/1) medium sand ; shell fragments; wet; borehole terminated at 15mBGL.	Natural
15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS21

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 14.6mBGL	DRILL DATE 30-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552277
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873669



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0	▼		Black (10YR 2/1) medium clay ; no coarse fragments; moist; change to;	Natural
0.2				
0.4				
0.6			Greyish brown (2.5Y 5/2) sandy clay loam ; no coarse fragments; moist; change to;	Natural
0.8			Dark greenish grey (5GY 4/1) fine-medium sand with diffuse transitions to very few, fine sized, distinct, light olive brown (2.5Y 5/4) mottles; no coarse fragments; wet; change to;	Natural
1				
1.2				
1.4				
1.6				
1.8				
2			Dark grey (4/N) fine-medium sand ; large shells throughout; wet; change to;	Natural
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS22

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.3mBGL	DRILL DATE 28-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552206
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873222



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8				
8.2 8.4 8.6 8.8 9			grey (6/N) fine-medium sand ; shell fragments throughout; wet; change to;	Natural

BOREHOLE

AS22

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.3mBGL

DRILL DATE 28-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552206

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873222



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2				
9.4				
9.6				
9.8				
10				
10.2				
10.4				
10.6				
10.8				
11				
11.2				
11.4			grey (5/N) fine-medium sand ; no coarse fragments; wet; change to;	Natural
11.6				
11.8				
12			Dark grey (4/N) clayey fine-medium sand ; shell fragments; wet; change to;	Natural
12.2				
12.4				
12.6				
12.8				
13				
13.2				
13.4				

BOREHOLE

AS22

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.3mBGL	DRILL DATE 28-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552206
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873222



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4				
15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18			grey (5/N) fine-medium sand ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS22

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.3mBGL

DRILL DATE 28-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552206

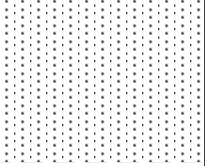
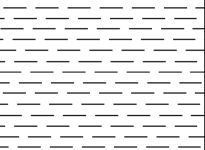
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6873222



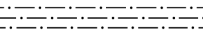
DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2				
18.4				
18.6				
18.8			Very dark greenish grey (5GY 3/1) medium clay ; few, fine to medium shell fragments; wet; borehole terminated at 19.3mBGL.	Natural
19				
19.2				
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS22

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.3mBGL	DRILL DATE 28-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552206
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY SAM	NORTHING 6873222



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark greyish brown (10YR 3/2) light clay ; no coarse fragments; dry; change to;	Natural
0.2			Grey (10YR 5/1) clayey sand with diffuse transitions to very few, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; moist; change to;	Natural
0.4				
0.6				
0.8	▼		Dark grey (2.5Y 4/1) clayey sand to sandy loam ; no coarse fragments; wet; change to;	Natural
1				
1.2			Very dark greenish grey (10Y 3/1) clayey sand to sandy loam ; no coarse fragments; wet; change to;	Natural
1.4				
1.6				
1.8				
2			Dark greenish grey (10Y 4/1) loamy sand to clayey sand ; no coarse fragments; wet; change to;	Natural
2.2				
2.4				
2.6				
2.8				
3			Dark greenish grey (10Y 4/1) loamy sand ; no coarse fragments; wet; change to;	Natural
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS23

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 7-Oct-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552517.8462

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873589.771



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			<p>Grey (5Y 5/1) loamy sand; very few, medium shell fragments and bark pieces; wet; change to;</p>	<p>Natural</p>

BOREHOLE

AS23

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 7-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552517.8462

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873589.771



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			<p>Grey (5Y 6/1) sand; no coarse fragments; wet; change to;</p>	<p>Natural</p>

BOREHOLE

AS23

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 7-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552517.8462

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873589.771



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6				
14.8				
15			Grey (5Y 5/1) loamy sand to sand ; no coarse fragments; wet; change to;	Natural
15.2				
15.4				
15.6				
15.8				
16			Dark grey (5Y 4/1) sandy loam ; no coarse fragments; wet; change to;	Natural
16.2				
16.4				
16.6				
16.8			Very dark greenish grey (10Y 3/1) sandy clay loam ; no coarse fragments; wet; change to;	Natural
17			Very dark greenish grey (10Y 3/1) clay loam, sandy ; no coarse fragments; wet; change to;	Natural
17.2				
17.4			Very dark grey (3/N) heavy clay ; no coarse fragments; wet; borehole terminated at 17.5mBGL.	Natural
17.6				
17.8				
18				

BOREHOLE

AS23

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 7-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552517.8462

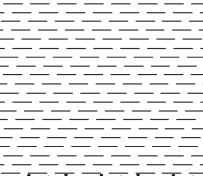
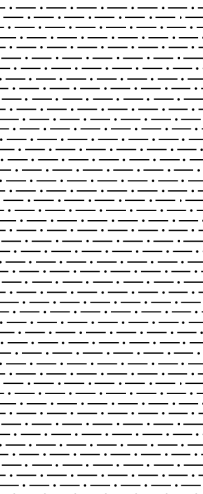
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873589.771



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark brown (10YR 2/2) light clay ; no coarse fragments; dry; change to;	Natural
0.2				
0.4				
0.6				
0.8	▼		Greyish brown (2.5Y 5/2) loamy sand with diffuse transitions to very few to few, fine sized, distinct, light olive brown (2.5Y 5/6) mottles; no coarse fragments; moist; change to;	Natural
1			Grey (5Y 5/1) clayey sand ; no coarse fragments; wet; change to;	Natural
1.2			Dark grey (4/N) clayey sand to sandy loam ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	Natural
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2			Dark grey (4/N) clayey sand to sandy loam ; no coarse fragments; wet; change to;	Natural
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS24

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 7-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552475.1014

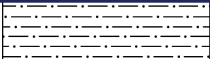
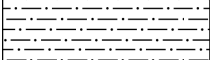
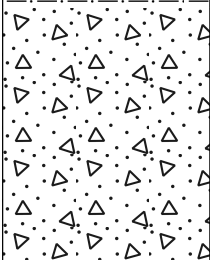













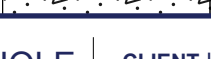
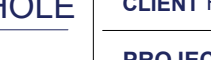



LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873395.681



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6				
4.8				
5			grey (5/N) clayey sand to loamy sand ; very few, fine shell fragments; wet; change to;	Natural
5.2				
5.4				
5.6				
5.8				
6			grey (5/N) loamy sand to sand ; very few to few, fine shell fragments and bark/organic matter @10.8-11.2m; wet; change to;	Natural
6.2				
6.4				
6.6				
6.8				
7				
7.2				
7.4				
7.6				
7.8				
8				
8.2				
8.4				
8.6				
8.8				
9				

BOREHOLE

AS24

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 7-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552475.1014

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873395.681



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				
			Dark grey (4/N) clayey sand to loamy sand ; very few, fine shell fragments; wet; change to;	Natural
			Very dark greenish grey (10G 3/1) clay loam, sandy ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS24

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 18mBGL

DRILL DATE 7-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552475.1014

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873395.681



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6			Dark greenish grey (10Y 4/1) sandy clay loam ; no coarse fragments; wet; change to;	Natural
14.8				
15			Dark greenish grey (10Y 4/1) sandy loam ; no coarse fragments; wet; change to;	Natural
15.2				
15.4				
15.6				
15.8				
16			grey (5/N) loamy sand ; no coarse fragments; wet; change to;	Natural
16.2				
16.4				
16.6				
16.8				
17			Dark greenish grey (10Y 4/1) clayey to loamy sand ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	Natural
17.2				
17.4				
17.6				
17.8			Dark greenish grey (10Y 4/1) heavy clay ; no coarse fragments; wet; borehole terminated at 18mBGL.	Natural
18				

BOREHOLE

AS24

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 18mBGL

DRILL DATE 7-Oct-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552475.1014

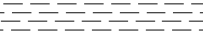
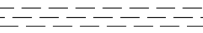
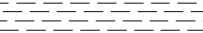
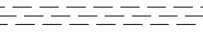

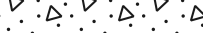
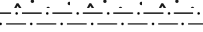
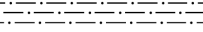













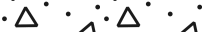

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873395.681



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2				
0.4				
0.6			Greyish brown (10YR 5/2) loamy sand with diffuse transitions to very few, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; moist; change to;	Natural
0.8	▼		Grey (2.5Y 5/1) clayey sand with diffuse transitions to very few, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; wet; change to;	Natural
1				
1.2			NR.	Natural
1.4				
1.6				
1.8				
2				
2.2			Very dark greenish grey (10Y 3/1) sandy loam ; no coarse fragments; wet; change to;	Natural
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2			Dark greenish grey (10Y 4/1) loamy sand ; few, fine shell fragments from 5.6-5.9m; wet; change to;	Natural
4.4				

BOREHOLE

AS25

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16mBGL

DRILL DATE 12-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552762.4908

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873536.198



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			Grey (5Y 5/1) sand to loamy sand ; wet; change to;	Natural

BOREHOLE

AS25

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16mBGL

DRILL DATE 12-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552762.4908

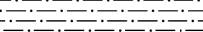
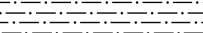
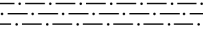
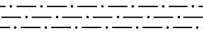







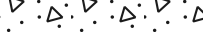
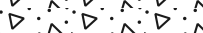



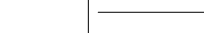

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873536.198



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2			Dark greyish brown (10YR 4/2) clayey sand to sandy loam with diffuse transitions to very few, fine sized, distinct, black (10YR 2/1) mottles; no coarse fragments; wet; change to;	Natural
9.4				
9.6				
9.8				
10				
10.2				
10.4			Brown (10YR 5/3) loamy sand ; no coarse fragments; wet; change to;	Natural
10.6			Grey (2.5Y 6/1) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
10.8			Brown (10YR 5/3) loamy sand ; no coarse fragments; wet; change to;	Natural
11				
11.2			Light olive grey (5Y 6/2) loamy sand to sand ; no coarse fragments; wet; change to;	Natural
11.4				
11.6				
11.8				
12				
12.2				
12.4				
12.6				
12.8			Olive yellow (2.5Y 6/6) loamy sand to sand ; no coarse fragments; wet; change to;	Natural
13				
13.2				
13.4			Light brownish grey (2.5Y 6/2) loamy sand to sand with diffuse transitions to common, medium sized, distinct, olive yellow (2.5Y 6/6) mottles; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS25

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16mBGL

DRILL DATE 12-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552762.4908


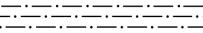
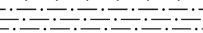
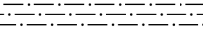
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873536.198



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14			Light grey (2.5Y 7/1) sand ; no coarse fragments; wet; change to;	Natural
14.2				
14.4			Brownish yellow (10YR 6/6) clayey sand ; no coarse fragments; wet; change to;	Natural
14.6				
14.8				
15				
15.2				
15.4			Dark greenish grey (10Y 4/1) silty clay loam ; no coarse fragments; wet; change to;	Natural
15.6				
15.8			Dark greenish grey (10Y 4/1) heavy clay ; no coarse fragments; wet; borehole terminated at 16mBGL.	Natural
16				
16.2				
16.4				
16.6				
16.8				
17				
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

AS25

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 16mBGL	DRILL DATE 12-Oct-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552762.4908
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY MTC	NORTHING 6873536.198



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark grey (10YR 3/1) light medium clay ; no coarse fragments; moist; change to;	Natural
0.2				
0.4			Grey (10YR 5/1) loamy sand with diffuse transitions to very few, fine sized, distinct, reddish yellow (7.5YR 6/8) mottles; no coarse fragments; moist; change to;	Natural
0.6				
0.8				
1				
1.2				
1.4				
1.6	▼		Dark grey (2.5Y 4/1) medium clay ; no coarse fragments; wet; change to;	Natural
1.8			Dark grey (5Y 4/1) sandy clay loam ; no coarse fragments; wet; change to;	Natural
2				
2.2				
2.4				
2.6				
2.8				
3			Grey (5Y 5/1) loamy sand ; no coarse fragments; wet; change to;	Natural
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS26

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 15.5mBGL **DRILL DATE** 6-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552731.3818

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873338.632



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN	
4.6					
4.8					
5					
5.2					
5.4					
5.6					
5.8					
6				Dark greyish brown (10YR 4/2) loamy sand ; no coarse fragments; wet; change to;	Natural
6.2					
6.4					
6.6					
6.8					
7					
7.2				Grey (10YR 5/1) loamy sand ; no coarse fragments; wet; change to;	Natural
7.4				Grey (10YR 6/1) loamy sand ; no coarse fragments; wet; change to;	Natural
7.6					
7.8					
8			Grey (10YR 5/1) loamy sand ; no coarse fragments; wet; change to;	Natural	
8.2					
8.4					
8.6					
8.8					
9					

BOREHOLE

AS26

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 15.5mBGL

DRILL DATE 6-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552731.3818











LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873338.632



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2				
9.4				
9.6			Greyish brown (10YR 5/2) loamy sand ; no coarse fragments; wet; change to;	Natural
9.8				
10			Yellowish brown (10YR 5/4) loamy sand with diffuse transitions to few to common, fine sized, distinct, dark yellowish brown (10YR 4/4) mottles; no coarse fragments; wet; change to;	Natural
10.2				
10.4				
10.6				
10.8				
11			Light grey (10YR 7/1) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
11.2				
11.4			Brown (10YR 5/3) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
11.6				
11.8			Light brownish grey (10YR 6/2) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
12				
12.2				
12.4				
12.6			Light grey (2.5Y 7/2) sand ; no coarse fragments; wet; change to;	Natural
12.8				
13			Yellow (10YR 7/8) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
13.2			Yellow (2.5Y 7/6) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
13.4				

BOREHOLE

AS26

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 15.5mBGL

DRILL DATE 6-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552731.3818

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873338.632



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8			Light grey (2.5Y 7/1) sand ; no coarse fragments; wet; change to;	Natural
14				
14.2				
14.4				
14.6				
14.8				
15				
15.2				
15.4			Very dark greenish grey (10Y 3/1) heavy clay ; no coarse fragments; wet; borehole terminated at 15.5mBGL.	Natural
15.6				
15.8				
16				
16.2				
16.4				
16.6				
16.8				
17				
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

AS26

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 15.5mBGL

DRILL DATE 6-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552731.3818

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873338.632



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark grey (7.5YR 3/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2				
0.4				
0.6				
0.8			Greyish brown (10YR 5/2) clayey sand with diffuse transitions to very few, fine sized, distinct, yellow (10YR 7/8) mottles; no coarse fragments; moist; change to;	Natural
1	▼		Grey (2.5Y 5/1) clayey sand ; no coarse fragments; wet; change to;	Natural
1.2				
1.4				
1.6				
1.8				
2			Dark grey (5Y 4/1) sandy loam ; no coarse fragments; wet; change to;	Natural
2.2				
2.4				
2.6				
2.8				
3			Grey (5Y 5/1) loamy sand ; no coarse fragments; wet; change to;	Natural
3.2				
3.4				
3.6			Grey (5Y 6/1) sand ; few, fine shell fragments; wet; change to;	Natural
3.8				
4				
4.2				
4.4				

BOREHOLE

AS27

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 16mBGL

DRILL DATE 2-Oct-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552700.2728

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873141.067



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6				
4.8				
5				
5.2				
5.4				
5.6				
5.8				
6				
6.2				
6.4				
6.6				
6.8				
7				
7.2				
7.4				
7.6				
7.8				
8			Grey (5Y 5/1) loamy sand ; no coarse fragments; wet; change to;	Natural
8.2				
8.4			Dark grey (5Y 4/1) clayey sand to sandy loam ; no coarse fragments; wet; change to;	Natural
8.6				
8.8				
9				

BOREHOLE

AS27

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16mBGL

DRILL DATE 2-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552700.2728




LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873141.067



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2			Grey (10YR 6/1) loamy sand to sand ; very few to few, fine shell fragments; wet; change to;	Natural
9.4			Brown (10YR 5/3) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
9.6			Dark yellowish brown (10YR 4/4) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
9.8				
10			Pale brown (10YR 6/3) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
10.2				
10.4				
10.6				
10.8			Dark yellowish brown (10YR 4/4) sand to loamy sand ; no coarse fragments; wet; change to;	Natural
11				
11.2			Light brownish grey (10YR 6/2) fine sand ; no coarse fragments; wet; change to;	Natural
11.4				
11.6			Light grey (2.5Y 7/1) fine sand with diffuse transitions to very few, fine sized, distinct, olive yellow (2.5Y 6/6) mottles; no coarse fragments; wet; change to;	Natural
11.8				
12				
12.2				
12.4				
12.6				
12.8				
13				
13.2				
13.4				

BOREHOLE

AS27

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16mBGL

DRILL DATE 2-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552700.2728

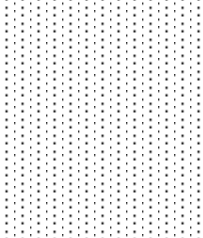
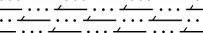
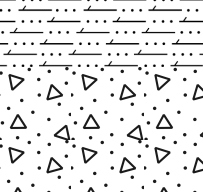
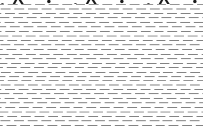
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873141.067



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6			Brownish yellow (10YR 6/6) clay loam, sandy with diffuse transitions to very few, fine sized, distinct, light grey (5Y 7/1) mottles; no coarse fragments; wet; change to;	Natural
14.8				
15			Brownish yellow (10YR 6/8) loamy sand to clayey sand with diffuse transitions to very few, fine sized, distinct, red (2.5YR 4/8) mottles; no coarse fragments; wet; segregation of a yellowish red (5YR5/8) clay lens @ 15.3m; change to;	Natural
15.2				
15.4				
15.6			Very dark greenish grey (10Y 3/1) heavy clay ; no coarse fragments; wet; borehole terminated at 16mBGL.	Natural
15.8				
16				
16.2				
16.4				
16.6				
16.8				
17				
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

AS27

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16mBGL

DRILL DATE 2-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552700.2728

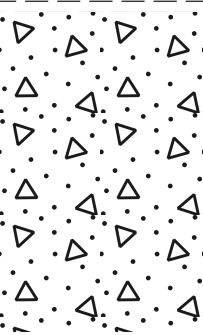
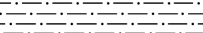
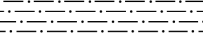
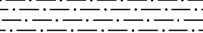
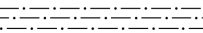
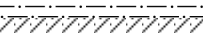







LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6873141.067



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) medium clay ; trace fine sand fragments; moist; change to;	Natural
0.2			Grey (10YR 6/1) sandy loam with diffuse transitions to few to common, fine sized, distinct, brownish yellow (10YR 6/6) mottles; no coarse fragments; wet; change to;	Natural
0.4				
0.6				
0.8				
1.0				
1.2				
1.4				
1.6			grey (6/N) clayey fine-medium sand with diffuse transitions to few to common, fine sized, distinct, olive yellow (5Y 6/6) mottles; no coarse fragments; wet; change to;	Natural
1.8				
2.0				
2.2			Greenish grey (10GY 6/1) silty fine-medium sand ; shell fragments @ 3.1, 3.4, 4-5.3m; wet; change to;	Natural
2.4				
2.6				
2.8				
3.0				
3.2				
3.4				
3.6				
3.8				
4.0				
4.2				
4.4				

BOREHOLE

AS28

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 15.2mBGL

DRILL DATE 16-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552348


LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6873077



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS28

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 15.2mBGL

DRILL DATE 16-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552348


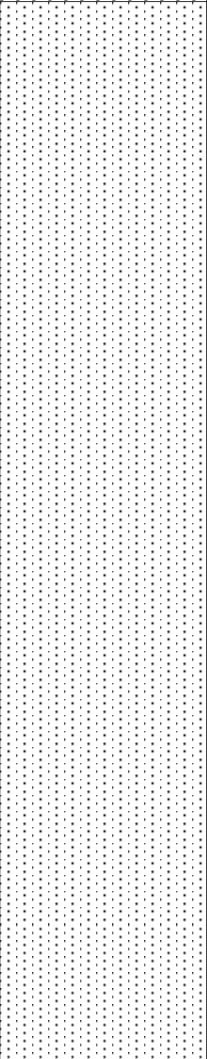
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6873077



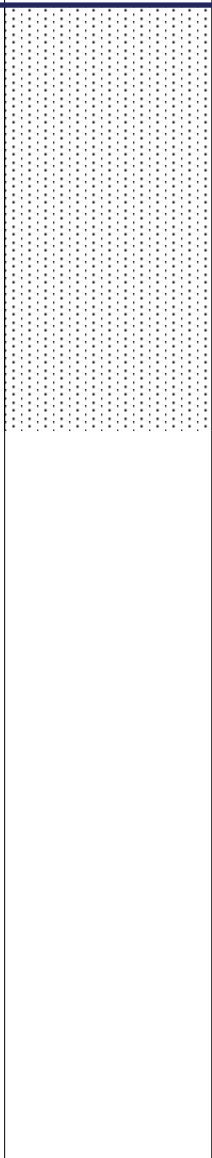
DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2				
9.4			Dark grey (4/N) silty fine sand ; no coarse fragments; wet; change to;	Natural
9.6				
9.8				
10			grey (5/N) silty fine sand ; no coarse fragments; wet; change to;	Natural
10.2				
10.4				
10.6				
10.8				
11				
11.2				
11.4				
11.6				
11.8				
12				
12.2				
12.4				
12.6				
12.8				
13			grey (6/N) silty fine sand ; no coarse fragments; wet; borehole terminated at 15.2mBGL in dense silty sand.	Natural
13.2				
13.4				

BOREHOLE

AS28

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 15.2mBGL	DRILL DATE 16-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552348
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY GLH	NORTHING 6873077



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS28

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 15.2mBGL

DRILL DATE 16-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552348

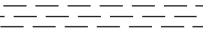
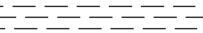
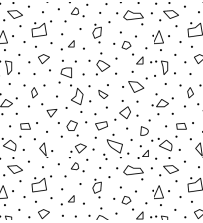
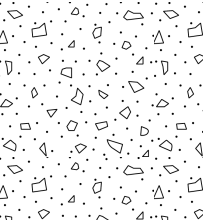
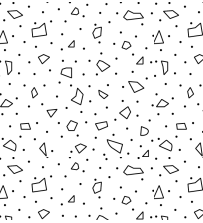
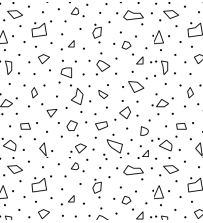
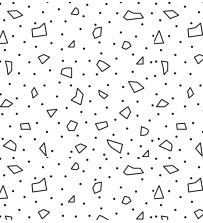
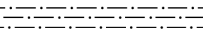
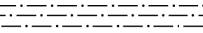
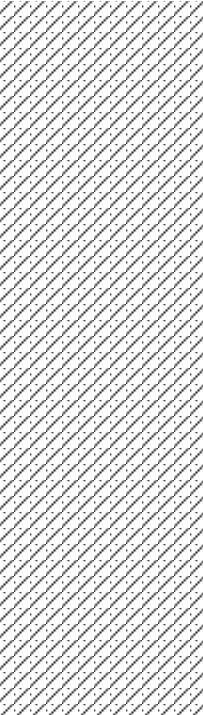
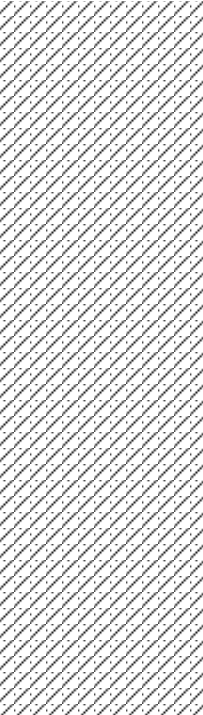
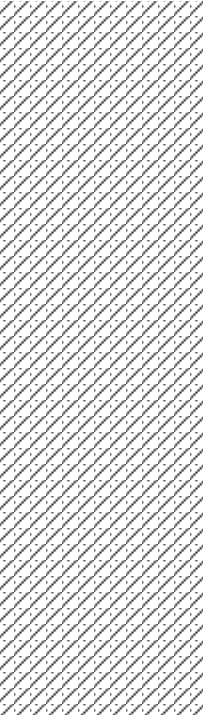
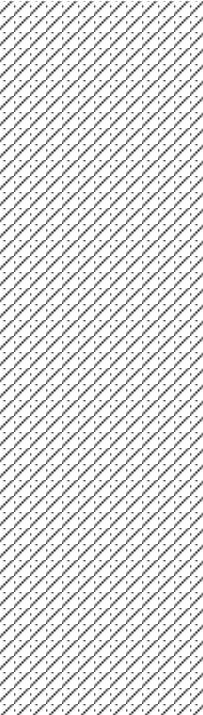
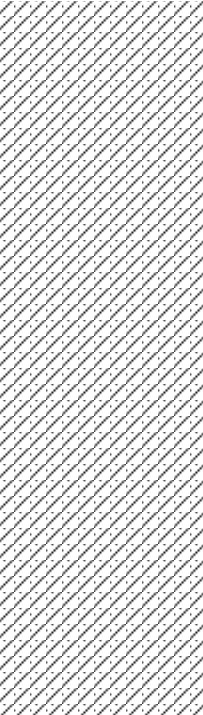
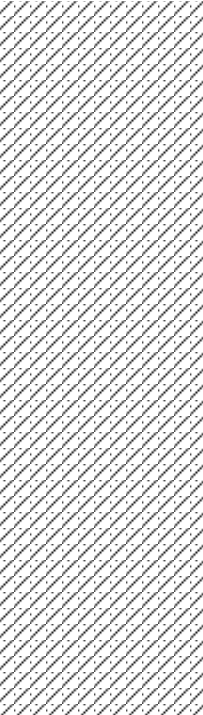
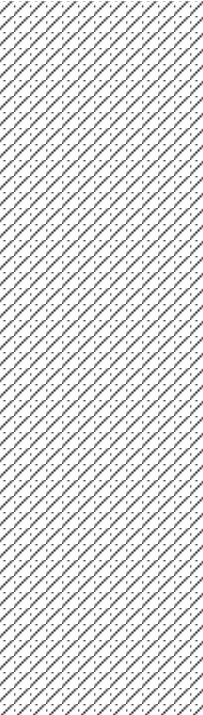
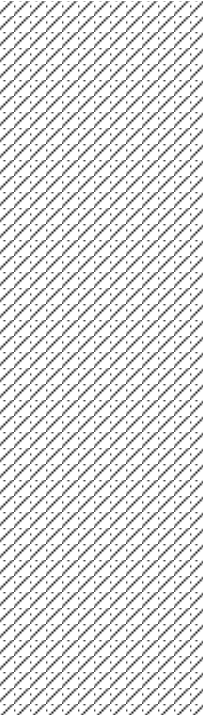
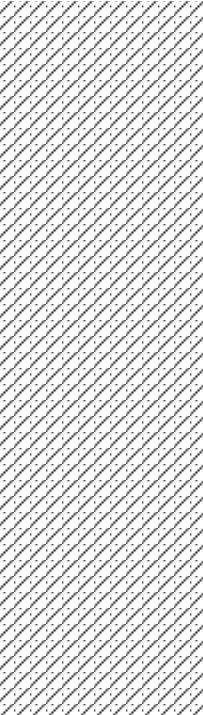
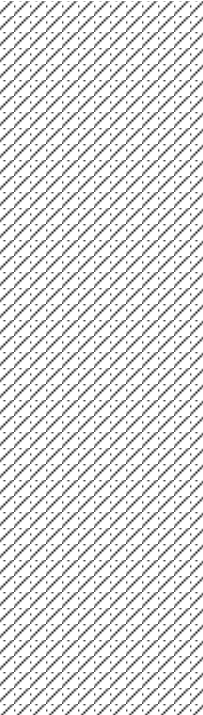
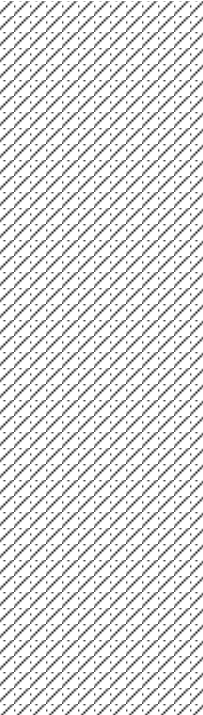
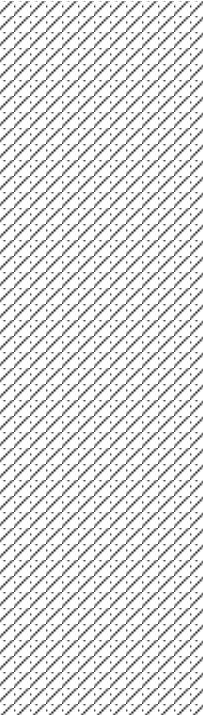
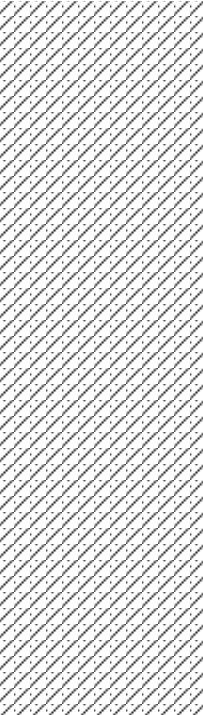
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6873077



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Dark reddish grey (7.5R 3/1) medium clay ; fine sand fragments; moist; change to;	Natural
0.2				
0.4	▼		Grey (10YR 6/1) sandy clay loam with diffuse transitions to very few, fine sized, distinct, brownish yellow (10YR 6/6) mottles; no coarse fragments; moist to wet; change to;	Natural
0.6				
0.8				
1				
1.2				
1.4			Grey (5Y 5/1) clayey sand with diffuse transitions to few, fine sized, distinct, dark yellowish brown (10YR 4/6) mottles; no coarse fragments; wet; change to;	Natural
1.6				
1.8			grey (5/N) silty fine-medium sand ; few, fine to medium shell fragments @ 4.2m and 7-7.5m; wet; change to;	Natural
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS29

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 10.6mBGL

DRILL DATE 15-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552317


LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872879



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS29

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 10.6mBGL

DRILL DATE 15-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552317



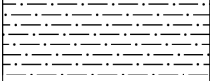
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872879



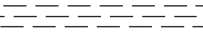
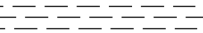
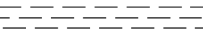
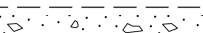
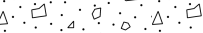

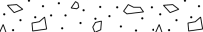

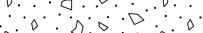

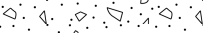
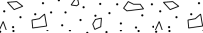
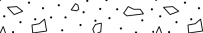




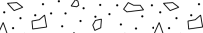




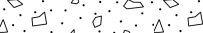
DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2				
9.4				
9.6				
9.8				
10			Greenish grey (5GY 6/1) sandy clay loam ; no coarse fragments; wet; change to;	Natural
10.2				
10.4			Pale olive (5Y 6/3) clayey sand ; no coarse fragments; wet; borehole terminated at 10.6mBGL.	Natural
10.6				
10.8				
11				
11.2				
11.4				
11.6				
11.8				
12				
12.2				
12.4				
12.6				
12.8				
13				
13.2				
13.4				

BOREHOLE

AS29

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035 **TOTAL DEPTH** 10.6mBGL **DRILL DATE** 15-Sep-20
PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed **DRILLED BY** PACIFIC GEOTECH **EASTING** 552317
LOCATION CUDGEN, NSW **DRILL METHOD** VIBROCORE **LOGGED BY** GLH **NORTHING** 6872879



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark brown (10YR 2/2) medium clay ; no coarse fragments; moist; change to;	Natural
0.2				
0.4				
0.6			Dark grey (7.5YR 4/1) sandy clay loam with diffuse transitions to many, medium sized, distinct, grey (10YR 5/1) and few, medium sized, distinct, yellow (10YR 7/8) mottles; no coarse fragments; wet; change to;	Natural
0.8	▼		Reddish grey (2.5YR 5/1) sandy clay loam with diffuse transitions to few, fine sized, distinct, yellowish brown (10YR 5/6) mottles; no coarse fragments; wet; change to;	Natural
1				
1.2				
1.4				
1.6			Very dark grey (3/N) fine-medium sandy clay loam with silty clay lenses ; no coarse fragments; wet; change to;	Natural
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3			Greenish grey (5GY 5/1) clayey fine-medium sand ; shell fragments (bivalve @5m); wet; change to;	Natural
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS30

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 8mBGL

DRILL DATE 15-Sep-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552286

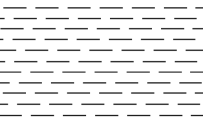
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872681



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6				
4.8				
5				
5.2				
5.4				
5.6			Dark greenish grey (5GY 4/1) silty fine-medium sand ; few, fine shell fragments throughout; wet; change to;	Natural
5.8				
6				
6.2				
6.4				
6.6				
6.8				
7			Pale olive (10Y 6/4) slity heavy clay (Pleistocene) with trace fine sand ; no coarse fragments; moist;stiff consistence; change to;	Natural
7.2				
7.4				
7.6			Light greenish grey (10GY 7/1) silty medium clay (Marine) with trace fine sand ; no coarse fragments; moist; firm to stiff consistence; borehole terminated at 8mBGL.	Natural
7.8				
8				
8.2				
8.4				
8.6				
8.8				
9				

BOREHOLE

AS30

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 8mBGL

DRILL DATE 15-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552286

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE


LOGGED BY GLH

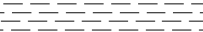
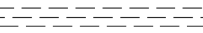
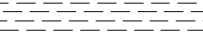

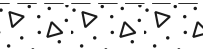



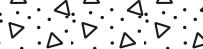

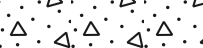


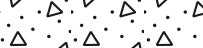

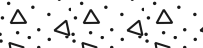
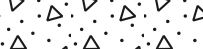




NORTHING 6872681



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
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BOREHOLE AS30	CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035	TOTAL DEPTH 8mBGL	DRILL DATE 15-Sep-20	
	PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552286	
	LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY GLH NORTHING 6872681	

DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) light clay ; no coarse fragments; moist; change to;	Natural
0.2				
0.4				
0.6			Grey (10YR 6/1) loamy sand with diffuse transitions to few, fine sized, distinct, dark grey (2.5Y 4/1) mottles; no coarse fragments; moist; change to;	Natural
0.8				
1	▼		Light brownish grey (2.5Y 6/2) loamy sand with diffuse transitions to very few, fine sized, distinct, yellow (2.5Y 7/6) mottles; no coarse fragments; wet; change to;	Natural
1.2				
1.4				
1.6			Grey (10YR 6/1) loamy sand ; no coarse fragments; wet; change to;	Natural
1.8				
2				
2.2			Dark grey (4/N) loamy sand ; no coarse fragments; wet; change to;	Natural
2.4				
2.6				
2.8				
3			Dark greenish grey (10Y 4/1) sand ; few, fine shell fragments; wet; change to;	Natural
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS31

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 16.5mBGL

DRILL DATE 1-Oct-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552517.9646

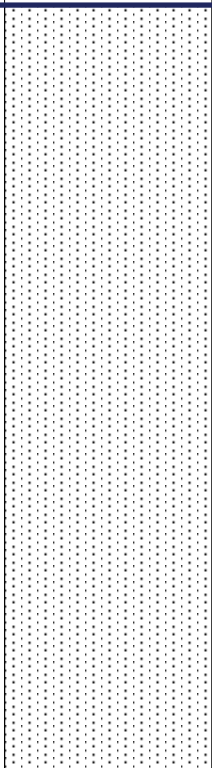
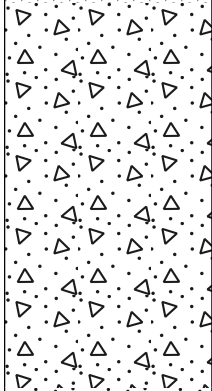
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6872967.309



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4				
7.6 7.8 8 8.2 8.4 8.6 8.8 9			Dark grey (4/N) loamy sand to clayey ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS31

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16.5mBGL

DRILL DATE 1-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552517.9646

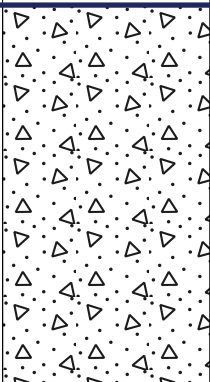
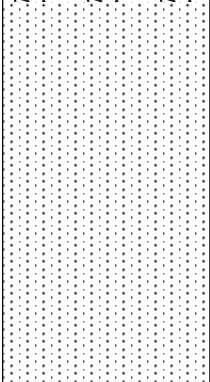
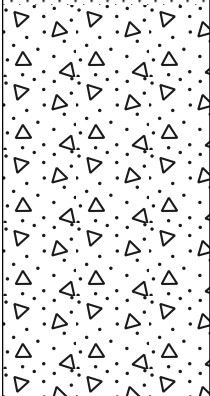
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6872967.309



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4			Dark grey (4/N) loamy sand ; no coarse fragments; wet; change to;	Natural
10.6 10.8 11 11.2 11.4 11.6 11.8			grey (5/N) sand ; no coarse fragments; wet; change to;	Natural
12 12.2 12.4 12.6 12.8 13 13.2 13.4			Dark grey (4/N) loamy sand ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS31

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16.5mBGL **DRILL DATE** 1-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552517.9646


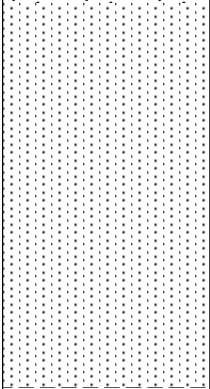
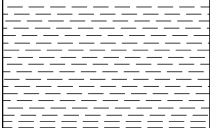
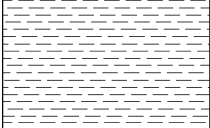
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6872967.309



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14				
14 14.2 14.4 14.6 14.8 15 15.2 15.4			grey (5/N) sand ; no coarse fragments; wet; change to;	Natural
15.6 15.8 16			Light greenish grey (10BG 8/1) medium heavy clay with diffuse transitions to many, medium sized, distinct, reddish yellow (7.5YR 6/8) mottles; few to common, fine to medium shell fragments; wet; change to;	Natural
16 16.2 16.4			Reddish yellow (7.5YR 6/8) medium heavy clay ; few to common, fine to medium shell fragments; wet; borehole terminated at 16.5mBGL.	Natural
16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS31

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16.5mBGL

DRILL DATE 1-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552517.9646

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY SAM

NORTHING 6872967.309



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) light clay ; no coarse fragments; wet; change to;	Natural
0.2				
0.4			Light brownish grey (10YR 6/2) sandy loam ; no coarse fragments; wet; change to;	Natural
0.6				
0.8			Grey (2.5Y 6/1) sand ; no coarse fragments; wet; change to;	Natural
1				
1.2	▼		Dark grey (5Y 4/1) sandy loam ; few, fine shell fragments @ 2m; wet; change to;	Natural
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS32

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 13.5mBGL **DRILL DATE** 2-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552487.3447

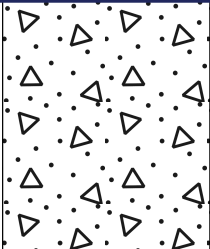





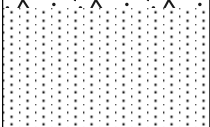
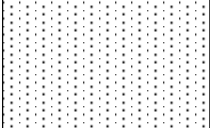



LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6872769.666



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6				
4.8				
5				
5.2				
5.4				
5.6			Grey (5Y 5/1) loamy sand ; very few, fine shell fragments throughout; wet; change to;	Natural
5.8				
6			Dark grey (5Y 4/1) sandy loam ; no coarse fragments; wet; change to;	Natural
6.2				
6.4				
6.6				
6.8				
7			Dark grey (5Y 4/1) sandy loam with diffuse transitions to very few, fine sized, distinct, olive yellow (2.5Y 6/8) and very few, fine sized, distinct, black (2.5/N) mottles; few to many, fine to medium fragments of rocks, shells and dry clay balls; wet; change to;	Natural
7.2				
7.4				
7.6			Grey (5Y 5/1) loamy sand ; no coarse fragments; wet; change to;	Natural
7.8				
8			Light grey (2.5Y 7/1) sand ; no coarse fragments; wet; change to;	Natural
8.2				
8.4				
8.6				
8.8				
9				

BOREHOLE

AS32

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 13.5mBGL **DRILL DATE** 2-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552487.3447

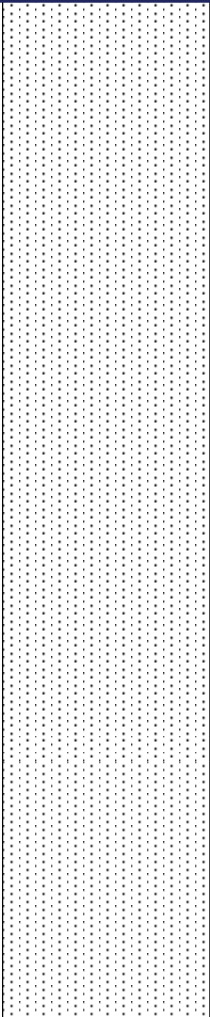
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY MTC

NORTHING 6872769.666



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2				
9.4				
9.6				
9.8				
10				
10.2				
10.4				
10.6				
10.8				
11				
11.2				
11.4				
11.6				
11.8				
12			Light grey (2.5Y 7/1) sand with diffuse transitions to very few, fine sized, distinct, yellow (2.5Y 7/8) mottles; no coarse fragments; wet; change to;	Natural
12.2			Light grey (2.5Y 7/1) sand ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	Natural
12.4				
12.6				
12.8				
13			Yellow (2.5Y 7/8) light medium clay ; no coarse fragments; wet; borehole terminated at 13.5mBGL.	Natural
13.2				
13.4				

BOREHOLE

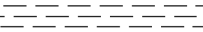
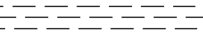
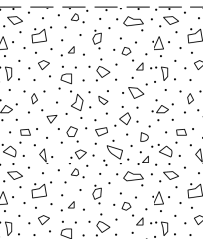
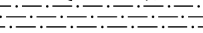
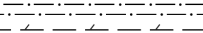
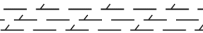
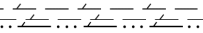
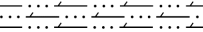
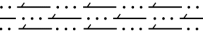
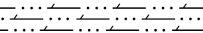
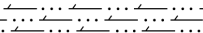
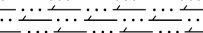
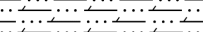
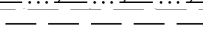
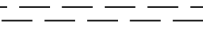
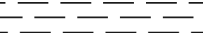
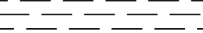
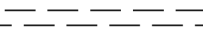
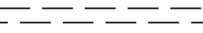
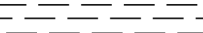
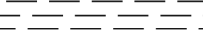
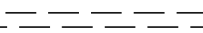
AS32

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035 **TOTAL DEPTH** 13.5mBGL **DRILL DATE** 2-Oct-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed **DRILLED BY** PACIFIC GEOTECH **EASTING** 552487.3447

LOCATION CUDGEN, NSW **DRILL METHOD** VIBROCORE **LOGGED BY** MTC **NORTHING** 6872769.666



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark greyish brown (10YR 3/2) medium clay ; no coarse fragments; moist; change to;	Natural
0.2				
0.4			Grey (10YR 5/1) sandy clay loam with diffuse transitions to few to common, fine sized, distinct, brownish yellow (10YR 6/6) mottles; no coarse fragments; moist; change to;	Natural
0.6				
0.8				
1				
1.2				
1.4	▼		Grey (5Y 5/1) clayey sand with diffuse transitions to very few to few, fine sized, distinct, olive yellow (2.5Y 6/6) mottles; no coarse fragments; wet; change to;	Natural
1.6			Dark grey (4/N) silty sandy light clay ; no coarse fragments; wet; change to;	Natural
1.8			Dark grey (4/N) clayey fine-medium sand ; no coarse fragments; wet; change to;	Natural
2				
2.2				
2.4				
2.6				
2.8			Dark greenish grey (5GY 4/1) silty sandy light clay ; few, fine shell fragments throughout; wet; change to;	Natural
3				
3.2				
3.4				
3.6				
3.8			grey (5/N) clayey fine-medium sand ; few, fine shell fragments throughout; wet; change to;	Natural
4				
4.2				
4.4				

BOREHOLE

AS33

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 10.2mBGL

DRILL DATE 15-Sep-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552450

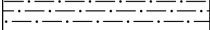

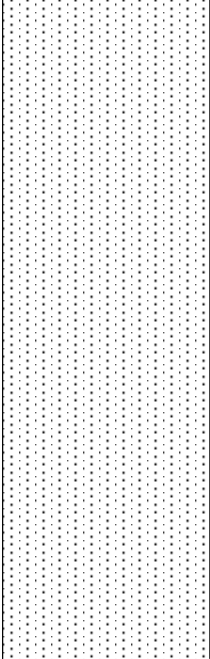
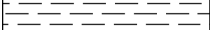
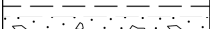
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872573



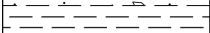
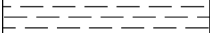
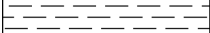
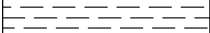
DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6				
4.8				
5				
5.2				
5.4				
5.6				
5.8				
6			Dark grey (4/N) silty fine-medium sand ; no coarse fragments; wet; change to;	Natural
6.2				
6.4				
6.6				
6.8				
7				
7.2				
7.4				
7.6				
7.8				
8				
8.2				
8.4				
8.6				
8.8			Dark greenish grey (10Y 4/1) silty medium clay ; no coarse fragments; wet; firm consistence; change to;	Natural
9			Very dark greenish grey (10Y 3/1) sandy clay loam ; few, fine shell fragments; wet; loose consistence; segregations of silty clay lenses; change to;	Natural

BOREHOLE

AS33

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 10.2mBGL	DRILL DATE 15-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552450
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY GLH	NORTHING 6872573




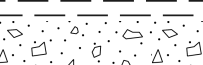
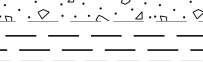



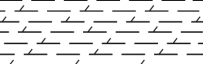
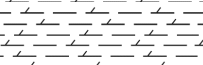
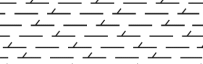
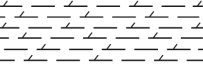
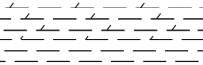
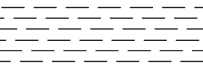
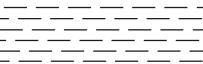
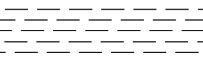





DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2				
9.4			Very dark greenish grey (5GY 3/1) silty medium clay (Marine) ; no coarse fragments; wet; firm consistence; borehole terminated at 10.2mBGL.	Natural
9.6				
9.8				
10				
10.2				
10.4				
10.6				
10.8				
11				
11.2				
11.4				
11.6				
11.8				
12				
12.2				
12.4				
12.6				
12.8				
13				
13.2				
13.4				

BOREHOLE

AS33

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 10.2mBGL	DRILL DATE 15-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552450
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY GLH	NORTHING 6872573



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark greyish brown (10YR 3/2) medium clay with diffuse transitions to common, medium sized, distinct, dark reddish brown (5YR 3/4) mottles; no coarse fragments; moist; moderate angular blocky structure; no segregations; change to;	Natural
0.2				
0.4			Grey (10YR 5/1) sandy light clay with diffuse transitions to common, medium sized, distinct, yellowish brown (10YR 5/8) mottles; no coarse fragments; moist; weak subangular blocky structure; no segregations; change to;	Natural
0.6				
0.8			Grey (2.5Y 6/1) sandy clay loam with diffuse transitions to common, medium sized, distinct, yellowish brown (10YR 5/8) mottles; no coarse fragments; moist to wet; massive structure; no segregations; change to;	Natural
1	▼		grey (6/N) sandy light clay with diffuse transitions to common, medium sized, distinct, yellowish red (5YR 4/6) mottles; no coarse fragments; wet; massive structure; no segregations; change to;	Natural
1.2			Grey (5Y 5/1) sandy medium clay with diffuse transitions to few, fine sized, distinct, dark yellowish brown (10YR 3/6) mottles; no coarse fragments; wet; massive structure; no segregations; change to;	Natural
1.4				
1.6			grey (5/N) sandy silty light clay ; few, fine to medium shell fragments; wet; massive structure; no segregations; change to;	Natural
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3			Very dark greenish grey (10Y 3/1) silty medium clay (Marine) ; few, fine to medium shell fragments; wet; massive structure; no segregations; borehole terminated at 3.7mBGL.	Natural
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS34

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 3.7mBGL

DRILL DATE 15-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552457

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872409



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark grey (10YR 3/1) light medium clay ; no coarse fragments; moist; moderate, 2-3mm angular blocky structure; weak consistence; no segregations; many, very fine roots; diffuse change to;	Natural
0.2				
0.4			Light grey (10YR 7/1) sandy loam with diffuse transitions to few, medium sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; moist; massive structure; very weak consistence; no segregations; few, very fine roots; clear change to;	Natural
0.6			White (2.5Y 8/1) loamy sand with diffuse transitions to few, medium sized, distinct, olive yellow (2.5Y 6/8) mottles; no coarse fragments; wet; single grain structure; very weak consistence; no segregations; diffuse change to;	Natural
0.8				
1			Light brownish grey (10YR 6/2) clayey sand with diffuse transitions to common, medium sized, distinct, yellow (10YR 7/8) mottles; no coarse fragments; wet; massive structure; very weak consistence; no segregations; diffuse change to;	Natural
1.2			Grey (5Y 6/1) clayey sand with diffuse transitions to few, fine sized, distinct, yellow (2.5Y 7/6) mottles; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	Natural
1.4				
1.6				
1.8				
2			grey (5/N) silty fine-medium sand ; few, fine shell fragments @ 4.5m, small stone @ 8.7m and medium stone @ 9.2m; wet; no segregations; change to;	Natural
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS35

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Sep-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552718


LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872936

**+ GILBERT
SUTHERLAND**

DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS35

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552718

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872936



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS35

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552718


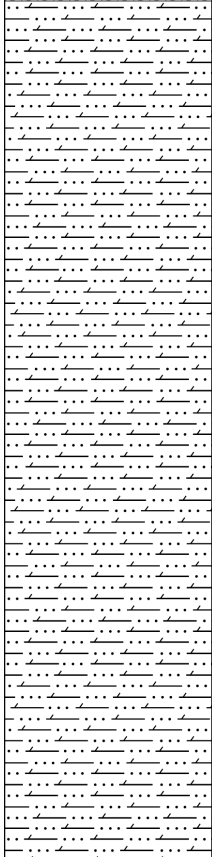
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872936



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6				
14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18			Dark grey (5Y 4/1) clayey and loamy sand ; no coarse fragments; wet; no segregations; borehole terminated at 20mBGL.	Natural

BOREHOLE

AS35

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552718

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872936



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4 19.6 19.8 20 20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

AS35

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552718

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872936



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark grey (10YR 3/1) sandy clay loam ; no coarse fragments; moist; change to;	Natural
0.2			Light grey (10YR 7/2) loamy sand with diffuse transitions to few, fine sized, distinct, brownish yellow (10YR 6/8) mottles; no coarse fragments; moist to wet; change to;	Natural
0.4	▼		Dark grey (5Y 4/1) clayey fine-medium sand with diffuse transitions to few, fine sized, distinct, olive (5Y 5/6) mottles; few, fine to medium shells and wood fragments @ 1.9-2.2m; wet; change to;	Natural
0.6				
0.8				
1				
1.2				
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6			Grey (5Y 5/1) silty fine-medium sand ; few, fine shell fragments; wet; change to;	Natural
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS36

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 9.1mBGL

DRILL DATE 14-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552687

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872738



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4				
5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			Grey (5Y 6/1) medium sand ; few to common, medium to large shell fragments @6.8-7.8m; wet; change to;	Natural

BOREHOLE

AS36

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 9.1mBGL

DRILL DATE 14-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552687


LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872738



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			Shell; no coarse fragments; no segregations; borehole terminated at 9.1mBGL in shell grit, unable to advance casing.	Natural

BOREHOLE

AS36

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 9.1mBGL	DRILL DATE 14-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552687
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY GLH	NORTHING 6872738



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark greyish brown (10YR 3/2) medium clay ; no coarse fragments; moist; weak, 2mm angular blocky structure; weak consistence; no segregations; change to;	Natural
0.2				
0.4			Grey (5Y 5/1) heavy sandy loam ; no coarse fragments; wet; massive structure; weak consistence; no segregations; change to;	Natural
0.6				
0.8	▼			
1			Greenish grey (10Y 5/1) fine - medium sand ; shell fragments and some organics @ 1.3m; wet; no segregations; change to;	Natural
1.2				
1.4				
1.6				
1.8				
2				
2.2				
2.4			grey (5/N) fine - medium sand ; shell fragments; wet; no segregations; change to;	Natural
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS37

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 7mBGL	DRILL DATE 14-Sep-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 552656
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY GLH	NORTHING 6872541



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4				
6.6 6.8 7			Dark greenish grey (10Y 4/1) silty heavy clay (Marine) ; shell fragments; wet; no segregations; borehole terminated at 7mBGL.	Natural
7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS37

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 7mBGL

DRILL DATE 14-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552656

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872541



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark greyish brown (10YR 3/2) medium clay ; with diffuse transitions to few, fine sized, distinct, brown (7.5YR 4/4) mottles; some fine sand; moist; weak, 2mm angular blocky structure; weak consistence; no segregations; many, very fine roots; change to;	Natural
0.2				
0.4			Grey (5Y 5/1) heavy sandy loam ; with diffuse transitions to few, fine sized, distinct, light olive grey (5Y 6/2) mottles; no coarse fragments; wet; massive structure; weak consistence; no segregations; common, very fine roots; change to;	Natural
0.6			Dark greenish grey (10Y 4/1) fine sand ; very few to few, fine shell fragments; wet; change to;	Natural
0.8				
1				
1.2	▼			
1.4				
1.6			grey (5/N) fine - medium sand ; few, fine to medium shell fragments; wet; change to;	Natural
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS38

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 6.5mBGL

DRILL DATE 14-Sep-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 552632

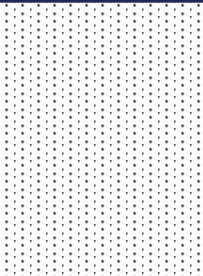
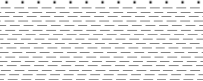
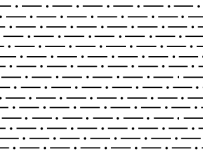
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872382



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6			Dark grey (4/N) fine sand ; few, fine to medium shell fragments and some organics present; wet; change to;	Natural
4.8				
5				
5.2				
5.4				
5.6			Greenish black (10Y 2.5/1) silty heavy clay (Marine) ; few to common, fine to medium shell fragments; wet; change to;	Natural
5.8				
6			Very dark grey (5Y 3/1) silty clayey sand ; few, fine shell fragments; wet; no segregations; borehole terminated at 6.5mBGL.	Natural
6.2				
6.4				
6.6				
6.8				
7				
7.2				
7.4				
7.6				
7.8				
8				
8.2				
8.4				
8.6				
8.8				
9				

BOREHOLE

AS38

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 6.5mBGL

DRILL DATE 14-Sep-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552632

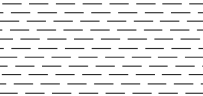



LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY GLH

NORTHING 6872382



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2				
0.4			Brown (7.5YR 5/4) sandy loam ; no coarse fragments; moist; change to;	Natural
0.6				
0.8			Grey (2.5Y 5/1) loamy sand ; no coarse fragments; moist to wet; change to;	Natural
1	▼		Dark grey (4/N) loamy sand ; very few, fine shell fragments and some wood; wet; change to;	Natural
1.2				
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4			Grey (5Y 6/1) loamy sand ; very few, fine shell fragments and some wood; wet; change to;	Natural

BOREHOLE

AS39

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553071.8059

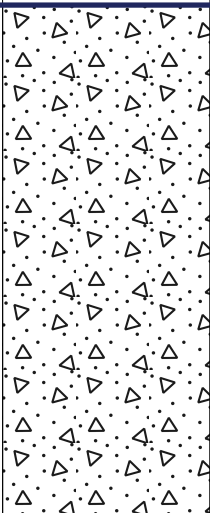
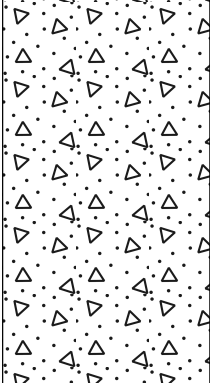
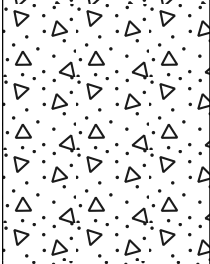
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873673.686



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4				
6.6 6.8 7 7.2 7.4 7.6 7.8			Greenish grey (5GY 6/1) loamy sand ; no coarse fragments; wet; change to;	Natural
8 8.2 8.4 8.6 8.8 9			Brown (10YR 4/3) loamy sand ; no coarse fragments; wet; segregation of very dark brown (10YR 2/2) light clay @ 7.4-7.6m; change to;	Natural

BOREHOLE

AS39

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553071.8059

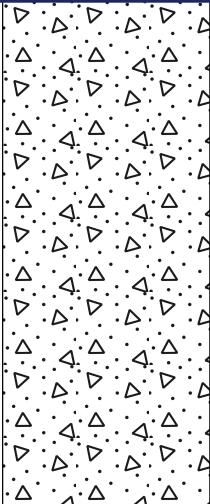
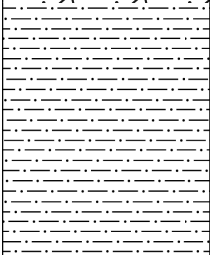
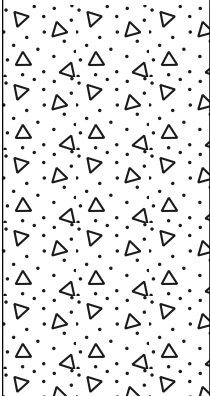
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873673.686



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11			Greyish brown (10YR 5/2) loamy sand ; no coarse fragments; wet; change to;	Natural
11.2 11.4 11.6 11.8			Very dark brown (10YR 2/2) clayey sand ; no coarse fragments; wet; change to;	Natural
12 12.2 12.4 12.6 12.8 13 13.2 13.4			Dark greyish brown (10YR 4/2) loamy sand ; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS39

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16.5mBGL **DRILL DATE** 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553071.8059

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873673.686



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6			White (2.5Y 8/1) loamy sand ; no coarse fragments; wet; change to;	Natural
13.8				
14				
14.2				
14.4				
14.6				
14.8				
15			Brownish yellow (10YR 6/8) sandy loam ; no coarse fragments; wet; change to;	Natural
15.2				
15.4				
15.6			Very dark greenish grey (10Y 3/1) heavy clay ; very few, fine to medium shell fragments; wet; borehole terminated at 16.5mBGL.	Natural
15.8				
16				
16.2				
16.4				
16.6				
16.8				
17				
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

AS39

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 16.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553071.8059


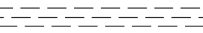



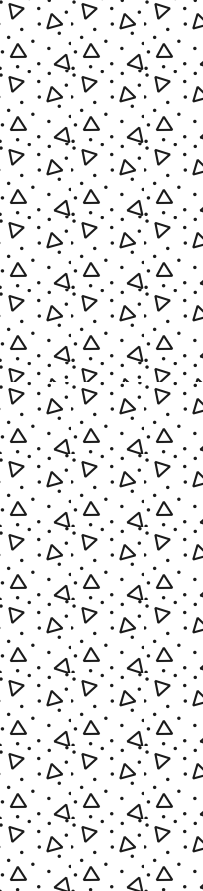
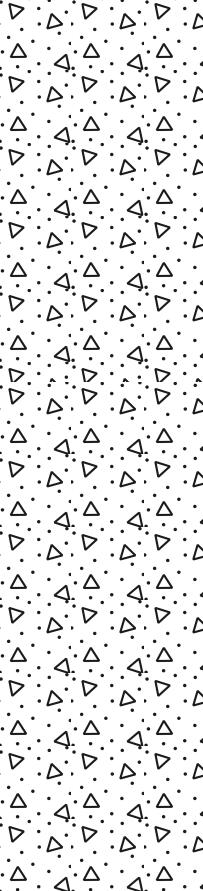
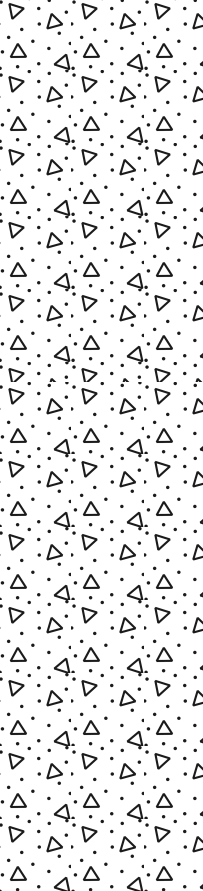
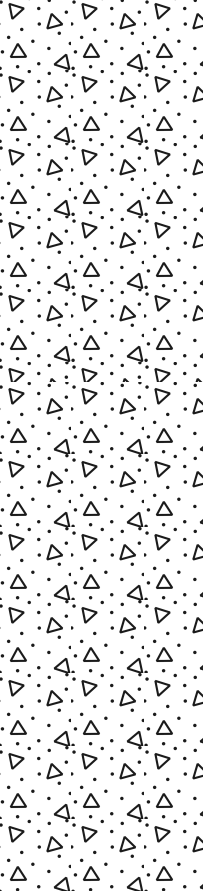
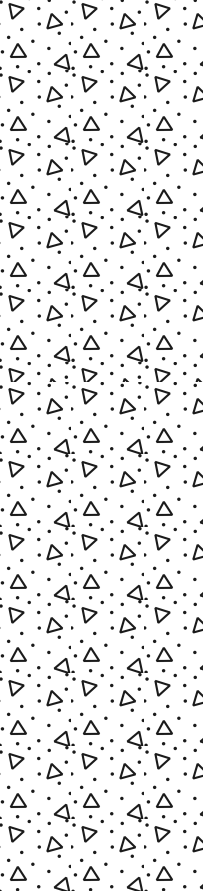
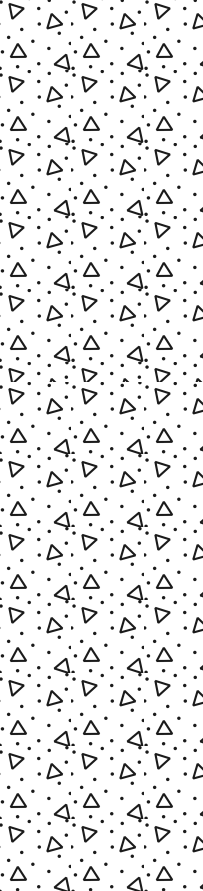
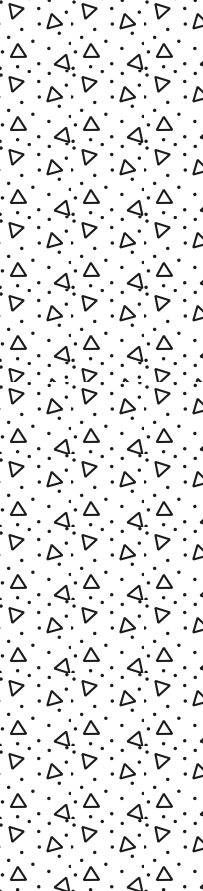
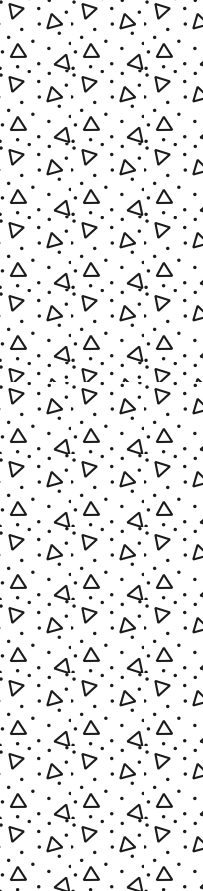
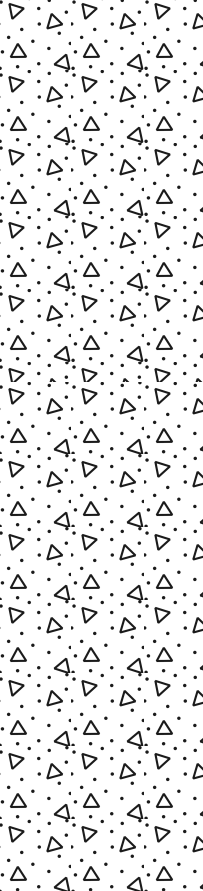
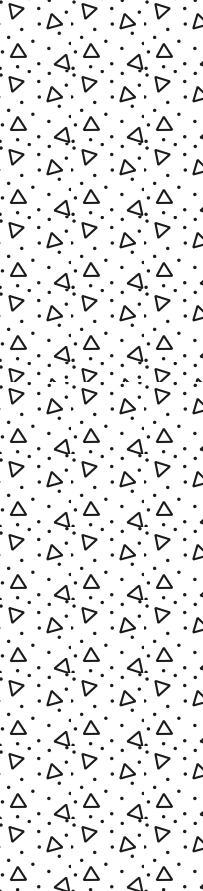
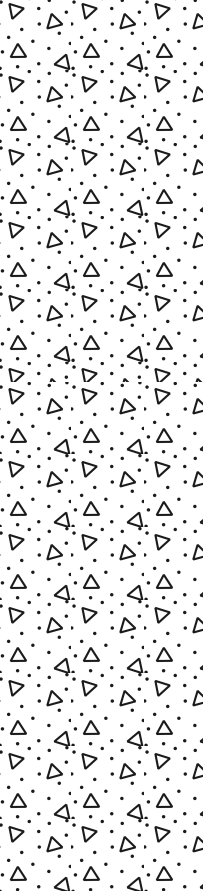
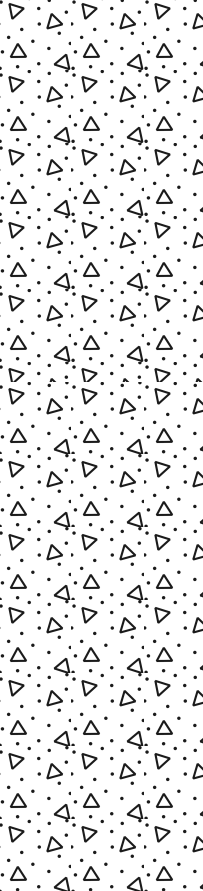
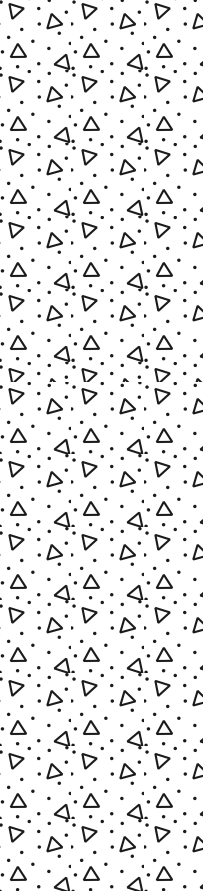
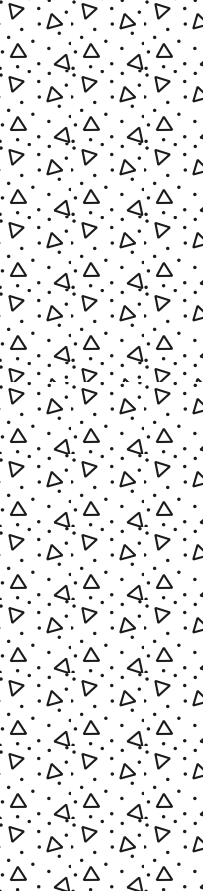
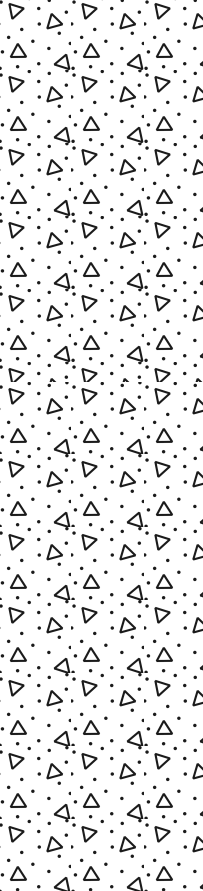
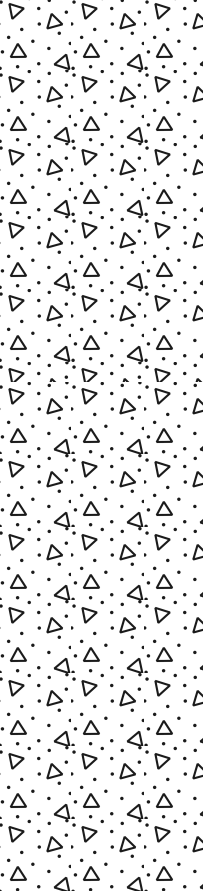
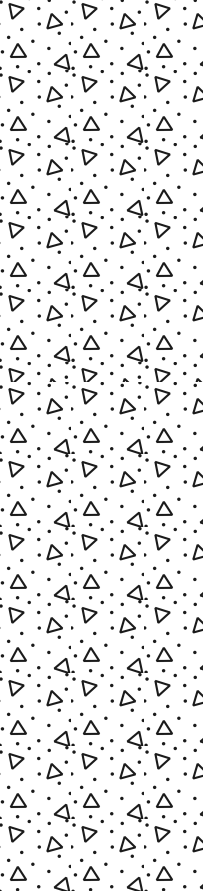
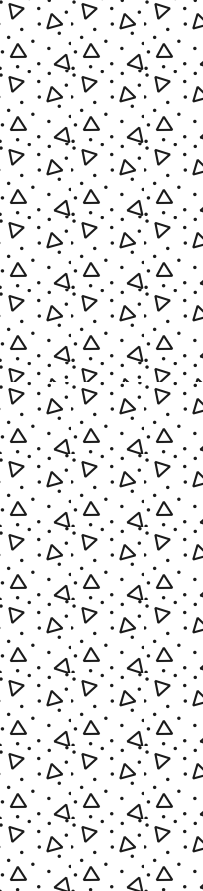
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873673.686



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (2.5Y 2.5/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2				
0.4			Brown (7.5YR 5/4) sandy loam with diffuse transitions to very few, fine sized, distinct, reddish yellow (7.5YR 6/8) mottles; no coarse fragments; moist; change to;	Natural
0.6				
0.8			Grey (7.5YR 6/1) clayey sand ; few, fine to medium shells @ 2-8m; moist to wet; change to;	Natural
1	▼		Dark grey (4/N) loamy sand ; very few to few, fine shell fragments; wet; change to;	Natural
1.2				
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6			Dark greenish grey (10Y 4/1) loamy sand ; few, fine shell fragments shells @ 2-8; wet; change to;	Natural
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS40

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.9mBGL

DRILL DATE 6-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553172.5693

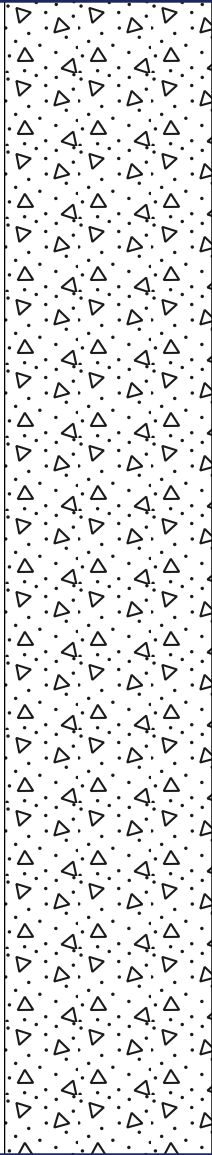
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874062.448



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS40

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.9mBGL

DRILL DATE 6-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553172.5693

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874062.448



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			Light grey (7.5YR 7/1) loamy sand ; very few, fine shell fragments; wet; change to;	Natural

BOREHOLE

AS40

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.9mBGL

DRILL DATE 6-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553172.5693

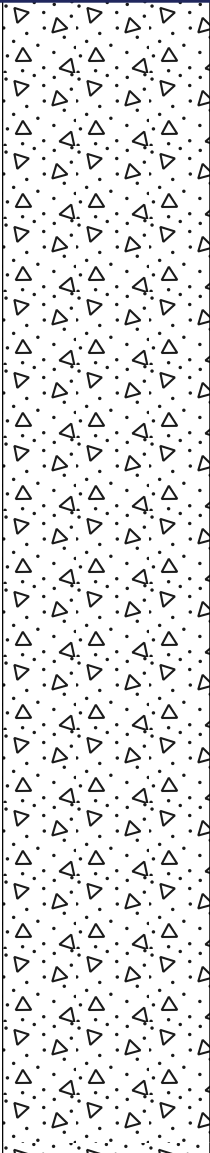
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874062.448



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS40

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.9mBGL

DRILL DATE 6-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553172.5693

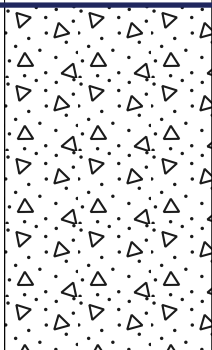
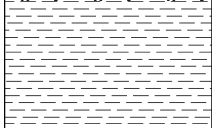
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874062.448



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4			Brownish yellow (10YR 6/6) loamy sand ; no coarse fragments; wet; change to;	Natural
19.4 19.6 19.8			Very dark grey (3/N) medium heavy clay ; no coarse fragments; wet; borehole terminated at 19.9mBGL.	Natural
20 20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

AS40

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.9mBGL

DRILL DATE 6-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553172.5693

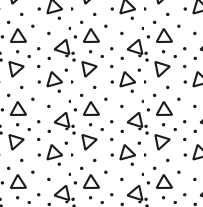
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6874062.448



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2				
0.4				
0.6			Brown (7.5YR 5/4) sandy loam with diffuse transitions to very few, fine sized, distinct, light grey (7.5YR 7/1) mottles; no coarse fragments; moderately moist; change to;	Natural
0.8				
1.0	▼		Light grey (5Y 7/1) loamy sand with diffuse transitions to common, medium sized, distinct, yellow (10YR 7/8) mottles; no coarse fragments; moist; change to;	Natural
1.2				
1.4				
1.6				
1.8				
2.0				
2.2				
2.4				
2.6				
2.8				
3.0				
3.2				
3.4				
3.6				
3.8				
4.0				
4.2				
4.4				
			Dark grey (4/N) loamy sand ; very few to few, fine shell fragments @ 6.5m and 8-8.5m; wet; change to;	Natural

BOREHOLE

AS41

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553233.5305

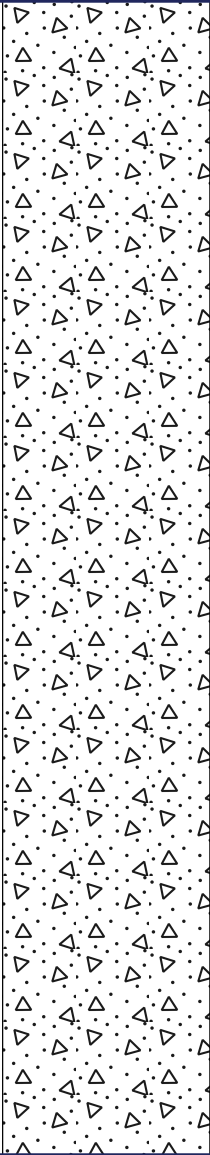
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873756.3



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS41

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553233.5305

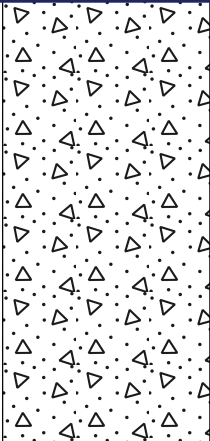
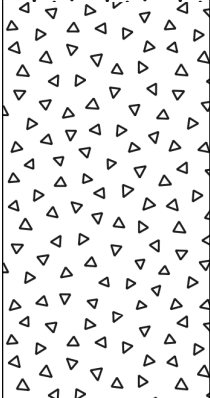
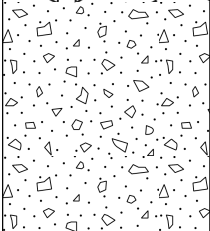

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873756.3



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6				
10.8 11 11.2 11.4 11.6 11.8 12 12.2			Dark brown (7.5YR 3/4) loam with diffuse transitions to common, medium sized, distinct, pale brown (10YR 6/3) mottles; few, fine to medium shell fragments 9-11.5m; wet; change to;	Natural
12.4 12.6 12.8			Very dark greyish brown (10YR 3/2) sandy clay loam ; no coarse fragments; wet; change to;	Natural
13 13.2 13.4			Very dark brown (10YR 2/2) sandy loam with diffuse transitions to many, medium sized, distinct, brown (10YR 4/3) mottles; no coarse fragments; wet; change to;	Natural

BOREHOLE

AS41

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553233.5305

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873756.3



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6				
14.8			Brown (10YR 4/3) loamy sand ; no coarse fragments; wet; change to;	Natural
15				
15.2				
15.4				
15.6				
15.8				
16				
16.2				
16.4				
16.6			Yellow (10YR 7/8) clay loam, sandy ; no coarse fragments; wet; change to;	Natural
16.8				
17			Brownish yellow (10YR 6/8) light clay ; no coarse fragments; wet; change to;	Natural
17.2				
17.4			Very dark greenish grey (10GY 3/1) heavy clay ; no coarse fragments; wet; borehole terminated at 17.5mBGL.	Natural
17.6				
17.8				
18				

BOREHOLE

AS41

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 17.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553233.5305

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873756.3



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (2.5Y 2.5/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2				
0.4			Grey (7.5YR 5/1) sandy loam ; no coarse fragments; dry; change to;	Natural
0.6				
0.8			Brown (7.5YR 5/3) loamy sand ; no coarse fragments; moist to wet; change to;	Natural
1	▼			
1.2			Dark grey (4/N) loamy sand ; very few, fine to medium shell fragments @ 6-9m; wet; change to;	Natural
1.4				
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS42

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 6-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553408.1098

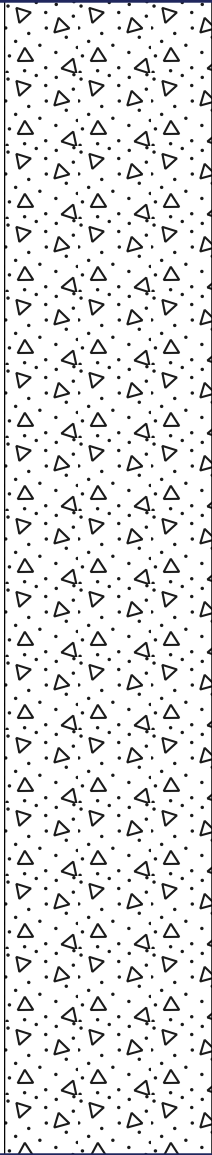
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873993.86



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS42

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 6-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553408.1098

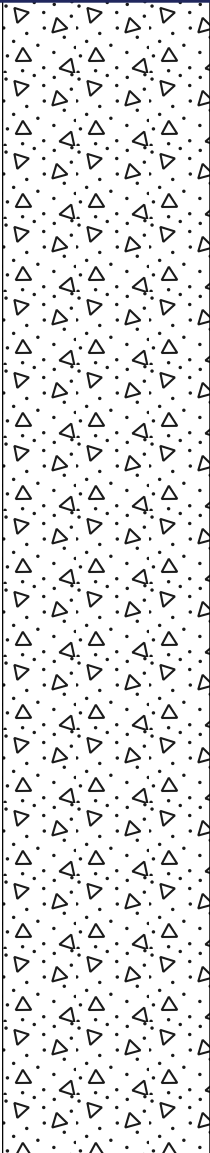
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873993.86



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS42

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 6-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553408.1098
























LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873993.86



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8			Light grey (7.5YR 7/1) loamy sand ; very few, fine to medium shell fragments @ 9-12m; wet; change to;	Natural
14				
14.2				
14.4				
14.6				
14.8				
15				
15.2				
15.4				
15.6				
15.8				
16				
16.2			Reddish yellow (7.5YR 6/8) loamy sand ; no coarse fragments; wet; change to;	Natural
16.4				
16.6				
16.8				
17				
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

AS42

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 19.5mBGL

DRILL DATE 6-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553408.1098

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873993.86



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2			NR due to a hose issue, scraped heavy clay from vibrocore.	Natural
18.4				
18.6				
18.8				
19				
19.2			Very dark greenish grey (10Y 3/1) heavy clay ; no coarse fragments; wet; borehole terminated at 19.5mBGL.	Natural
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS42

CLIENT HANSON CONSTRUCTION MATERIALS	PROJECT No. 12035	TOTAL DEPTH 19.5mBGL	DRILL DATE 6-Nov-20
PROJECT TWEED SAND PLANT EXPANSION	SURFACE RL Not surveyed	DRILLED BY PACIFIC GEOTECH	EASTING 553408.1098
LOCATION CUDGEN, NSW	DRILL METHOD VIBROCORE	LOGGED BY RMB	NORTHING 6873993.86



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) light clay ; no coarse fragments; dry; change to;	Natural
0.2				
0.4				
0.6			Light grey (7.5YR 7/1) sandy loam ; no coarse fragments; moist; change to;	Natural
0.8	▼			
1			Light brownish grey (2.5Y 6/2) loamy sand ; no coarse fragments; wet; change to;	Natural
1.2				
1.4				
1.6				
1.8			Grey (5Y 5/1) loamy sand ; few, fine shell fragments @ 6-7.5m; wet; change to;	Natural
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

AS43

CLIENT HANSON CONSTRUCTION MATERIALS PROJECT No. 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH EASTING 553379.7709

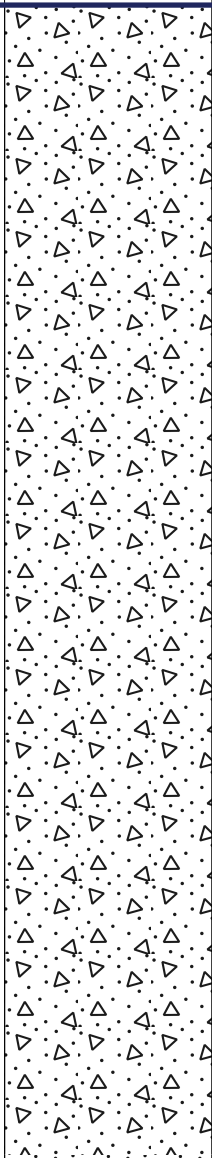
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873847.064



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9				

BOREHOLE

AS43

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553379.7709

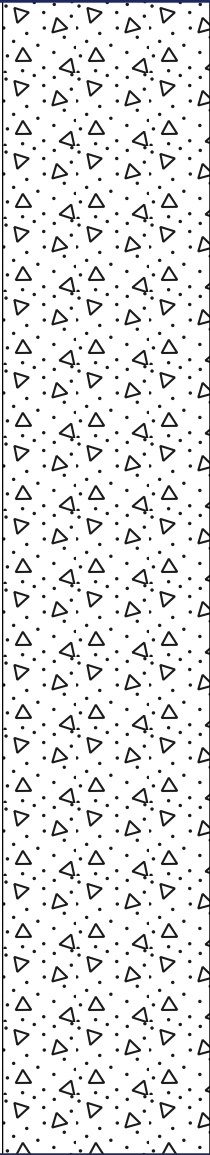
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873847.064



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			grey (5/N) loamy sand with diffuse transitions to very few, fine sized, distinct, black (2.5Y 2.5/1) mottles; very few, fine shell fragments @9-12m, very few, to few, fine to medium sized shells @ 12-15m; wet; change to;	Natural

BOREHOLE

AS43

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553379.7709

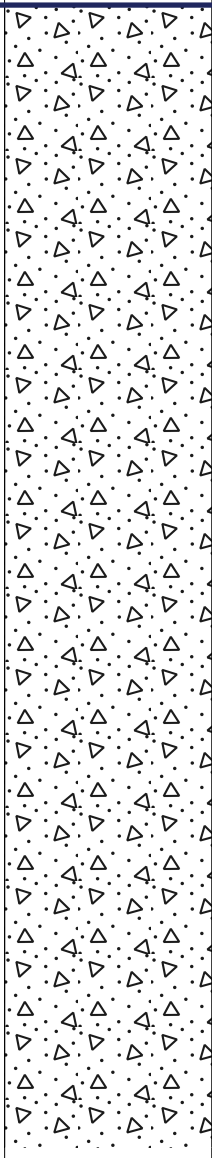
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873847.064



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

AS43

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553379.7709

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873847.064



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2			NR.	Natural
18.4				
18.6				
18.8				
19				
19.2				
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6			Greenish black (10Y 2.5/1) medium heavy clay ; very few, medium shell fragments; wet; borehole terminated at 21.5mBGL.	Natural
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

AS43

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 5-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553379.7709


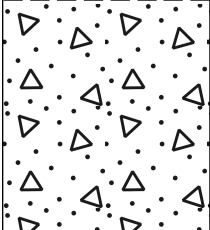
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873847.064



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0 0.2 0.4			Black (2.5Y 2.5/1) silty clay loam to light clay ; no coarse fragments; dry; change to;	Natural
0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8 4 4.2 4.4	▼		Pinkish grey (7.5YR 7/2) sandy loam with diffuse transitions to common, medium sized, distinct, grey (5Y 6/1) mottles; no coarse fragments; moist to wet; change to;	Natural
			Dark grey (4/N) loamy sand ; very few, fine shell fragments @ 6m; wet; change to;	Natural

BOREHOLE

AS44

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553575.9189

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873877.327



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			<p>Very dark grey (3/N) loamy sand; very few, fine shell fragments; wet; change to;</p>	<p>Natural</p>

BOREHOLE

AS44

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553575.9189

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873877.327



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

AS44

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553575.9189

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873877.327



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18			<p>Very dark greenish grey (10Y 3/1) loamy sand; no coarse fragments; wet; change to;</p>	Natural

BOREHOLE

AS44

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553575.9189

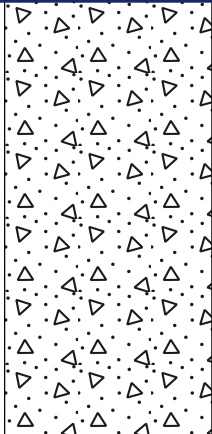
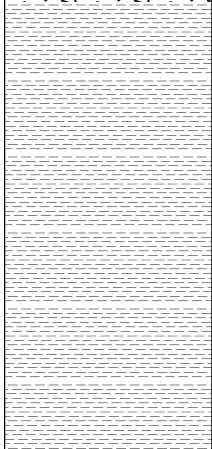
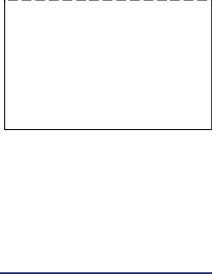
LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873877.327



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4 19.6				
19.8 20 20.2 20.4 20.6 20.8 21 21.2 21.4			Greenish black (10Y 2.5/1) heavy clay ; very few, fine to medium shell fragments; wet; borehole terminated at 21.5mBGL.	Natural
21.6 21.8 22 22.2 22.4				

BOREHOLE

AS44

CLIENT HANSON CONSTRUCTION MATERIALS **PROJECT No.** 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 4-Nov-20

PROJECT TWEED SAND PLANT EXPANSION **SURFACE RL** Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 553575.9189

LOCATION CUDGEN, NSW

DRILL METHOD VIBROCORE

LOGGED BY RMB

NORTHING 6873877.327



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0 0.2 0.4			Very dark brown (10YR 2/2) sandy clay loam ; no coarse fragments; moderately moist; massive structure; very weak consistence; no segregations; change to;	NATURAL
0.6 0.8 1 1.2 1.4	▼		Grey (10YR 6/1) loamy sand ; no coarse fragments; moderately moist; massive structure; very weak consistence; no segregations; change to;	NATURAL
1.6 1.8			Very dark greenish grey (10Y 3/1) clayey sand ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
2 2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8			Dark greenish grey (10Y 4/1) loamy sand ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
4 4.2 4.4			Olive grey (5Y 5/2) loamy sand ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL

BOREHOLE

MB13a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 15-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552740.07

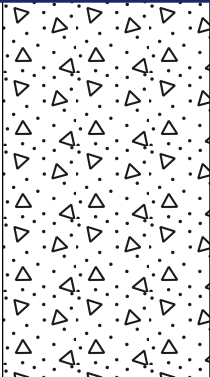

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873905.19



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6				
6.2 6.4			Olive grey (5Y 5/2) loamy sand ; very few, coarse gravelly, rounded calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			Olive grey (5Y 5/2) loamy sand ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL

BOREHOLE

MB13a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 15-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552740.07

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873905.19



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			<p>Grey (5Y 6/1) fine sand; very few, coarse gravelly, rounded calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; change to;</p>	<p>NATURAL</p>

BOREHOLE

MB13a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 15-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552740.07

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873905.19



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN	
13.6					
13.8					
14					
14.2					
14.4					
14.6					
14.8					
15					
15.2					
15.4					
15.6					
15.8					
16					
16.2					
16.4					
16.6					
16.8					
17					
17.2					
17.4			Dark grey (10YR 4/1) clayey sand ; very few, coarse gravelly, rounded calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL	
17.6			Very dark greenish grey (10Y 3/1) silty medium clay ; very few, coarse gravelly, rounded calcareous sand fragments; moist; massive structure; firm consistence; no segregations; borehole terminated at 20mBGL.	NATURAL	
17.8					
18					

BOREHOLE

MB13a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 15-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552740.07

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873905.19



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4 19.6 19.8 20 20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

MB13a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 15-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552740.07

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873905.19



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark grey (10YR 3/1) sandy loam ; no coarse fragments; moist; massive structure; weak consistence; no segregations; change to;	NATURAL
0.2			Reddish grey (5YR 5/2) sandy clay loam ; no coarse fragments; moist; massive structure; very weak consistence; no segregations; change to;	NATURAL
0.4				
0.6				
0.8	▼		Light brownish grey (10YR 6/2) loamy sand ; no coarse fragments; moist; massive structure; loose consistence; no segregations; change to;	NATURAL
1				
1.2				
1.4				
1.6				
1.8				
2			Grey (2.5Y 5/1) clayey sand ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4			Grey (2.5Y 5/1) loamy sand ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL
4.2				
4.4				

BOREHOLE

MB14a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552711.53

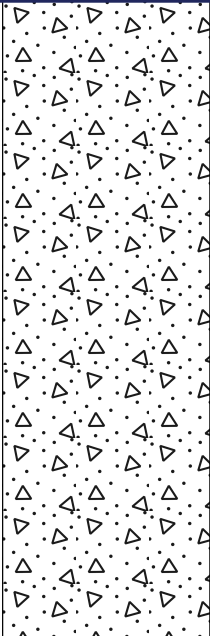










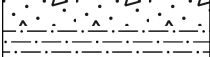
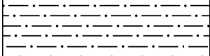
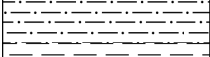
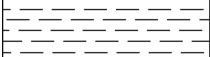
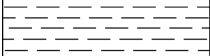







LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6872597.36



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6				
4.8				
5				
5.2				
5.4				
5.6				
5.8				
6				
6.2				
6.4				
6.6				
6.8				
7				
7.2			Grey (2.5Y 5/1) clayey sand ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
7.4				
7.6			Very dark greenish grey (10Y 3/1) silty medium clay ; very few, medium gravelly, subangular calcareous sand fragments; moist; massive structure; firm consistence; no segregations; change to;	NATURAL
7.8				
8				
8.2				
8.4				
8.6				
8.8				
9				

BOREHOLE

MB14a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552711.53

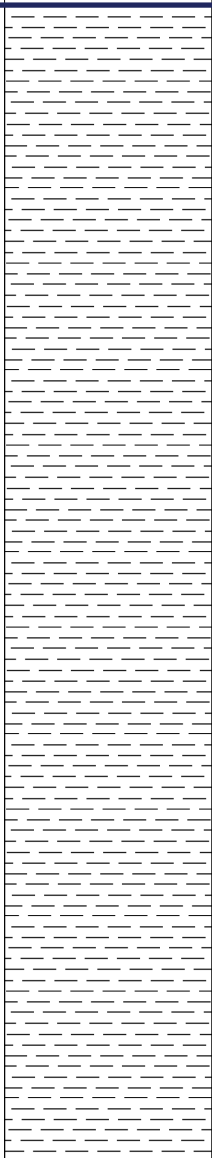
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6872597.36



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

MB14a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552711.53

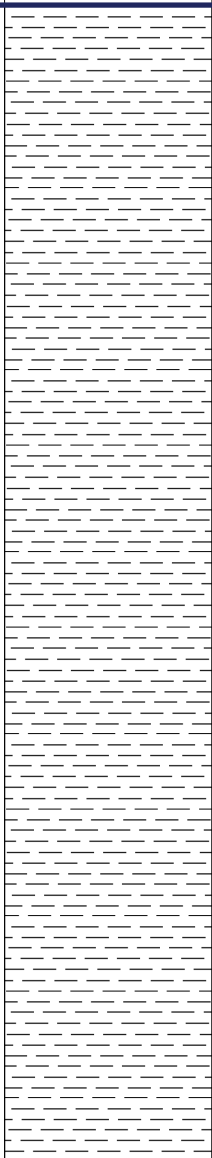
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6872597.36



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18				

BOREHOLE

MB14a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552711.53

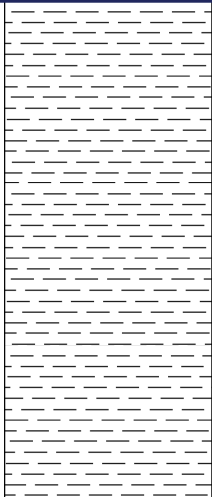
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6872597.36



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4 19.6 19.8 20			Pale orange yellow (10YR 9/2) silty medium clay ; very few, medium gravelly, subangular calcareous sand fragments; moist; massive structure; very strong consistence; no segregations; borehole terminated at 20mBGL.	NATURAL
20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

MB14a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 16-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552711.53

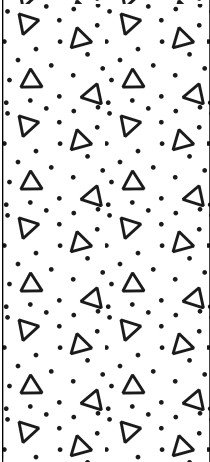
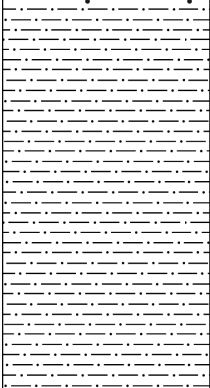
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6872597.36



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark greyish brown (10YR 3/2) silty clay loam ; no coarse fragments; moist; massive structure; weak consistence; no segregations; change to;	NATURAL
0.2 0.4 0.6 0.8 1 1.2	▼		Greyish brown (10YR 5/2) sandy loam ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
1.4 1.6 1.8 2 2.2 2.4 2.6 2.8			Greyish brown (10YR 5/2) sandy loam ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
3 3.2 3.4 3.6 3.8 4 4.2 4.4			Very dark grey (5Y 3/1) clayey sand ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL

BOREHOLE

MB15a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 17-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 551808.9

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873422.44



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6				
6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			grey (5/N) sandy loam ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL

BOREHOLE

MB15a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 17-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 551808.9

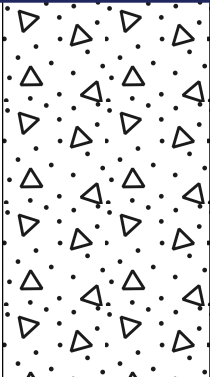
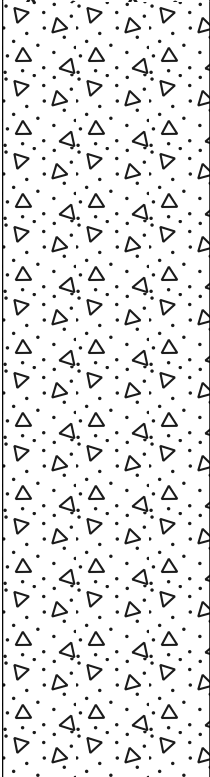
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873422.44



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4				
10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			Dark grey (5Y 4/1) loamy sand ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL

BOREHOLE

MB15a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 17-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 551808.9

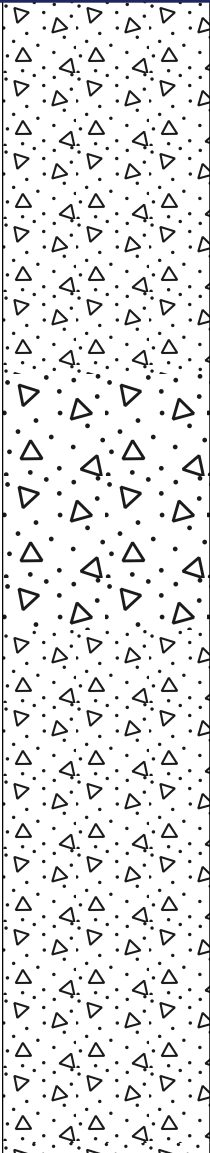
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873422.44



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14 14.2 14.4 14.6 14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18			<p>Very dark grey (5Y 3/1) sandy loam; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;</p> <p>Dark grey (5Y 4/1) loamy sand; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;</p>	<p>NATURAL</p> <p>NATURAL</p>

BOREHOLE

MB15a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 17-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 551808.9

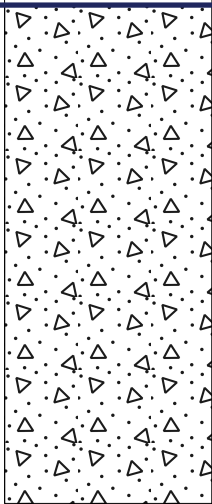
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873422.44



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4 19.6 19.8 20 20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4			<p>Dark grey (5Y 4/1) light loamy fine sand; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; borehole terminated at 20mBGL.</p>	<p>NATURAL</p>

BOREHOLE

MB15a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 17-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 551808.9

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6873422.44



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) silty clay loam ; no coarse fragments; moist; massive structure; very weak consistence; no segregations; change to;	NATURAL
0.2			Greyish brown (2.5Y 5/2) clayey sand ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
0.4				
0.6				
0.8				
1	▼			
1.2				
1.4			Dark grey (5Y 4/1) clayey sand ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL
1.6				
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

MB16a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552130.24

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874378.67



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8				
6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			grey (5/N) loamy sand ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL

BOREHOLE

MB16a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552130.24

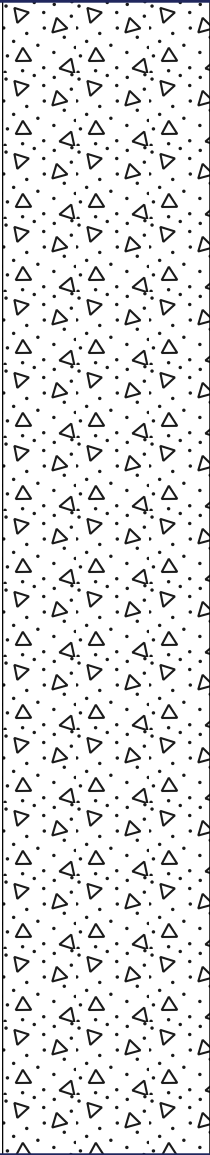
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874378.67



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

MB16a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552130.24









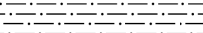
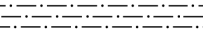
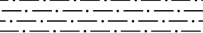
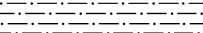
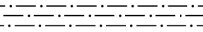
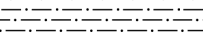
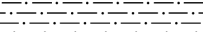
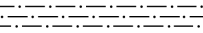

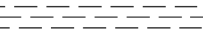
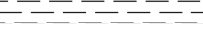
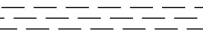
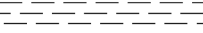
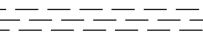
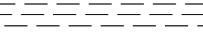
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874378.67



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14			Dark grey (5Y 4/1) sandy loam ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
14.2				
14.4				
14.6				
14.8				
15			Very dark grey (5Y 3/1) clayey sand ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL
15.2				
15.4				
15.6				
15.8				
16				
16.2				
16.4				
16.6			Very dark greenish grey (10Y 3/1) silty medium clay ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
16.8				
17			Very dark greenish grey (10Y 3/1) silty medium clay ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; borehole terminated at 20mBGL.	NATURAL
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

MB16a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552130.24

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874378.67



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4 19.6 19.8 20 20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

MB16a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 20-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552130.24

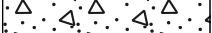


LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874378.67



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Very dark grey (10YR 3/1) silty clay loam ; no coarse fragments; moist; massive structure; weak consistence; no segregations; change to;	NATURAL
0.2			Greyish brown (10YR 5/2) heavy loamy sand ; no coarse fragments; moist; massive structure; very weak consistence; no segregations; change to;	NATURAL
0.4				
0.6				
0.8				
1				
1.2				
1.4	▼		Grey (2.5Y 5/1) heavy loamy sand ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
1.6				
1.8				
2				
2.2				
2.4				
2.6			Dark grey (5Y 4/1) clayey sand ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
2.8				
3				
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

MB17a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 21-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552301.08

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874902.89



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8				
8.2 8.4 8.6 8.8 9			Grey (5Y 5/1) heavy loamy sand ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL

BOREHOLE

MB17a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 21-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552301.08

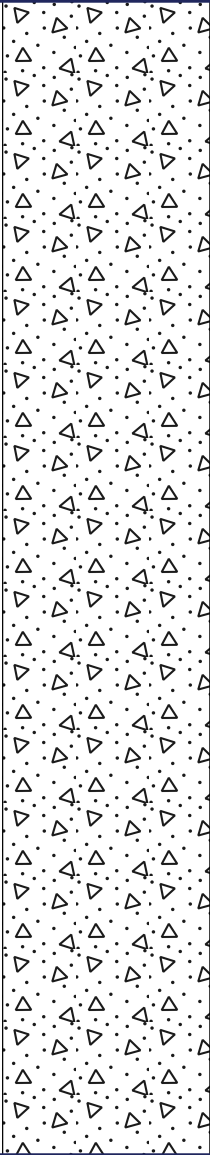
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874902.89



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4				

BOREHOLE

MB17a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 21-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552301.08











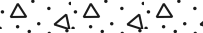







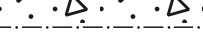
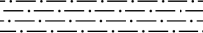
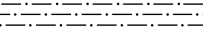
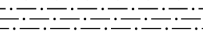
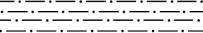
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874902.89



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6				
13.8				
14				
14.2				
14.4				
14.6				
14.8				
15				
15.2				
15.4				
15.6				
15.8				
16			Grey (5Y 5/1) sandy loam ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL
16.2				
16.4				
16.6				
16.8				
17			Very dark grey (5Y 3/1) clayey sand ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL
17.2				
17.4				
17.6				
17.8				
18				

BOREHOLE

MB17a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 21-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552301.08

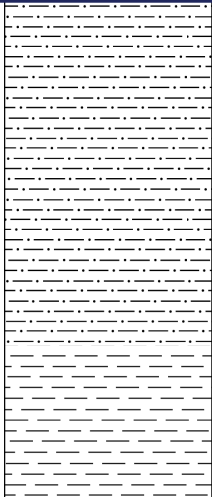
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874902.89



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2 18.4 18.6 18.8 19 19.2 19.4 19.6 19.8 20			Very dark greenish grey (10Y 3/1) silty medium clay ; no coarse fragments; wet; massive structure; loose consistence; no segregations; borehole terminated at 20mBGL.	NATURAL
20.2 20.4 20.6 20.8 21 21.2 21.4 21.6 21.8 22 22.2 22.4				

BOREHOLE

MB17a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 20mBGL

DRILL DATE 21-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552301.08




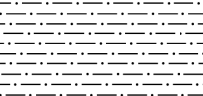
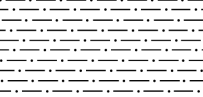

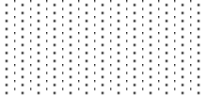
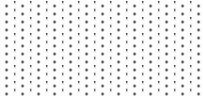

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874902.89



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
0			Black (10YR 2/1) silty clay loam ; no coarse fragments; moist; massive structure; weak consistence; no segregations; change to;	NATURAL
0.2				
0.4			Grey (10YR 5/1) loamy sand ; no coarse fragments; moist; massive structure; very weak consistence; no segregations; change to;	NATURAL
0.6				
0.8	▼		Grey (7.5YR 5/1) loamy sand ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
1				
1.2				
1.4				
1.6			Very dark grey (5Y 3/1) clayey sand ; no coarse fragments; wet; massive structure; very weak consistence; no segregations; change to;	NATURAL
1.8				
2				
2.2				
2.4				
2.6				
2.8				
3			Grey (5Y 5/1) sand ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL
3.2				
3.4				
3.6				
3.8				
4				
4.2				
4.4				

BOREHOLE

MB18a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 22-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH

EASTING 552979.83

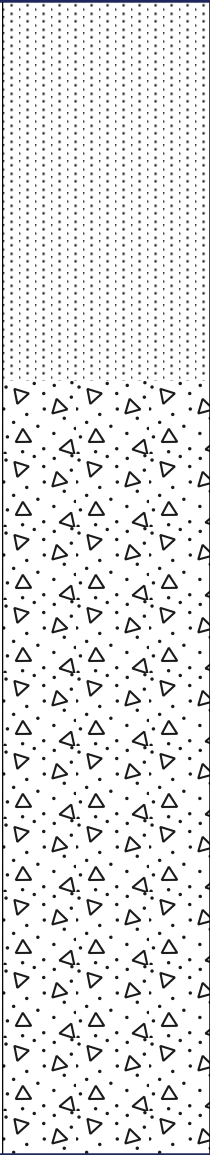
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874672.57



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8 8.2 8.4 8.6 8.8 9			<p>Dark grey (5Y 4/1) loamy sand; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; loose consistence; no segregations; change to;</p>	<p>NATURAL</p>

BOREHOLE

MB18a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 22-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH

EASTING 552979.83

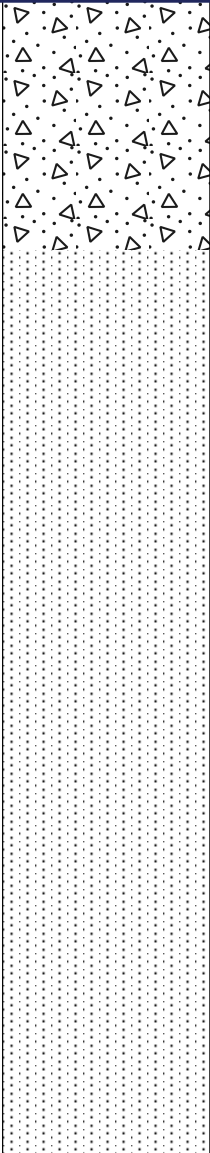
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874672.57



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
9.2 9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8 12 12.2 12.4 12.6 12.8 13 13.2 13.4			<p>Grey (5Y 5/1) sand; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; loose consistence; no segregations; change to;</p>	<p>NATURAL</p>

BOREHOLE

MB18a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 22-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552979.83

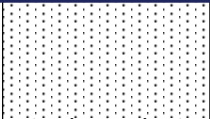

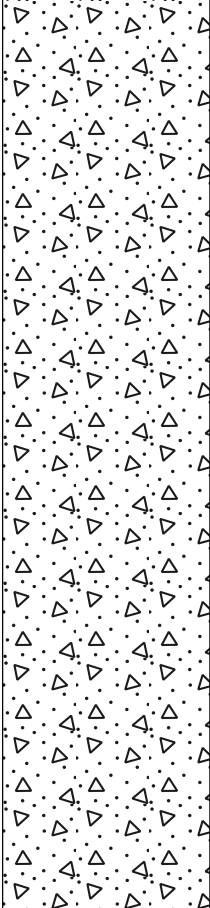
LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874672.57



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
13.6 13.8 14				
14.2 14.4 14.6			Dark grey (5Y 4/1) loamy sand ; very few, medium gravelly, subangular calcareous sand fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL
14.8 15 15.2 15.4 15.6 15.8 16 16.2 16.4 16.6 16.8 17 17.2 17.4 17.6 17.8 18			Dark grey (5Y 4/1) loamy sand ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL

BOREHOLE

MB18a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 22-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552979.83

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874672.57



DEPTH (mBGL)	GROUNDWATER	GRAPHIC LOG	SOIL DESCRIPTION	ORIGIN
18.2				
18.4				
18.6			Very dark grey (5Y 3/1) clayey sand ; no coarse fragments; wet; massive structure; loose consistence; no segregations; change to;	NATURAL
18.8				
19				
19.2				
19.4				
19.6				
19.8				
20				
20.2				
20.4				
20.6				
20.8				
21				
21.2				
21.4				
21.6				
21.8				
22				
22.2				
22.4				

BOREHOLE

MB18a

CLIENT HANSON CONSTRUCTION MATERIALS

PROJECT No. 12035

TOTAL DEPTH 21.5mBGL

DRILL DATE 22-Apr-20

PROJECT TWEED SAND PLANT EXPANSION

SURFACE RL Not surveyed

DRILLED BY PACIFIC GEOTECH **EASTING** 552979.83

LOCATION CUDGEN, NSW

DRILL METHOD AUGER

LOGGED BY GLH

NORTHING 6874672.57



12 Appendix 3 – Summary results

13 Appendix 4 – Laboratory certificates

CERTIFICATE OF ANALYSIS

Work Order : **EB2026164**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : MS ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : +61 07 38523999
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : BN/413/20
No. of samples received : 53
No. of samples analysed : 53

Page : 1 of 13
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8616
Date Samples Received : 06-Oct-2020 15:49
Date Analysis Commenced : 14-Oct-2020
Issue Date : 14-Oct-2020 16:44



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				MB13 0-0.6 EB2021780001	MB13 1 EB2021780003	MB13 1.75 EB2021780004	MB13 3 EB2021780006	MB13 4 EB2021780007
Client sampling date / time				15-Apr-2020 00:00	15-Apr-2020 00:00	15-Apr-2020 00:00	15-Apr-2020 00:00	15-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-001	EB2026164-002	EB2026164-003	EB2026164-004	EB2026164-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.7	5.4	5.0	5.5	9.1
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	56	5	9	2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.09	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.034	0.022	0.152	0.121	0.088
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	21	14	95	75	55
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	----	0.53
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	----	106
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	----	0.17
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.12	0.03	0.17	0.12	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	77	19	104	78	<10
Liming Rate	----	1	kg CaCO3/t	6	1	8	6	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.12	0.03	0.17	0.12	0.09
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	77	19	104	78	55
Liming Rate excluding ANC	----	1	kg CaCO3/t	6	1	8	6	4



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				MB13 7 EB2021780010	MB13 10 EB2021780013	MB13 13 EB2021780016	MB13 16 EB2021780019	MB13 18 EB2021780021
Client sampling date / time				15-Apr-2020 00:00	15-Apr-2020 00:00	15-Apr-2020 00:00	15-Apr-2020 00:00	15-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-006	EB2026164-007	EB2026164-008	EB2026164-009	EB2026164-010
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.5	9.5	9.6	9.5	8.6
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.066	0.019	0.020	0.026	1.02
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	41	12	13	16	636
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.96	0.66	1.96	0.83	6.95
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	392	132	391	166	1390
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.63	0.21	0.63	0.27	2.23
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	<0.02	0.02	0.03	1.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	41	12	13	16	636
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	<1	<1	1	48



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				MB14 0-0.15 EB2021780022	MB14 2 EB2021780025	MB14 4 EB2021780027	MB14 6 EB2021780029	MB14 7.5 EB2021780031
Client sampling date / time				16-Apr-2020 00:00	16-Apr-2020 00:00	16-Apr-2020 00:00	16-Apr-2020 00:00	16-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-011	EB2026164-012	EB2026164-013	EB2026164-014	EB2026164-015
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.7	6.8	9.0	8.8	8.4
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	30	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.05	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.018	0.113	0.065	0.164	2.10
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	12	71	41	102	1310
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.30	1.16	1.14	7.64
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	61	231	228	1530
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.10	0.37	0.36	2.45
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.07	0.05	<0.02	<0.02	0.47
Net Acidity (acidity units)	----	10	mole H+ / t	41	30	<10	<10	290
Liming Rate	----	1	kg CaCO3/t	3	2	<1	<1	22
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.11	0.06	0.16	2.10
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	41	71	41	102	1310
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	5	3	8	98



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				MB15 0.3 EB2021780032	MB15 1 EB2021780033	MB15 2 EB2021780034	MB15 4 EB2021780036	MB15 6 EB2021780038
Client sampling date / time				17-Apr-2020 00:00	17-Apr-2020 00:00	17-Apr-2020 00:00	17-Apr-2020 00:00	17-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-016	EB2026164-017	EB2026164-018	EB2026164-019	EB2026164-020
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.8	6.7	6.9	7.0	8.5
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	49	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.08	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.031	0.017	0.331	0.113	0.187
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	20	11	206	70	117
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.17	0.54	0.40	0.82
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	33	108	80	163
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.05	0.17	0.13	0.26
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.11	<0.02	0.22	0.03	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	69	<10	134	17	<10
Liming Rate	----	1	kg CaCO3/t	5	<1	10	1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.11	<0.02	0.33	0.11	0.19
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	69	11	206	70	117
Liming Rate excluding ANC	----	1	kg CaCO3/t	5	<1	16	5	9



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				MB15 7 EB2021780039	MB15 9 EB2021780041	MB15 12 EB2021780044	MB15 15 EB2021780047	MB15 17 EB2021780049
Client sampling date / time				17-Apr-2020 00:00	17-Apr-2020 00:00	17-Apr-2020 00:00	17-Apr-2020 00:00	17-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-021	EB2026164-022	EB2026164-023	EB2026164-024	EB2026164-025
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.3	9.1	9.5	8.8	9.4
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.044	0.134	0.049	0.369	0.087
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	28	84	31	230	54
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.52	1.02	3.07	2.76	2.95
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	103	203	614	552	590
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.16	0.32	0.98	0.88	0.94
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.13	0.05	0.37	0.09
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	28	84	31	230	54
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	6	2	17	4



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				MB15 18 EB2021780050	MB15 20 EB2021780052	MB16 1 EB2021780054	MB16 2 EB2021780055	MB16 5 EB2021780058
Client sampling date / time				17-Apr-2020 00:00	17-Apr-2020 00:00	20-Apr-2020 00:00	20-Apr-2020 00:00	20-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-026	EB2026164-027	EB2026164-028	EB2026164-029	EB2026164-030
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.2	9.4	5.7	5.0	8.8
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	9	20	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.03	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.212	0.076	0.011	0.096	0.118
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	132	48	<10	60	74
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	6.25	6.90	----	----	1.08
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1250	1380	----	----	216
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	2.00	2.21	----	----	0.35
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.02	0.13	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	16	80	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	1	6	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.21	0.08	0.02	0.13	0.12
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	132	48	16	80	74
Liming Rate excluding ANC	----	1	kg CaCO3/t	10	4	1	6	6



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				MB16 8 EB2021781001	MB16 11 EB2021781004	MB16 14 EB2021781007	MB16 16 EB2021781009	MB16 17 EB2021781010
Client sampling date / time				20-Apr-2020 00:00	20-Apr-2020 00:00	20-Apr-2020 00:00	20-Apr-2020 00:00	20-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-031	EB2026164-032	EB2026164-033	EB2026164-034	EB2026164-035
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.2	9.3	9.4	9.1	8.3
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.056	0.058	0.018	0.121	0.636
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	35	36	11	76	397
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.25	2.12	2.99	4.86	5.53
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	449	424	598	972	1100
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.72	0.68	0.96	1.56	1.77
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.06	<0.02	0.12	0.64
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	35	36	11	76	397
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	3	<1	6	30



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				MB17 0.15 EB2021781011	MB17 2 EB2021781013	MB17 4 EB2021781015	MB17 7 EB2021781018	MB17 10 EB2021781021
Client sampling date / time				21-Apr-2020 00:00	21-Apr-2020 00:00	21-Apr-2020 00:00	21-Apr-2020 00:00	21-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-036	EB2026164-037	EB2026164-038	EB2026164-039	EB2026164-040
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.4	4.9	7.1	9.1	9.4
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	132	16	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.21	0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.018	0.143	0.108	0.094	0.029
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	11	89	67	59	18
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.31	2.06	1.47
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	62	411	294
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.10	0.66	0.47
EA033-D: Retained Acidity								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.03	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.03	----	----	----	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.23	0.17	0.04	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	145	105	26	<10	<10
Liming Rate	----	1	kg CaCO3/t	11	8	2	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.23	0.17	0.11	0.09	0.03
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	145	105	67	59	18
Liming Rate excluding ANC	----	1	kg CaCO3/t	11	8	5	4	1



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				MB17 13 EB2021781024	MB17 16 EB2021781027	MB17 19 EB2021781030	MB18 0.4 EB2021781031	MB18 1 EB2021781032
Client sampling date / time				21-Apr-2020 00:00	21-Apr-2020 00:00	21-Apr-2020 00:00	22-Apr-2020 00:00	22-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-041	EB2026164-042	EB2026164-043	EB2026164-044	EB2026164-045
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.4	9.4	9.5	5.3	5.6
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	11	2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.025	0.032	0.036	0.014	0.019
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	16	20	23	<10	12
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.77	3.78	3.37	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	354	756	673	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.57	1.21	1.08	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.03	0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	20	14
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	1	1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	0.03	0.04	0.03	0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	16	20	23	20	14
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	2	2	1	1



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				MB18 3 EB2021781034	MB18 5 EB2021781036	MB18 7 EB2021781038	MB18 10 EB2021781041	MB18 13 EB2021781044
Client sampling date / time				22-Apr-2020 00:00	22-Apr-2020 00:00	22-Apr-2020 00:00	22-Apr-2020 00:00	22-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026164-046	EB2026164-047	EB2026164-048	EB2026164-049	EB2026164-050
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	5.1	9.3	9.3	9.4	9.5
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	10	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.096	0.035	0.052	0.062	0.038
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	60	22	33	39	24
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.80	1.60	2.58	2.29
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	160	321	515	458
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.26	0.51	0.82	0.74
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.11	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	70	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	5	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.11	0.04	0.05	0.06	0.04
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	70	22	33	39	24
Liming Rate excluding ANC	----	1	kg CaCO3/t	5	2	2	3	2



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				MB18 15 EB2021781047	MB18 18 EB2021781050	MB18 20 EB2021781053	----	----
Client sampling date / time				22-Apr-2020 00:00	22-Apr-2020 00:00	22-Apr-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	EB2026164-051	EB2026164-052	EB2026164-053	-----	-----
				Result	Result	Result	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.5	9.5	9.0	----	----
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	----	----
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.035	0.037	0.167	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	22	23	104	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.75	3.25	7.69	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	550	648	1540	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.88	1.04	2.46	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	----	----
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	0.04	0.17	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	22	23	104	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	8	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EB2026774**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : MS ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : +61 07 38523999
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : BN/413/20
No. of samples received : 97
No. of samples analysed : 97

Page : 1 of 22
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8616
Date Samples Received : 13-Oct-2020 09:47
Date Analysis Commenced : 22-Oct-2020
Issue Date : 26-Oct-2020 16:35



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS18 0.0	AS18 1.5	AS18 2.5	AS18 4.0	AS18 7.0
Client sampling date / time				28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-001	EB2026774-002	EB2026774-003	EB2026774-004	EB2026774-005	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.1	6.2	5.0	9.0	9.3	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	12	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.016	0.026	0.438	0.162	0.049	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	16	273	101	30	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	1.37	0.96	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	273	193	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	0.44	0.31	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.03	0.46	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	16	285	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	1	21	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	0.03	0.46	0.16	0.05	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	16	285	101	30	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	1	21	8	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS18 8.5	AS18 9.5	AS18 11.5	AS18 13.5	AS18 14.5
Client sampling date / time				28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-006	EB2026774-007	EB2026774-008	EB2026774-009	EB2026774-010	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.3	9.1	9.5	9.3	8.7	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.052	0.042	0.046	0.126	0.045	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	32	26	29	78	28	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.85	0.85	1.58	4.72	1.63	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	169	169	316	943	326	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.27	0.27	0.51	1.51	0.52	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.04	0.05	0.12	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	32	26	29	78	28	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	2	6	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS22 0.0	AS22 1.5	AS22 3.0	AS22 5.0	AS22 7.0
Client sampling date / time				28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-011	EB2026774-012	EB2026774-013	EB2026774-014	EB2026774-015	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	4.6	6.8	5.2	9.1	9.1	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	66	<2	7	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.10	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.043	0.046	0.255	0.169	0.123	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	27	28	159	106	76	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.55	----	3.81	2.60	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	110	----	761	520	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.18	----	1.22	0.83	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.15	<0.02	0.26	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	92	<10	165	<10	<10	
Liming Rate	----	1	kg CaCO3/t	7	<1	12	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.15	0.04	0.26	0.17	0.12	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	92	28	165	106	76	
Liming Rate excluding ANC	----	1	kg CaCO3/t	7	2	12	8	6	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS22 9.0	AS22 12.0	AS22 13.5	AS22 15.0	AS22 17.0
Client sampling date / time				28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	28-Sep-2020 00:00	16-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-016	EB2026774-017	EB2026774-018	EB2026774-019	EB2026774-020	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.3	9.0	9.2	9.4	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.064	0.122	0.319	0.163	0.067	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	40	76	199	102	42	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.01	4.26	9.44	5.55	1.97	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	402	851	1880	1110	394	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.64	1.36	3.02	1.78	0.63	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.12	0.32	0.16	0.07	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	40	76	199	102	42	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	6	15	8	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				AS22 19.0	AS28 0.0	AS28 1.0	AS28 2.5	AS28 3.5
Client sample ID								
Client sampling date / time				16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026774-021	EB2026774-022	EB2026774-023	EB2026774-024	EB2026774-025
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	8.4	5.3	6.7	6.1	9.1
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	20	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.03	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	1.69	0.032	0.039	0.123	0.077
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1060	20	24	76	48
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	5.70	----	0.67	----	1.16
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1140	----	134	----	233
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.83	----	0.21	----	0.37
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.48	0.06	<0.02	0.12	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	296	40	<10	76	<10
Liming Rate	----	1	kg CaCO3/t	22	3	<1	6	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	1.69	0.06	0.04	0.12	0.08
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	1060	40	24	76	48
Liming Rate excluding ANC	----	1	kg CaCO3/t	79	3	2	6	4



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				AS28 5.0	AS28 7.0	AS28 9.5	AS28 12.0	AS28 14.0
Client sample ID				16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00
Client sampling date / time				16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2026774-026	EB2026774-027	EB2026774-028	EB2026774-029	EB2026774-030
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.2	9.4	9.3	9.4	9.5
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.062	0.059	0.126	0.120	0.064
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	38	37	78	75	40
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.22	1.92	5.83	4.52	2.18
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	245	384	1160	904	436
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.39	0.62	1.87	1.45	0.70
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.06	0.12	0.12	0.06
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	38	37	78	75	40
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	3	6	6	3



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS28 15.0	AS29 0.0	AS29 1.0	AS29 2.0	AS29 4.0
Client sampling date / time				16-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-031	EB2026774-032	EB2026774-033	EB2026774-034	EB2026774-035	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.5	5.0	5.5	5.2	6.4	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	46	5	10	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.07	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.069	0.049	0.027	0.131	0.116	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	43	30	17	82	72	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.70	----	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	539	----	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.86	----	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.12	0.04	0.15	0.12	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	76	22	92	72	
Liming Rate	----	1	kg CaCO3/t	<1	6	2	7	5	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.12	0.04	0.15	0.12	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	43	76	22	92	72	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	6	2	7	5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS29 6.0	AS29 8.0	AS29 9.5	AS29 10.5	AS30 0.0
Client sampling date / time				15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-036	EB2026774-037	EB2026774-038	EB2026774-039	EB2026774-040	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.3	9.3	9.2	7.2	4.8	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	59	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	0.10	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.050	0.049	0.068	0.012	0.057	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	31	30	42	<10	36	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.84	0.99	0.59	0.02	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	167	198	118	<10	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.27	0.32	0.19	<0.01	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.15	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	95	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	7	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.05	0.07	<0.02	0.15	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	31	30	42	<10	95	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	3	<1	7	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS30 1.0	AS30 2.0	AS30 4.0	AS30 5.0	AS30 6.0
Client sampling date / time				15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-041	EB2026774-042	EB2026774-043	EB2026774-044	EB2026774-045	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.0	4.5	9.0	9.0	9.0	
Titration Actual Acidity (23F)	----	2	mole H+ / t	16	25	<2	<2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02	0.04	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.035	0.300	0.162	0.177	0.132	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	22	187	101	111	82	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	2.05	2.80	1.00	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	410	559	199	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.66	0.90	0.32	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.06	0.34	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	37	213	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	3	16	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.34	0.16	0.18	0.13	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	37	213	101	111	82	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	16	8	8	6	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS30 8.0	AS33 0.5	AS33 1.5	AS33 2.5	AS33 3.5
Client sampling date / time				15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-046	EB2026774-047	EB2026774-048	EB2026774-049	EB2026774-050	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.8	5.0	4.3	4.6	7.8	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	18	90	51	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.03	0.14	0.08	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.013	0.010	0.870	0.520	0.822	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	543	324	513	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.35	----	----	----	1.03	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	70	----	----	----	207	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.11	----	----	----	0.33	
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	0.29	----	----	
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	0.30	----	----	
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	<0.02	----	----	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	<10	----	----	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	<0.02	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.04	1.02	0.60	0.60	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	24	636	375	375	
Liming Rate	----	1	kg CaCO3/t	<1	2	48	28	28	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	0.04	1.02	0.60	0.82	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	24	636	375	513	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	2	48	28	38	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS33 5.5	AS33 7.5	AS33 8.75	AS33 9.5	AS34 0.0
Client sampling date / time				15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-051	EB2026774-052	EB2026774-053	EB2026774-054	EB2026774-055	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	8.9	9.1	5.9	8.7	5.0	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	15	<2	47	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.02	<0.02	0.07	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.314	0.133	2.11	1.30	0.080	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	196	83	1320	810	50	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	3.29	0.99	----	8.32	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	657	198	----	1660	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.05	0.32	----	2.66	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	2.13	<0.02	0.16	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	1330	<10	97	
Liming Rate	----	1	kg CaCO3/t	<1	<1	100	<1	7	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.31	0.13	2.13	1.30	0.16	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	196	83	1330	810	97	
Liming Rate excluding ANC	----	1	kg CaCO3/t	15	6	100	61	7	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS34 0.75	AS34 1.25	AS34 2.0	AS34 3.5	AS35 0.0
Client sampling date / time				15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	15-Sep-2020 00:00	16-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-056	EB2026774-057	EB2026774-058	EB2026774-059	EB2026774-060	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.7	5.6	4.6	5.3	4.8	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	4	2	53	30	40	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.08	0.05	0.06	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.025	0.022	0.744	1.55	0.030	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	16	14	464	964	19	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.03	0.02	0.83	1.59	0.09	
Net Acidity (acidity units)	----	10	mole H+ / t	20	16	517	994	59	
Liming Rate	----	1	kg CaCO3/t	1	1	39	75	4	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	0.02	0.83	1.59	0.09	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	20	16	517	994	59	
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	1	39	75	4	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS35 0.5	AS35 1.5	AS35 2.0	AS35 4.0	AS35 6.0
Client sampling date / time				16-Sep-2020 00:00	16-Sep-2020 00:00	16-Sep-2020 00:00	17-Sep-2020 00:00	17-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-061	EB2026774-062	EB2026774-063	EB2026774-064	EB2026774-065	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.4	5.4	5.3	4.9	9.3	
Titration Actual Acidity (23F)	----	2	mole H+ / t	5	4	9	10	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.020	0.012	0.088	0.086	0.013	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	13	<10	55	53	<10	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	----	1.34	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	----	268	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	----	0.43	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.03	<0.02	0.10	0.10	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	18	12	64	63	<10	
Liming Rate	----	1	kg CaCO3/t	1	<1	5	5	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	<0.02	0.10	0.10	<0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	18	12	64	63	<10	
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	<1	5	5	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS35 8.0	AS35 10.5	AS35 13.0	AS35 15.0	AS35 18.5
Client sampling date / time				17-Sep-2020 00:00	17-Sep-2020 00:00	17-Sep-2020 00:00	17-Sep-2020 00:00	17-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-066	EB2026774-067	EB2026774-068	EB2026774-069	EB2026774-070	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.4	9.5	9.5	9.5	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.013	0.012	0.013	0.013	0.012	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.82	1.30	2.26	2.88	1.68	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	164	260	451	574	336	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.26	0.42	0.72	0.92	0.54	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS36 0.0	AS36 1.0	AS36 2.0	AS36 3.0	AS36 5.0
Client sampling date / time				14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-071	EB2026774-072	EB2026774-073	EB2026774-074	EB2026774-075	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.3	5.7	9.0	6.4	9.3	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	7	3	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.011	0.011	0.152	0.080	0.092	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	95	50	57	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.94	----	1.14	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	188	----	228	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.30	----	0.36	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.02	<0.02	<0.02	0.08	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	13	<10	<10	50	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	4	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	<0.02	0.15	0.08	0.09	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	13	<10	95	50	57	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	7	4	4	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS36 7.0	AS36 9.0	AS37 0.5	AS37 2.0	AS37 4.0
Client sampling date / time				14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-076	EB2026774-077	EB2026774-078	EB2026774-079	EB2026774-080	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.6	9.0	6.1	9.1	9.4	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.046	0.080	0.016	0.062	0.056	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	28	50	10	39	35	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	4.89	12.6	----	0.04	0.52	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	977	2530	----	<10	103	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.56	4.05	----	0.01	0.16	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.05	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	10	34	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	2	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.08	<0.02	0.06	0.06	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	28	50	10	39	35	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	4	<1	3	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS37 6.0	AS37 7.0	AS38 0.5	AS38 1.5	AS38 2.5
Client sampling date / time				14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2026774-081	EB2026774-082	EB2026774-083	EB2026774-084	EB2026774-085	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.3	3.9	6.0	5.4	9.2	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	216	<2	7	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.34	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.089	1.80	0.014	0.164	0.108	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	56	1120	<10	103	68	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.21	----	----	----	0.58	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	241	----	----	----	115	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.39	----	----	----	0.18	
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	1.04	----	----	----	
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	1.35	----	----	----	
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	0.31	----	----	----	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	144	----	----	----	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	0.23	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	2.37	<0.02	0.18	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	1480	<10	109	<10	
Liming Rate	----	1	kg CaCO3/t	<1	111	<1	8	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.09	2.37	<0.02	0.18	0.11	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	56	1480	<10	109	68	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	111	<1	8	5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	AS38 4.0	AS38 5.0	AS38 5.75	AS38 6.25	DUP 1
Client sampling date / time			14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	14-Sep-2020 00:00	[14-Sep-2020]
Compound	CAS Number	LOR	Unit	EB2026774-086	EB2026774-087	EB2026774-088	EB2026774-089	EB2026774-090
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.2	9.2	4.8	9.0	9.4
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	87	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.14	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.071	0.116	1.80	0.396	0.064
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	44	72	1120	247	40
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.10	0.86	----	2.88	1.68
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	21	172	----	576	335
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.03	0.28	----	0.92	0.54
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.05	<0.02	1.94	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	30	<10	1210	<10	<10
Liming Rate	----	1	kg CaCO3/t	2	<1	91	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.12	1.94	0.40	0.06
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	44	72	1210	247	40
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	5	91	18	3



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	DUP 2	DUP 3	DUP 4	DUP 5	DUP 6
Client sampling date / time				[14-Sep-2020]	[14-Sep-2020]	[14-Sep-2020]	[14-Sep-2020]	[14-Sep-2020]	
Compound	CAS Number	LOR	Unit	EB2026774-091	EB2026774-092	EB2026774-093	EB2026774-094	EB2026774-095	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.3	9.4	9.5	5.2	5.4	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	14	5	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.125	0.114	0.063	0.049	0.067	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	78	71	39	31	42	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	5.42	3.73	1.47	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1080	746	293	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.74	1.20	0.47	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.07	0.08	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	44	47	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	3	4	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.12	0.11	0.06	0.07	0.08	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	78	71	39	44	47	
Liming Rate excluding ANC	----	1	kg CaCO3/t	6	5	3	3	4	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				DUP 7	DUP 8	----	----	----
Client sampling date / time				[14-Sep-2020]	[14-Sep-2020]	----	----	----
Compound	CAS Number	LOR	Unit	EB2026774-096	EB2026774-097	-----	-----	-----
				Result	Result	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	8.1	9.4	----	----	----
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	----	----
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.154	0.046	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	96	29	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.10	0.20	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	21	40	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.03	0.06	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	0.13	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	82	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t	6	<1	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.15	0.05	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	96	29	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	7	2	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EB2027666**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : ----
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : EN/222
No. of samples received : 37
No. of samples analysed : 37

Page : 1 of 10
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61 7 3552 8616
Date Samples Received : 22-Oct-2020 13:19
Date Analysis Commenced : 05-Nov-2020
Issue Date : 05-Nov-2020 16:48



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

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This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS32 0	AS32 2	AS32 4	AS32 5	AS32 7
Client sampling date / time				02-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027666-001	EB2027666-002	EB2027666-003	EB2027666-004	EB2027666-005	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.2	6.4	8.8	9.2	9.0	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	23	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.04	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.021	0.109	0.160	0.102	0.203	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	13	68	100	63	126	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	1.24	2.13	2.48	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	248	425	495	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.40	0.68	0.79	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.06	0.11	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	36	68	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	3	5	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.11	0.16	0.10	0.20	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	36	68	100	63	126	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	5	8	5	9	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS32 7.5	AS32 8	AS32 9	AS32 9.5	AS32 11.5
Client sampling date / time				02-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027666-006	EB2027666-007	EB2027666-008	EB2027666-009	EB2027666-010	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.9	6.9	6.6	6.7	7.2	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.383	0.026	0.021	0.010	0.012	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	239	16	13	<10	<10	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.26	0.20	0.25	0.25	0.24	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	53	41	49	50	48	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.08	0.06	0.08	0.08	0.08	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.33	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	204	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	15	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.38	0.02	0.02	<0.02	<0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	239	16	13	<10	<10	
Liming Rate excluding ANC	----	1	kg CaCO3/t	18	1	<1	<1	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS32 13.5	D9	D10	D11	D12
Client sampling date / time				02-Oct-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027666-011	EB2027666-012	EB2027666-013	EB2027666-014	EB2027666-015	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.7	9.4	9.6	9.5	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.008	0.044	0.032	0.052	0.057	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	27	20	33	36	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.24	1.50	2.46	4.44	3.89	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	48	300	492	886	778	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.08	0.48	0.79	1.42	1.25	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	0.04	0.03	0.05	0.06	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	27	20	33	36	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	2	1	2	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				D13	D15	D16	D17	D18
Client sampling date / time				30-Sep-2020 00:00	01-Oct-2020 00:00	01-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027666-016	EB2027666-017	EB2027666-018	EB2027666-019	EB2027666-020
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.5	9.2	9.5	7.3	6.8
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.056	0.152	0.059	0.025	0.016
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	35	95	37	15	10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.17	4.96	1.95	0.23	0.17
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	434	991	389	46	34
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.70	1.59	0.62	0.07	0.05
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.15	0.06	0.02	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	35	95	37	15	10
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	7	3	1	<1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	D19	D20	D21	D22	D23
Client sampling date / time					07-Oct-2020 00:00	07-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027666-021	EB2027666-022	EB2027666-023	EB2027666-024	EB2027666-025	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.4	4.7	5.8	9.5	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	46	<2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.07	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.050	0.038	0.242	0.114	0.045	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	31	24	151	71	28	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.19	1.04	----	----	2.37	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	238	207	----	----	473	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.38	0.33	----	----	0.76	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.32	0.11	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	197	71	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	15	5	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.04	0.32	0.11	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	31	24	197	71	28	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	15	5	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	D24	D25	D26	D27	D28
Client sampling date / time					13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027666-026	EB2027666-027	EB2027666-028	EB2027666-029	EB2027666-030	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.5	9.5	9.5	9.5	9.5
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.035	0.034	0.022	0.020	0.018	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	22	22	14	13	11	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.44	1.10	0.86	0.97	1.45	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	288	219	173	193	290	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.46	0.35	0.28	0.31	0.46	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.03	0.02	0.02	<0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	22	22	14	13	11	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	1	<1	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	D29	D30	D31	D32	D33
Client sampling date / time				15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027666-031	EB2027666-032	EB2027666-033	EB2027666-034	EB2027666-035	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.5	9.5	9.5	5.9	8.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.044	0.043	0.024	0.050	2.25	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	27	27	15	31	1400	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.52	3.02	2.40	----	4.73	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	504	604	478	----	944	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.81	0.97	0.77	----	1.51	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.05	1.24	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	31	774	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	2	58	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.04	0.02	0.05	2.25	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	27	27	15	31	1400	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	1	2	105	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				D34	D35	----	----	----
Client sampling date / time				15-Oct-2020 00:00	15-Oct-2020 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2027666-036	EB2027666-037	-----	-----	-----
				Result	Result	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.5	9.3	----	----	----
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	----	----
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.043	0.084	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	27	52	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.70	3.62	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	340	723	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.54	1.16	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	<1	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.08	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	27	52	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	4	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EB2027668**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : MS ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : +61 07 38523999
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : BN/413/20
No. of samples received : 60
No. of samples analysed : 60

Page : 1 of 14
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8616
Date Samples Received : 22-Oct-2020 13:19
Date Analysis Commenced : 06-Nov-2020
Issue Date : 06-Nov-2020 17:15



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders (EB2027668, EB2027666 and EB2027675) due to the size of the sample numbers. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				AS20 0	AS20 2	AS20 4.5	AS20 7	AS20 10
Client sample ID								
Client sampling date / time				30-Sep-2020 00:00	30-Sep-2020 00:00	30-Sep-2020 00:00	30-Sep-2020 00:00	30-Sep-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027668-001	EB2027668-002	EB2027668-003	EB2027668-004	EB2027668-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.5	4.5	5.5	9.4	9.4
Titration Actual Acidity (23F)	----	2	mole H+ / t	126	33	5	<2	<2
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	0.20	0.05	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.043	0.254	0.112	0.071	0.147
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	27	159	70	44	92
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	1.07	8.25
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	214	1650
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	0.34	2.64
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.24	0.31	0.12	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	153	192	75	<10	<10
Liming Rate	----	1	kg CaCO3/t	11	14	6	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.24	0.31	0.12	0.07	0.15
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	153	192	75	44	92
Liming Rate excluding ANC	----	1	kg CaCO3/t	11	14	6	3	7



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS20 13	AS20 16	AS20 19.5	AS21 0	AS21 2.5
Client sampling date / time				30-Sep-2020 00:00	30-Sep-2020 00:00	30-Sep-2020 00:00	30-Sep-2020 00:00	30-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027668-006	EB2027668-007	EB2027668-008	EB2027668-009	EB2027668-010	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.5	9.6	8.4	4.5	4.7	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	104	26	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.17	0.04	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.066	0.024	1.76	0.040	0.239	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	41	15	1100	25	149	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.18	2.05	4.72	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	436	410	943	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.70	0.66	1.51	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.76	0.21	0.28	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	471	129	175	
Liming Rate	----	1	kg CaCO3/t	<1	<1	35	10	13	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.02	1.76	0.21	0.28	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	41	15	1100	129	175	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	1	82	10	13	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS21 4.5	AS21 7	AS21 9.5	AS21 12	AS21 15
Client sampling date / time				30-Sep-2020 00:00	30-Sep-2020 00:00	30-Sep-2020 00:00	30-Sep-2020 00:00	30-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027668-011	EB2027668-012	EB2027668-013	EB2027668-014	EB2027668-015	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	8.7	9.3	9.5	9.5	9.4	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.091	0.128	0.058	0.042	0.018	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	57	80	36	26	11	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.39	2.34	2.12	2.24	0.78	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	78	467	423	447	155	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.12	0.75	0.68	0.72	0.25	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.09	0.13	0.06	0.04	<0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	57	80	36	26	11	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	6	3	2	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS23 0	AS23 1.5	AS23 3.5	AS23 6	AS23 10.5
Client sampling date / time				07-Oct-2020 00:00	07-Oct-2020 00:00	07-Oct-2020 00:00	07-Oct-2020 00:00	07-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027668-016	EB2027668-017	EB2027668-018	EB2027668-019	EB2027668-020	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.0	4.8	7.6	9.3	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	38	24	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.06	0.04	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.030	0.254	0.144	0.084	0.022	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	19	158	90	52	14	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.27	1.57	1.63	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	54	314	326	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.09	0.50	0.52	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.09	0.29	0.08	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	57	183	54	<10	<10	
Liming Rate	----	1	kg CaCO3/t	4	14	4	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.09	0.29	0.14	0.08	0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	57	183	90	52	14	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	14	7	4	1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS23 14	AS23 17.5	AS24 0	AS24 1.5	AS24 4
Client sampling date / time				07-Oct-2020 00:00	07-Oct-2020 00:00	07-Oct-2020 00:00	07-Oct-2020 00:00	07-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027668-021	EB2027668-022	EB2027668-023	EB2027668-024	EB2027668-025	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	8.8	5.1	4.6	5.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	26	40	3	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.04	0.06	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.036	0.346	0.020	0.371	0.134	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	22	216	12	231	84	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.34	13.6	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	68	2710	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.11	4.34	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.06	0.43	0.14	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	38	271	87	
Liming Rate	----	1	kg CaCO3/t	<1	<1	3	20	6	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.35	0.06	0.43	0.14	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	22	216	38	271	87	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	16	3	20	6	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS24 6	AS24 9.5	AS24 12	AS24 15	AS24 18
Client sampling date / time				07-Oct-2020 00:00	07-Oct-2020 00:00	07-Oct-2020 00:00	07-Oct-2020 00:00	07-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027668-026	EB2027668-027	EB2027668-028	EB2027668-029	EB2027668-030	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.3	9.4	9.4	9.2	8.8	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.075	0.046	0.050	0.248	0.405	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	46	29	31	155	253	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.43	1.10	1.05	11.2	14.7	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	286	219	209	2240	2940	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.46	0.35	0.34	3.60	4.70	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.05	0.05	0.25	0.40	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	46	29	31	155	253	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	2	2	12	19	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS25 0	AS25 2.0	AS25 4.0	AS25 6.5	AS25 8.0
Client sampling date / time				13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027668-031	EB2027668-032	EB2027668-033	EB2027668-034	EB2027668-035	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.0	4.7	5.4	9.2	6.1	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	33	22	5	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.05	0.04	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.020	0.260	0.127	0.083	0.066	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	13	162	79	52	41	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	1.38	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	277	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	0.44	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.07	0.30	0.13	<0.02	0.06	
Net Acidity (acidity units)	----	10	mole H+ / t	46	185	84	<10	41	
Liming Rate	----	1	kg CaCO3/t	3	14	6	<1	3	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.30	0.13	0.08	0.06	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	46	185	84	52	41	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	14	6	4	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS25 10.0	AS25 12.0	AS25 16.0	AS26 0	AS26 2
Client sampling date / time					13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	06-Oct-2020 00:00	06-Oct-2020 00:00
Compound	CAS Number	LOR	Unit		EB2027668-036	EB2027668-037	EB2027668-038	EB2027668-039	EB2027668-040
				Result	Result	Result	Result	Result	Result
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.8	6.9	3.9	5.3	4.8	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	120	14	18	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.19	0.02	0.03	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.057	0.018	2.87	0.022	0.253	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	36	11	1790	14	158	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.20	0.32	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	41	64	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.06	0.10	----	----	----	
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	0.50	----	----	
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	0.60	----	----	
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	0.10	----	----	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	44	----	----	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	0.07	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	3.13	0.04	0.28	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	1950	28	176	
Liming Rate	----	1	kg CaCO3/t	<1	<1	146	2	13	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	<0.02	3.13	0.04	0.28	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	36	11	1950	28	176	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	<1	146	2	13	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS26 4.5	AS26 6.5	AS26 9	AS26 12.5	AS26 14.5
Client sampling date / time				06-Oct-2020 00:00	06-Oct-2020 00:00	06-Oct-2020 00:00	06-Oct-2020 00:00	06-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027668-041	EB2027668-042	EB2027668-043	EB2027668-044	EB2027668-045	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.3	6.8	6.6	6.7	4.8	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	18	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	0.03	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.056	0.026	0.012	0.010	0.637	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	35	16	<10	<10	397	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.46	0.14	0.24	0.09	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	292	29	48	18	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.47	0.05	0.08	0.03	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.66	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	415	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	31	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.02	<0.02	<0.02	0.66	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	35	16	<10	<10	415	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	1	<1	<1	31	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS26 15.5	AS27 0	AS27 2	AS27 3.5	AS27 6
Client sampling date / time				06-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027668-046	EB2027668-047	EB2027668-048	EB2027668-049	EB2027668-050	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	4.2	4.8	4.9	9.3	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	75	34	12	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.12	0.06	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	3.23	0.014	0.220	0.067	0.029	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	2020	<10	137	42	18	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	0.82	0.61	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	164	123	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	0.26	0.20	
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.40	----	----	----	----	
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.42	----	----	----	----	
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	0.02	----	----	----	----	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	3.37	0.07	0.24	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	2100	43	149	<10	<10	
Liming Rate	----	1	kg CaCO3/t	158	3	11	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	3.37	0.07	0.24	0.07	0.03	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	2100	43	149	42	18	
Liming Rate excluding ANC	----	1	kg CaCO3/t	158	3	11	3	1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS27 10	AS27 13.5	AS27 16	AS31 0	AS31 2
Client sampling date / time					02-Oct-2020 00:00	02-Oct-2020 00:00	02-Oct-2020 00:00	01-Oct-2020 00:00	01-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027668-051	EB2027668-052	EB2027668-053	EB2027668-054	EB2027668-055	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	7.5	6.8	4.3	4.8	5.5	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	67	43	6	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.11	0.07	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.021	0.009	3.33	0.013	0.094	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	13	<10	2080	<10	58	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.23	0.06	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	46	13	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.07	0.02	----	----	----	
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	0.34	----	----	
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	0.35	----	----	
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	<0.02	----	----	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	<10	----	----	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	<0.02	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	3.44	0.08	0.10	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	2150	51	65	
Liming Rate	----	1	kg CaCO3/t	<1	<1	161	4	5	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	<0.02	3.44	0.08	0.10	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	13	<10	2150	51	65	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	161	4	5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				AS31 4.5	AS31 7.5	AS31 10	AS31 13	AS31 16.5
Client sample ID				AS31 4.5	AS31 7.5	AS31 10	AS31 13	AS31 16.5
Client sampling date / time				01-Oct-2020 00:00	01-Oct-2020 00:00	01-Oct-2020 00:00	01-Oct-2020 00:00	01-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027668-056	EB2027668-057	EB2027668-058	EB2027668-059	EB2027668-060
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.3	9.2	9.5	9.3	7.1
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.118	0.120	0.070	0.136	0.008
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	73	75	44	85	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.96	3.06	2.69	4.98	0.33
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	391	612	537	995	65
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.63	0.98	0.86	1.60	0.10
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.12	0.12	0.07	0.14	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	73	75	44	85	<10
Liming Rate excluding ANC	----	1	kg CaCO3/t	6	6	3	6	<1

CERTIFICATE OF ANALYSIS

Work Order : **EB2027675**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : MS ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : +61 07 38523999
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : BN/413/20
No. of samples received : 66
No. of samples analysed : 66

Page : 1 of 16
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8616
Date Samples Received : 22-Oct-2020 13:19
Date Analysis Commenced : 09-Nov-2020
Issue Date : 09-Nov-2020 14:06



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS6 0.0	AS6 3.0	AS6 3.5	AS6 6.0	AS6 8.5
Client sampling date / time				15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-001	EB2027675-002	EB2027675-003	EB2027675-004	EB2027675-005	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.0	4.6	8.1	9.4	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	27	29	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.04	0.05	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.010	0.158	0.087	0.030	0.047	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	98	54	19	29	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.34	0.49	1.62	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	69	97	325	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.11	0.16	0.52	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.05	0.20	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	33	128	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	2	10	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.20	0.09	0.03	0.05	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	33	128	54	19	29	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	10	4	1	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS6 10.0	AS6 12.5	AS6 15.0	AS6 16.0	AS6 18.0
Client sampling date / time				15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-006	EB2027675-007	EB2027675-008	EB2027675-009	EB2027675-010	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.6	9.5	9.5	9.4	8.8	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.032	0.029	0.084	0.084	0.355	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	20	18	53	52	222	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.59	0.97	6.21	4.02	3.45	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	318	195	1240	804	688	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.51	0.31	1.99	1.29	1.10	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	0.03	0.08	0.08	0.36	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	20	18	53	52	222	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	1	4	4	17	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS6 18.5	AS7 0.0	AS7 2.0	AS7 3.5	AS7 4.0
Client sampling date / time				15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-011	EB2027675-012	EB2027675-013	EB2027675-014	EB2027675-015	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	7.0	4.9	5.2	5.4	5.7	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	45	12	3	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.07	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	2.12	0.026	0.029	0.059	0.047	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1320	16	18	37	30	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.25	----	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	450	----	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.72	----	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	1.64	0.10	0.05	0.06	0.05	
Net Acidity (acidity units)	----	10	mole H+ / t	1020	61	30	40	30	
Liming Rate	----	1	kg CaCO3/t	77	5	2	3	2	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	2.12	0.10	0.05	0.06	0.05	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	1320	61	30	40	30	
Liming Rate excluding ANC	----	1	kg CaCO3/t	99	5	2	3	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS7 6.5	AS7 8.5	AS7 11.5	AS7 14.5	AS7 16.5
Client sampling date / time				15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-016	EB2027675-017	EB2027675-018	EB2027675-019	EB2027675-020	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.2	9.5	9.4	9.3	9.1	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.033	0.045	0.094	0.213	0.281	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	21	28	59	133	175	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.47	1.68	3.50	7.24	2.80	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	94	336	700	1450	560	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.15	0.54	1.12	2.32	0.90	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	0.04	0.09	0.21	0.28	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	21	28	59	133	175	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	4	10	13	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS7 17.25	AS14 0.0	AS14 2.0	AS14 5.5	AS14 8.5
Client sampling date / time				15-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2027675-021	EB2027675-022	EB2027675-023	EB2027675-024	EB2027675-025	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	8.5	4.6	4.7	9.3	9.4	
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	89	29	<2	<2	
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.14	0.05	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	2.01	0.032	0.242	0.035	0.049	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1250	20	151	22	30	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	4.54	----	----	0.57	2.54	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	907	----	----	114	508	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.45	----	----	0.18	0.81	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	1.04	0.18	0.29	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	647	109	180	<10	<10	
Liming Rate	----	1	kg CaCO3/t	48	8	14	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	2.01	0.18	0.29	0.03	0.05	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	1250	109	180	22	30	
Liming Rate excluding ANC	----	1	kg CaCO3/t	94	8	14	2	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS14 10.0	AS14 12.0	AS14 14.0	AS14 16.5	AS14 18.0
Client sampling date / time				14-Oct-2020 00:00	14-Oct-2020 00:00	14-Oct-2020 00:00	14-Oct-2020 00:00	14-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-026	EB2027675-027	EB2027675-028	EB2027675-029	EB2027675-030	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.5	9.5	9.4	9.1	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.055	0.046	0.035	0.051	0.300	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	34	29	22	32	187	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.95	2.88	2.92	1.76	8.50	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	590	575	584	351	1700	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.94	0.92	0.94	0.56	2.72	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.05	0.04	0.05	0.30	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	34	29	22	32	187	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	2	2	14	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS15 0.0	AS15 1.5	AS15 5.5	AS15 9.0	AS15 11.5
Client sampling date / time				13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-031	EB2027675-032	EB2027675-033	EB2027675-034	EB2027675-035	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	4.7	4.7	9.3	9.3	9.4	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	90	35	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.14	0.06	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.031	0.310	0.040	0.029	0.030	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	20	193	25	18	19	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	1.28	0.80	0.90	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	256	161	179	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.41	0.26	0.29	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.18	0.37	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	110	228	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	8	17	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.18	0.37	0.04	0.03	0.03	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	110	228	25	18	19	
Liming Rate excluding ANC	----	1	kg CaCO3/t	8	17	2	1	1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS15 14.0	AS15 17.5	AS16 0.0	AS16 2.0	AS16 5.0
Client sampling date / time				13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-036	EB2027675-037	EB2027675-038	EB2027675-039	EB2027675-040	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	8.6	5.2	5.0	6.0	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	27	18	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.04	0.03	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.023	0.483	0.039	0.230	0.078	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	14	302	24	143	49	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.38	8.35	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	277	1670	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.44	2.67	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.08	0.26	0.08	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	51	161	49	
Liming Rate	----	1	kg CaCO3/t	<1	<1	4	12	4	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	0.48	0.08	0.26	0.08	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	14	302	51	161	49	
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	23	4	12	4	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS16 7.0	AS16 9.0	AS16 11.5	AS16 14.0	AS16 17.0
Client sampling date / time				13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	13-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-041	EB2027675-042	EB2027675-043	EB2027675-044	EB2027675-045	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.4	9.4	9.3	9.2	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.052	0.045	0.046	0.042	0.210	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	33	28	29	26	131	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.94	2.67	1.43	1.82	9.81	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	588	534	287	363	1960	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.94	0.86	0.46	0.58	3.14	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.04	0.05	0.04	0.21	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	33	28	29	26	131	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	2	2	10	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS17 0.0	AS17 1	AS17 2.5	AS17 4	AS17 6
Client sampling date / time				29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-046	EB2027675-047	EB2027675-048	EB2027675-049	EB2027675-050	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	4.8	6.0	5.1	7.9	9.0	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	66	<2	12	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.10	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.031	0.016	0.232	0.093	0.167	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	19	<10	145	58	104	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	0.34	1.66	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	68	332	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	0.11	0.53	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.14	<0.02	0.25	0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	86	<10	156	13	<10	
Liming Rate	----	1	kg CaCO3/t	6	<1	12	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.14	<0.02	0.25	0.09	0.17	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	86	<10	156	58	104	
Liming Rate excluding ANC	----	1	kg CaCO3/t	6	<1	12	4	8	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS17 9	AS17 12	AS17 13.5	AS17 15.5	AS17 18.5
Client sampling date / time				29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-051	EB2027675-052	EB2027675-053	EB2027675-054	EB2027675-055	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	8.9	9.4	9.5	9.5	9.1	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.335	0.078	0.045	0.054	0.396	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	209	48	28	34	247	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.47	4.53	3.19	5.03	9.80	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	494	905	637	1000	1960	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.79	1.45	1.02	1.61	3.14	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.34	0.08	0.04	0.05	0.40	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	209	48	28	34	247	
Liming Rate excluding ANC	----	1	kg CaCO3/t	16	4	2	2	18	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS17 19	AS19 0	AS19 2	AS19 3.5	AS19 5.5
Client sampling date / time				29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-056	EB2027675-057	EB2027675-058	EB2027675-059	EB2027675-060	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	8.5	4.7	4.9	5.5	6.1	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	102	23	2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.16	0.04	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	1.76	0.054	0.353	0.093	0.037	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1100	34	220	58	23	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	6.79	----	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1360	----	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	2.18	----	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.32	0.22	0.39	0.10	0.04	
Net Acidity (acidity units)	----	10	mole H+ / t	197	136	243	60	23	
Liming Rate	----	1	kg CaCO3/t	15	10	18	4	2	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	1.76	0.22	0.39	0.10	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	1100	136	243	60	23	
Liming Rate excluding ANC	----	1	kg CaCO3/t	83	10	18	4	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS19 7	AS19 8.5	AS19 10	AS19 11	AS19 14.5
Client sampling date / time				29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	29-Sep-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2027675-061	EB2027675-062	EB2027675-063	EB2027675-064	EB2027675-065	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.3	9.4	9.4	9.4	9.4	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.041	0.038	0.059	0.056	0.020	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	26	24	37	35	13	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.65	2.44	4.67	3.94	1.72	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	329	488	933	788	345	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.53	0.78	1.50	1.26	0.55	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.04	0.06	0.06	0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	26	24	37	35	13	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	3	3	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	AS19 19	----	----	----	----
Client sampling date / time			29-Sep-2020 00:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2027675-066	-----	-----	-----	-----
				Result	----	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	8.5	----	----	----	----
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	1.10	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	686	----	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	9.40	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1880	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	3.01	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	1.10	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	686	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	51	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EB2029676**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : MS ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : +61 07 38523999
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : BN/413/20
No. of samples received : 52
No. of samples analysed : 52

Page : 1 of 13
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8616
Date Samples Received : 10-Nov-2020 16:45
Date Analysis Commenced : 17-Nov-2020
Issue Date : 17-Nov-2020 17:07



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS1 0.0	AS1 1.5	AS1 3.5	AS1 4.0	AS1 6.5
Client sampling date / time				20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029676-001	EB2029676-002	EB2029676-003	EB2029676-004	EB2029676-005	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	4.3	4.7	9.4	4.6	9.4	
Titration Actual Acidity (23F)	----	2	mole H+ / t	108	14	<2	26	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	0.17	0.02	<0.02	0.04	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.022	0.109	0.051	0.185	0.063	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	14	68	32	116	39	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	1.62	----	1.04	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	325	----	208	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.52	----	0.33	
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----	
HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----	
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.20	0.13	<0.02	0.23	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	122	82	<10	142	<10	
Liming Rate	----	1	kg CaCO3/t	9	6	<1	11	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.20	0.13	0.05	0.23	0.06	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	122	82	32	142	39	
Liming Rate excluding ANC	----	1	kg CaCO3/t	9	6	2	11	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS1 8.5	AS1 10.5	AS1 13.5	AS1 15.5	AS1 16.5
Client sampling date / time				20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029676-006	EB2029676-007	EB2029676-008	EB2029676-009	EB2029676-010	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.5	9.6	9.5	9.4	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.054	0.034	0.068	0.105	0.049	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	34	21	43	65	31	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.98	1.71	5.02	6.67	3.42	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	396	342	1000	1330	682	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.63	0.55	1.61	2.14	1.09	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.03	0.07	0.10	0.05	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	34	21	43	65	31	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	3	5	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS1 19.0	AS1 20.0	AS2 0.0	AS2 0.5	AS2 3.5
Client sampling date / time				20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029676-011	EB2029676-012	EB2029676-013	EB2029676-014	EB2029676-015	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.6	8.5	4.7	5.2	4.8	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	74	19	24	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.12	0.03	0.04	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.040	1.85	0.020	0.028	0.270	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	25	1150	12	17	169	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	3.00	5.52	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	599	1100	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.96	1.77	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.67	0.14	0.06	0.31	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	416	86	36	193	
Liming Rate	----	1	kg CaCO3/t	<1	31	6	3	14	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	1.85	0.14	0.06	0.31	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	25	1150	86	36	193	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	86	6	3	14	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS2 5.0	AS2 7.0	AS2 11.0	AS2 14.0	AS2 16.5
Client sampling date / time				20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029676-016	EB2029676-017	EB2029676-018	EB2029676-019	EB2029676-020	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.0	9.3	9.5	9.5	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	12	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.160	0.135	0.036	0.062	0.066	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	100	84	22	39	41	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	4.68	1.62	4.17	3.80	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	936	325	833	758	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	1.50	0.52	1.34	1.22	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.18	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	112	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	8	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.18	0.14	0.04	0.06	0.07	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	112	84	22	39	41	
Liming Rate excluding ANC	----	1	kg CaCO3/t	8	6	2	3	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS2 19.0	AS3 0	AS3 1.0	AS3 2.0	AS3 3.5
Client sampling date / time				20-Oct-2020 00:00	16-Oct-2020 00:00	16-Oct-2020 00:00	16-Oct-2020 00:00	16-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029676-021	EB2029676-022	EB2029676-023	EB2029676-024	EB2029676-025	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	8.5	4.5	5.7	4.5	5.1	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	136	6	62	8	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.22	<0.02	0.10	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	1.16	0.023	0.014	0.386	0.083	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	727	14	<10	241	52	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	5.14	----	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1030	----	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.64	----	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.07	0.24	0.02	0.48	0.10	
Net Acidity (acidity units)	----	10	mole H+ / t	42	150	14	303	60	
Liming Rate	----	1	kg CaCO3/t	3	11	1	23	4	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	1.16	0.24	0.02	0.48	0.10	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	727	150	14	303	60	
Liming Rate excluding ANC	----	1	kg CaCO3/t	54	11	1	23	4	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS3 5.0	AS3 7.0	AS3 9.0	AS3 10.0	AS3 12.5
Client sampling date / time				16-Oct-2020 00:00	16-Oct-2020 00:00	19-Oct-2020 00:00	19-Oct-2020 00:00	19-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029676-026	EB2029676-027	EB2029676-028	EB2029676-029	EB2029676-030	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.1	9.3	9.5	9.6	9.4	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.086	0.124	0.040	0.044	0.036	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	54	77	25	27	23	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.58	3.56	2.03	1.66	1.38	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	116	711	406	333	276	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.19	1.14	0.65	0.53	0.44	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.08	0.12	0.04	0.04	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	54	77	25	27	23	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	6	2	2	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS3 16.5	AS3 19.5	AS3 20.0	AS4 0.0	AS4 1.5
Client sampling date / time				19-Oct-2020 00:00	19-Oct-2020 00:00	19-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029676-031	EB2029676-032	EB2029676-033	EB2029676-034	EB2029676-035	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.6	8.5	6.4	4.7	4.6	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	94	36	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.15	0.06	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.035	0.992	0.984	0.028	0.306	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	22	619	614	17	191	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	3.41	6.93	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	682	1380	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.09	2.22	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.98	0.18	0.36	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	614	111	227	
Liming Rate	----	1	kg CaCO3/t	<1	<1	46	8	17	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	0.99	0.98	0.18	0.36	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	22	619	614	111	227	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	46	46	8	17	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS4 3.5	AS4 5.5	AS4 8.0	AS4 12.0	AS4 15.5
Client sampling date / time				20-Oct-2020 00:00	20-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029676-036	EB2029676-037	EB2029676-038	EB2029676-039	EB2029676-040	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.5	9.6	9.5	9.6	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.072	0.052	0.022	0.041	0.038	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	45	32	14	26	24	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.48	1.34	1.68	1.26	2.19	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	295	269	335	251	438	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.47	0.43	0.54	0.40	0.70	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.05	0.02	0.04	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	45	32	14	26	24	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	2	1	2	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS4 17.5	AS4 18.5	AS4 19.0	AS5 0.0	AS5 1.5
Client sampling date / time				21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029676-041	EB2029676-042	EB2029676-043	EB2029676-044	EB2029676-045	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.7	9.6	9.1	4.5	6.2	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	133	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.21	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.047	0.037	0.270	0.016	0.174	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	29	23	169	<10	109	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	4.39	4.12	14.2	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	876	823	2840	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.40	1.32	4.56	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.23	0.17	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	142	109	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	11	8	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.04	0.27	0.23	0.17	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	29	23	169	142	109	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	13	11	8	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				AS5 4.0	AS5 6.5	AS5 8.0	AS5 10.5	AS5 13.5
Client sample ID				15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00
Client sampling date / time				15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00	15-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2029676-046	EB2029676-047	EB2029676-048	EB2029676-049	EB2029676-050
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.2	9.5	9.5	9.3	9.6
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.072	0.044	0.065	0.140	0.035
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	45	28	41	87	22
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.45	0.95	2.13	5.77	2.07
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	91	190	426	1150	413
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.14	0.30	0.68	1.85	0.66
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.04	0.06	0.14	0.03
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	45	28	41	87	22
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	2	3	6	2



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID			AS5 16.5	AS5 19.5	----	----	----	
Client sampling date / time			15-Oct-2020 00:00			15-Oct-2020 00:00			----	----	----
Compound	CAS Number	LOR	Unit	EB2029676-051	EB2029676-052	-----	-----	-----	-----	-----	
				Result	Result	----	----	----	----	----	
EA033-A: Actual Acidity											
pH KCl (23A)	----	0.1	pH Unit	9.3	8.4	----	----	----	----	----	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	----	----	----	----	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	----	----	----	----	----	
EA033-B: Potential Acidity											
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.250	1.43	----	----	----	----	----	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	156	894	----	----	----	----	----	
EA033-C: Acid Neutralising Capacity											
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	10.9	6.30	----	----	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	2190	1260	----	----	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	3.51	2.02	----	----	----	----	----	
EA033-E: Acid Base Accounting											
ANC Fineness Factor	----	0.5	-	1.5	1.5	----	----	----	----	----	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.09	----	----	----	----	----	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	55	----	----	----	----	----	
Liming Rate	----	1	kg CaCO3/t	<1	4	----	----	----	----	----	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.25	1.43	----	----	----	----	----	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	156	894	----	----	----	----	----	
Liming Rate excluding ANC	----	1	kg CaCO3/t	12	67	----	----	----	----	----	

CERTIFICATE OF ANALYSIS

Work Order : **EB2029555**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : MS ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : +61 07 38523999
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : BN/413/20
No. of samples received : 27
No. of samples analysed : 27

Page : 1 of 8
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8616
Date Samples Received : 10-Nov-2020 15:46
Date Analysis Commenced : 18-Nov-2020
Issue Date : 18-Nov-2020 17:21



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)				Client sample ID	AS13 0.0	AS13 2.0	AS13 3.0	AS13 3.5	AS13 6.0
Client sampling date / time				03-Nov-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029555-001	EB2029555-002	EB2029555-003	EB2029555-004	EB2029555-005	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	4.7	5.6	8.9	9.2	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	84	9	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.14	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.064	0.280	0.138	0.092	0.062	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	40	174	86	57	38	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.80	0.43	1.49	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	159	86	298	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.25	0.14	0.48	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.20	0.29	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	124	184	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	9	14	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.20	0.29	0.14	0.09	0.06	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	124	184	86	57	38	
Liming Rate excluding ANC	----	1	kg CaCO3/t	9	14	6	4	3	



Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)				Client sample ID	AS13 9.0	AS13 11.0	AS13 15.0	AS13 18.0	AS11 0.0
Client sampling date / time				03-Nov-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00	23-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029555-006	EB2029555-007	EB2029555-008	EB2029555-009	EB2029555-010	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.5	9.7	9.5	9.7	4.8	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	71	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	0.11	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.033	0.019	0.083	0.040	0.024	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	21	12	52	25	15	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.64	2.15	4.69	3.24	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	127	430	938	647	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.20	0.69	1.50	1.04	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.14	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	86	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	6	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	<0.02	0.08	0.04	0.14	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	21	12	52	25	86	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	<1	4	2	6	



Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)				Client sample ID	AS11 1.5	AS11 2.5	AS11 3.5	AS11 5.0	AS11 7.0
Client sampling date / time				23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	03-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029555-011	EB2029555-012	EB2029555-013	EB2029555-014	EB2029555-015	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.0	5.7	8.0	8.8	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	18	7	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.03	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.285	0.180	0.079	0.133	0.054	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	178	112	49	83	34	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.32	0.45	1.89	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	63	90	378	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.10	0.14	0.60	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.31	0.19	<0.02	0.04	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	196	119	<10	23	<10	
Liming Rate	----	1	kg CaCO3/t	15	9	<1	2	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.31	0.19	0.08	0.13	0.05	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	196	119	49	83	34	
Liming Rate excluding ANC	----	1	kg CaCO3/t	15	9	4	6	2	



Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)				Client sample ID	AS11 9.5	AS11 13.5	AS11 16.5	AS11 18.0	D63
Client sampling date / time				03-Nov-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00	23-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029555-016	EB2029555-017	EB2029555-018	EB2029555-019	EB2029555-020	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.6	9.7	9.6	8.6	6.0	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	3	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.068	0.021	0.067	0.910	0.106	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	42	13	42	567	66	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	4.30	3.12	4.55	5.47	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	860	623	910	1090	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.38	1.00	1.46	1.75	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.11	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	69	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	5	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.02	0.07	0.91	0.11	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	42	13	42	567	69	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	<1	3	42	5	



Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)				Client sample ID	D64	D65	D66	D67	D68
Client sampling date / time					23-Oct-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00	03-Nov-2020 00:00
Compound	CAS Number	LOR	Unit		EB2029555-021	EB2029555-022	EB2029555-023	EB2029555-024	EB2029555-025
					Result	Result	Result	Result	Result
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		8.5	9.5	9.6	9.2	9.5
Titrateable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S		0.153	0.061	0.039	0.079	0.039
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		96	38	25	49	24
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		0.50	1.93	4.22	0.49	1.36
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		100	386	844	98	271
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		0.16	0.62	1.35	0.16	0.43
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S		0.05	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		29	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t		2	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		0.15	0.06	0.04	0.08	0.04
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		96	38	25	49	24
Liming Rate excluding ANC	----	1	kg CaCO3/t		7	3	2	4	2



Analytical Results

Sub-Matrix: PULP (Matrix: SOIL)		Client sample ID			D69	D70	----	----	----	
Client sampling date / time		03-Nov-2020 00:00			03-Nov-2020 00:00			----	----	----
Compound	CAS Number	LOR	Unit	EB2029555-026	EB2029555-027	-----	-----	-----		
				Result	Result	----	----	----		
EA033-A: Actual Acidity										
pH KCl (23A)	----	0.1	pH Unit	9.6	9.5	----	----	----		
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	----	----		
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	----	----	----		
EA033-B: Potential Acidity										
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.030	0.096	----	----	----		
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	19	60	----	----	----		
EA033-C: Acid Neutralising Capacity										
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.95	8.23	----	----	----		
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	390	1640	----	----	----		
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.62	2.63	----	----	----		
EA033-E: Acid Base Accounting										
ANC Fineness Factor	----	0.5	-	1.5	1.5	----	----	----		
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	----	----	----		
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	----	----	----		
Liming Rate	----	1	kg CaCO3/t	<1	<1	----	----	----		
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	0.10	----	----	----		
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	19	60	----	----	----		
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	4	----	----	----		

CERTIFICATE OF ANALYSIS

Work Order : **EB2029681**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : MS ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : +61 07 38523999
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : BN/413/20
No. of samples received : 32
No. of samples analysed : 32

Page : 1 of 9
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8616
Date Samples Received : 11-Nov-2020 15:52
Date Analysis Commenced : 19-Nov-2020
Issue Date : 19-Nov-2020 13:24



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

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- General Comments
- Analytical Results

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Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



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

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **The samples in this work order have been re-batched from EB2029102 and EB2029215.**
- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS12 0.0	AS12 1.5	AS12 3.5	AS12 4.0	AS12 4.5
Client sampling date / time				04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029681-001	EB2029681-002	EB2029681-003	EB2029681-004	EB2029681-005	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.0	4.5	9.0	9.1	9.2	
Titration Actual Acidity (23F)	----	2	mole H+ / t	40	30	<2	<2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	0.06	0.05	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.014	0.306	0.071	0.093	0.108	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	191	44	58	67	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.65	1.08	1.76	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	130	216	352	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.21	0.34	0.56	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.08	0.35	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	49	221	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	4	16	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.08	0.35	0.07	0.09	0.11	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	49	221	44	58	67	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	16	3	4	5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS12 5.0	AS12 6.0	AS12 8.5	AS12 13.0	AS12 16.5
Client sampling date / time				04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029681-006	EB2029681-007	EB2029681-008	EB2029681-009	EB2029681-010	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.2	9.4	9.5	9.5	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.086	0.048	0.057	0.031	0.054	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	54	30	35	19	34	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.71	0.79	2.29	1.91	4.13	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	342	158	457	382	825	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.55	0.25	0.73	0.61	1.32	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.08	0.05	0.06	0.03	0.05	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	54	30	35	19	34	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	2	3	1	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS12 20.0	AS12 22.0	AS12 22.5	AS12 23.0	AS13 19.5
Client sampling date / time				04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029681-011	EB2029681-012	EB2029681-013	EB2029681-014	EB2029681-015	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.5	8.7	8.3	8.0	9.1	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.051	0.570	1.00	1.34	0.112	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	32	356	624	836	70	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	5.02	4.93	5.26	3.70	1.04	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1000	984	1050	740	209	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.61	1.58	1.68	1.19	0.33	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.55	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	342	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	26	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.57	1.00	1.34	0.11	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	32	356	624	836	70	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	27	47	63	5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS41 0.0	AS41 1.0	AS41 2.5	AS41 3.5	AS41 4.5
Client sampling date / time				05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029681-016	EB2029681-017	EB2029681-018	EB2029681-019	EB2029681-020	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.4	6.6	5.4	5.3	5.3	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	13	<2	6	6	4	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.013	0.021	0.156	0.086	0.068	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	13	97	54	42	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.10	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	19	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.03	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.03	<0.02	0.16	0.10	0.07	
Net Acidity (acidity units)	----	10	mole H+ / t	21	<10	103	59	46	
Liming Rate	----	1	kg CaCO3/t	2	<1	8	4	3	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	0.02	0.16	0.10	0.07	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	21	13	103	59	46	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	<1	8	4	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS41 6.5	AS41 9.0	AS41 11.0	AS41 12.0	AS41 14.5
Client sampling date / time				05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029681-021	EB2029681-022	EB2029681-023	EB2029681-024	EB2029681-025	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.3	8.9	7.1	7.1	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.077	0.118	0.126	0.057	0.029	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	48	74	78	35	18	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.65	4.90	0.82	0.08	0.10	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	529	980	164	16	20	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.85	1.57	0.26	0.03	0.03	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.04	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	24	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	2	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.08	0.12	0.12	0.06	0.03	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	48	74	78	35	18	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	6	6	3	1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS41 17.0	AS41 17.5	D71	D72	D73
Client sampling date / time				05-Nov-2020 00:00	05-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	04-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029681-026	EB2029681-027	EB2029681-028	EB2029681-029	EB2029681-030	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.8	4.6	4.5	9.4	9.4	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	32	42	<2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.05	0.07	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.015	3.13	0.316	0.052	0.082	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	1950	197	33	51	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.14	----	----	1.50	2.34	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	29	----	----	300	467	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.05	----	----	0.48	0.75	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	3.18	0.38	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	1980	239	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	149	18	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	3.18	0.38	0.05	0.08	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	1980	239	33	51	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	149	18	2	4	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				D74	D75	----	----	----
Client sampling date / time				04-Nov-2020 00:00	04-Nov-2020 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2029681-031	EB2029681-032	-----	-----	-----
				Result	Result	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.4	8.3	----	----	----
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	----	----
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.065	1.00	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	40	625	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	4.10	3.53	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	820	705	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.31	1.13	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.25	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	156	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	12	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	1.00	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	40	625	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	47	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EB2029672**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : MS ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : +61 07 38523999
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : BN/413/20
No. of samples received : 59
No. of samples analysed : 59

Page : 1 of 14
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8616
Date Samples Received : 10-Nov-2020 16:00
Date Analysis Commenced : 20-Nov-2020
Issue Date : 20-Nov-2020 18:23



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS8 0.0	AS8 1.0	AS8 1.5	AS8 4.0	AS8 5.0
Client sampling date / time				21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029672-001	EB2029672-002	EB2029672-003	EB2029672-004	EB2029672-005	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	4.4	5.1	4.4	5.1	5.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	106	12	46	13	6	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.17	<0.02	0.07	0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.023	0.014	0.347	0.142	0.069	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	14	<10	217	88	43	
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	0.13	----	----	
HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	0.13	----	----	
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	<0.02	----	----	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	<10	----	----	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	<0.02	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.19	0.03	0.42	0.16	0.08	
Net Acidity (acidity units)	----	10	mole H+ / t	120	21	262	101	50	
Liming Rate	----	1	kg CaCO3/t	9	2	20	8	4	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.19	0.03	0.42	0.16	0.08	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	120	21	262	101	50	
Liming Rate excluding ANC	----	1	kg CaCO3/t	9	2	20	8	4	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS8 7.0	AS8 9.5	AS8 12.0	AS8 16.0	AS8 18.0
Client sampling date / time				21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029672-006	EB2029672-007	EB2029672-008	EB2029672-009	EB2029672-010	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.5	9.4	9.5	9.6	9.4	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.062	0.043	0.038	0.031	0.105	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	39	27	24	19	65	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	3.41	1.32	2.28	2.19	6.06	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	681	263	455	438	1210	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.09	0.42	0.73	0.70	1.94	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.04	0.04	0.03	0.10	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	39	27	24	19	65	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	2	2	1	5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS8 19.0	AS8 20.0	AS9 0.0	AS9 1.5	AS9 4.0
Client sampling date / time				21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029672-011	EB2029672-012	EB2029672-013	EB2029672-014	EB2029672-015	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.2	8.5	4.6	9.1	9.4	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	70	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.11	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.128	1.38	0.024	0.123	0.049	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	80	860	15	76	30	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	7.47	7.72	----	0.48	2.32	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1490	1540	----	96	463	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	2.39	2.47	----	0.15	0.74	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.14	0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	85	12	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	6	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.13	1.38	0.14	0.12	0.05	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	80	860	85	76	30	
Liming Rate excluding ANC	----	1	kg CaCO3/t	6	64	6	6	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS9 6.0	AS9 7.0	AS9 9.0	AS9 11.5	AS9 15.5
Client sampling date / time				21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029672-016	EB2029672-017	EB2029672-018	EB2029672-019	EB2029672-020	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.5	9.5	9.5	9.2	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.070	0.059	0.058	0.089	0.230	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	44	36	36	56	144	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.47	1.40	2.01	3.97	8.70	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	494	280	402	793	1740	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.79	0.45	0.64	1.27	2.79	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.06	0.06	0.09	0.23	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	44	36	36	56	144	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	3	3	4	11	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS9 18.0	AS9 20.0	AS10 0.0	AS10 1.0	AS10 3.0
Client sampling date / time				21-Oct-2020 00:00	21-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029672-021	EB2029672-022	EB2029672-023	EB2029672-024	EB2029672-025	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.2	5.0	5.1	9.2	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	39	13	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.06	0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.072	0.140	0.019	0.013	0.041	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	45	88	12	<10	26	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	4.10	2.34	----	----	0.45	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	820	467	----	----	89	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.31	0.75	----	----	0.14	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.08	0.03	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	51	21	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	4	2	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.14	0.08	0.03	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	45	88	51	21	26	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	6	4	2	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS10 5.0	AS10 7.0	AS10 8.5	AS10 11.0	AS10 13.5
Client sampling date / time				23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029672-026	EB2029672-027	EB2029672-028	EB2029672-029	EB2029672-030	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.0	9.4	9.4	9.5	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.086	0.050	0.073	0.058	0.068	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	54	31	46	36	43	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.02	1.34	1.25	1.53	2.25	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	269	249	306	449	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	0.43	0.40	0.49	0.72	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.08	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	50	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	4	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.09	0.05	0.07	0.06	0.07	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	54	31	46	36	43	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	2	3	3	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AS10 16.5	AS10 18.5	D36	D37	D38
Client sampling date / time				23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029672-031	EB2029672-032	EB2029672-033	EB2029672-034	EB2029672-035	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	8.9	9.4	8.4	9.5	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.090	0.384	0.063	1.43	0.044	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	56	240	40	894	28	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	5.49	3.15	1.88	4.54	1.53	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1100	630	375	908	305	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.76	1.01	0.60	1.46	0.49	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.46	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	288	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	22	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.09	0.38	0.06	1.43	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	56	240	40	894	28	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	18	3	67	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				D39	D40	D41	D42	D43
Client sampling date / time				23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	22-Oct-2020 00:00	22-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2029672-036	EB2029672-037	EB2029672-038	EB2029672-039	EB2029672-040
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.5	5.3	9.5	4.3	9.3
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	19	<2	93	<2
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.03	<0.02	0.15	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.042	0.014	0.065	0.012	0.047
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	26	<10	40	<10	30
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.45	----	3.27	----	0.39
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	290	----	654	----	78
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.46	----	1.05	----	0.12
EA033-D: Retained Acidity								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	----	<0.02	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	<0.02	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	----	<0.02	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	----	<10	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	----	<0.02	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.04	<0.02	0.16	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	28	<10	101	<10
Liming Rate	----	1	kg CaCO3/t	<1	2	<1	8	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.04	0.06	0.16	0.05
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	26	28	40	101	30
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	3	8	2



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				D44	D45	D46	D47	D48
Client sampling date / time				22-Oct-2020 00:00	22-Oct-2020 00:00	20-Oct-2020 00:00	20-Oct-2020 00:00	21-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2029672-041	EB2029672-042	EB2029672-043	EB2029672-044	EB2029672-045
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.4	9.5	9.5	9.6	9.7
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.030	0.098	0.038	0.051	0.125
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	19	61	24	32	78
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.59	5.99	6.08	0.72	3.94
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	318	1200	1210	145	788
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.51	1.92	1.95	0.23	1.26
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	0.10	0.04	0.05	0.12
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	19	61	24	32	78
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	4	2	2	6



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	D49	D50	D51	D52	D53
Client sampling date / time				21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	21-Oct-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2029672-046	EB2029672-047	EB2029672-048	EB2029672-049	EB2029672-050	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.7	4.8	5.9	9.6	9.7	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	18	2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.03	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.041	0.156	0.063	0.041	0.031	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	26	98	39	25	20	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	3.67	----	----	2.28	2.17	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	734	----	----	456	434	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.18	----	----	0.73	0.70	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.18	0.07	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	116	42	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	9	3	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.18	0.07	0.04	0.03	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	26	116	42	25	20	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	9	3	2	1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				D54	D55	D56	D57	D58
Client sampling date / time				22-Oct-2020 00:00	22-Oct-2020 00:00	22-Oct-2020 00:00	22-Oct-2020 00:00	22-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EB2029672-051	EB2029672-052	EB2029672-053	EB2029672-054	EB2029672-055
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.4	9.5	9.5	9.6	5.9
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	5
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.075	0.054	0.087	0.073	0.013
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	47	34	54	46	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.90	1.32	3.82	4.19	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	379	263	763	837	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.61	0.42	1.22	1.34	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	13
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.05	0.09	0.07	0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	47	34	54	46	13
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	2	4	3	<1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	D59	D60	D61	D62	----
Client sampling date / time				22-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	23-Oct-2020 00:00	----	
Compound	CAS Number	LOR	Unit	EB2029672-056	EB2029672-057	EB2029672-058	EB2029672-059	-----	
				Result	Result	Result	Result	----	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.4	9.5	9.5	9.6	----	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	----	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	----	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.055	0.050	0.074	0.058	----	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	34	31	46	36	----	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.41	1.41	1.41	1.76	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	82	282	281	351	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.13	0.45	0.45	0.56	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	----	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	----	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	----	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	----	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.05	0.07	0.06	----	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	34	31	46	36	----	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	3	3	----	

CERTIFICATE OF ANALYSIS

Work Order : **EB2030421**
Client : **GILBERT & SUTHERLAND PTY LTD**
Contact : MS ERIN HOLTON
Address : P O BOX 4115
 ROBINA QLD, AUSTRALIA 4230
Telephone : +61 07 38523999
Project : 12035 ASS sampling
Order number : ----
C-O-C number : ----
Sampler : SARAH MCGHEE
Site : ----
Quote number : BN/413/20
No. of samples received : 91
No. of samples analysed : 91

Page : 1 of 21
Laboratory : Environmental Division Brisbane
Contact : Carsten Emrich
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8616
Date Samples Received : 16-Nov-2020 10:54
Date Analysis Commenced : 25-Nov-2020
Issue Date : 26-Nov-2020 12:37



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	AS39 0.0	AS39 1.0	AS39 2.0	AS39 2.5	AS39 4.0
				Sampling date / time	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00
Compound	CAS Number	LOR	Unit	EB2030421-001	EB2030421-002	EB2030421-003	EB2030421-004	EB2030421-005	EB2030421-005
				Result	Result	Result	Result	Result	Result
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.2	5.8	5.8	5.2	5.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	13	2	2	10	5	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.012	0.008	0.042	0.184	0.107	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	26	115	67	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.03	<0.02	0.04	0.20	0.12	
Net Acidity (acidity units)	----	10	mole H+ / t	21	<10	28	124	72	
Liming Rate	----	1	kg CaCO3/t	2	<1	2	9	5	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	<0.02	0.04	0.20	0.12	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	21	<10	28	124	72	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	<1	2	9	5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	AS39 6.0	AS39 8.0	AS39 10.0	AS39 12.5	AS39 14.0
				Sampling date / time	05-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00
Compound	CAS Number	LOR	Unit	EB2030421-006	EB2030421-007	EB2030421-008	EB2030421-009	EB2030421-010	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.2	6.5	6.4	6.7	6.8	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.024	0.029	0.014	0.015	0.014	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	15	18	<10	<10	<10	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.23	----	0.16	0.27	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	47	----	33	54	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.07	----	0.05	0.09	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	15	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	0.03	<0.02	<0.02	<0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	15	18	<10	<10	<10	
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	1	<1	<1	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	AS39 15.5	AS39 16.0	AS39 16.5	AS40 0.0	AS40 0.5
Sampling date / time				06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-011	EB2030421-012	EB2030421-013	EB2030421-014	EB2030421-015	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.4	4.0	4.0	5.1	5.6	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	77	114	23	4	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.12	0.18	0.04	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.016	2.08	3.03	0.020	0.031	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	1300	1890	13	19	
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	0.32	0.53	----	----	
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.39	0.54	----	----	
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	0.06	<0.02	----	----	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	30	<10	----	----	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	0.05	<0.02	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	2.25	3.22	0.06	0.04	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	1400	2010	35	24	
Liming Rate	----	1	kg CaCO3/t	<1	105	150	3	2	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	2.25	3.22	0.06	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	1400	2010	35	24	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	105	150	3	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	AS40 1.5	AS40 3.0	AS40 6.0	AS40 8.5	AS40 11.5
Sampling date / time			06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00
Compound	CAS Number	LOR	Unit	EB2030421-016	EB2030421-017	EB2030421-018	EB2030421-019	EB2030421-020
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	5.0	9.2	9.2	9.4	6.8
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	12	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.263	0.065	0.075	0.080	0.013
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	164	41	47	50	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.90	1.35	1.91	0.26
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	181	269	381	53
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.29	0.43	0.61	0.08
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.28	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	176	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	13	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.28	0.06	0.08	0.08	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	176	41	47	50	<10
Liming Rate excluding ANC	----	1	kg CaCO3/t	13	3	4	4	<1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	AS40 14.0	AS40 17.0	AS40 19.0	AS40 19.5	AS41 0.5
Sampling date / time				06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	05-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-021	EB2030421-022	EB2030421-023	EB2030421-024	EB2030421-025	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.6	6.4	6.8	8.3	5.7	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	3	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.010	0.011	0.010	0.692	0.012	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	432	<10	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.20	----	0.20	1.66	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	39	----	40	331	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.06	----	0.06	0.53	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.34	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	211	11	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	16	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	0.69	<0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	<10	432	11	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	<1	32	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	AS41 3.0	AS41 16.5	AS42 0.0	AS42 1.0	AS42 1.5
Sampling date / time				05-Nov-2020 00:00	05-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-026	EB2030421-027	EB2030421-028	EB2030421-029	EB2030421-030	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.4	6.7	5.4	5.9	5.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	4	<2	10	<2	4	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.077	0.014	0.013	0.008	0.043	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	48	<10	<10	<10	27	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.16	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	33	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.05	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.08	<0.02	0.03	<0.02	0.05	
Net Acidity (acidity units)	----	10	mole H+ / t	52	<10	18	<10	31	
Liming Rate	----	1	kg CaCO3/t	4	<1	1	<1	2	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.08	<0.02	0.03	<0.02	0.05	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	52	<10	18	<10	31	
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	<1	1	<1	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	AS42 2.5	AS42 4.5	AS42 5.0	AS42 7.5	AS42 10.5
Sampling date / time				06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-031	EB2030421-032	EB2030421-033	EB2030421-034	EB2030421-035	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	5.7	5.6	9.3	9.4	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	3	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.094	0.046	0.050	0.033	0.036	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	59	29	31	20	23	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.99	0.70	1.42	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	197	140	284	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.32	0.22	0.46	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.10	0.04	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	62	29	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	5	2	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.10	0.04	0.05	0.03	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	62	29	31	20	23	
Liming Rate excluding ANC	----	1	kg CaCO3/t	5	2	2	2	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	AS42 13.0	AS42 13.5	AS42 14.5	AS42 17.5	AS42 18.0
Sampling date / time			06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	06-Nov-2020 00:00	05-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-036	EB2030421-037	EB2030421-038	EB2030421-039	EB2030421-040
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.4	7.8	6.0	6.6	6.7
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.052	0.169	0.137	0.012	0.012
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	32	106	86	<10	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.42	0.30	----	0.22	0.20
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	284	59	----	43	40
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.46	0.10	----	0.07	0.06
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.10	0.14	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	66	86	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	5	6	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.17	0.14	<0.02	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	32	106	86	<10	<10
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	8	6	<1	<1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	AS42 19.5	AS43 0.0	AS43 2.0	AS43 3.0	AS43 5.0
				Sampling date / time	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00
Compound	CAS Number	LOR	Unit	EB2030421-041	EB2030421-042	EB2030421-043	EB2030421-044	EB2030421-045	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.1	6.1	5.6	5.6	5.6	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	4	5	3	3	2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	2.70	0.017	0.052	0.055	0.055	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1680	10	33	34	34	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	2.71	0.02	0.06	0.06	0.06	
Net Acidity (acidity units)	----	10	mole H+ / t	1690	15	36	37	37	
Liming Rate	----	1	kg CaCO3/t	127	1	3	3	3	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	2.71	0.02	0.06	0.06	0.06	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	1690	15	36	37	37	
Liming Rate excluding ANC	----	1	kg CaCO3/t	127	1	3	3	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	AS43 5.5	AS43 9.0	AS43 12.0	AS43 15.0	AS43 18.0
Sampling date / time			05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00
Compound	CAS Number	LOR	Unit	EB2030421-046	EB2030421-047	EB2030421-048	EB2030421-049	EB2030421-050
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.5	9.6	9.6	9.7	9.4
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.069	0.089	0.060	0.052	0.112
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	43	55	37	32	70
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.87	3.80	2.68	4.02	2.38
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	174	759	536	803	476
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.28	1.22	0.86	1.29	0.76
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	0.09	0.06	0.05	0.11
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	43	55	37	32	70
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	4	3	2	5



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	AS43 21.0	AS43 21.5	AS44 0.0	AS44 1.0	AS44 1.5
Sampling date / time			05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00
Compound	CAS Number	LOR	Unit	EB2030421-051	EB2030421-052	EB2030421-053	EB2030421-054	EB2030421-055
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	8.6	8.1	5.6	6.2	5.3
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	10	<2	8
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	1.62	1.33	0.015	0.015	0.109
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1010	830	<10	<10	68
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	7.46	3.12	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1490	623	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	2.39	1.00	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.02	0.66	0.03	<0.02	0.12
Net Acidity (acidity units)	----	10	mole H+ / t	16	414	20	<10	76
Liming Rate	----	1	kg CaCO3/t	1	31	2	<1	6
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	1.62	1.33	0.03	<0.02	0.12
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	1010	830	20	<10	76
Liming Rate excluding ANC	----	1	kg CaCO3/t	76	62	2	<1	6



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	AS44 3.0	AS44 4.5	AS44 6.0	AS44 6.5	AS44 10.0
			Sampling date / time	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00
Compound	CAS Number	LOR	Unit	EB2030421-056	EB2030421-057	EB2030421-058	EB2030421-059	EB2030421-060
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	5.6	5.8	9.4	9.5	9.6
Titration Actual Acidity (23F)	----	2	mole H+ / t	2	<2	<2	<2	<2
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.080	0.048	0.113	0.073	0.131
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	50	30	70	45	82
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	3.27	2.36	6.99
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	653	471	1400
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	1.05	0.76	2.24
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.08	0.05	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	52	30	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	4	2	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.08	0.05	0.11	0.07	0.13
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	52	30	70	45	82
Liming Rate excluding ANC	----	1	kg CaCO3/t	4	2	5	3	6



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	AS44 13.0	AS44 16.0	AS44 18.0	AS44 19.5	AS44 20.0
Sampling date / time				05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-061	EB2030421-062	EB2030421-063	EB2030421-064	EB2030421-065	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.6	9.7	9.7	9.5	9.4	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.051	0.032	0.062	0.120	0.220	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	32	20	39	74	137	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.31	2.32	2.22	6.16	10.3	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	462	463	445	1230	2050	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.74	0.74	0.71	1.97	3.29	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.05	0.03	0.06	0.12	0.22	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	32	20	39	74	137	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	1	3	6	10	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	AS44 21.0	AS44 21.5	D76	D77	D78
Sampling date / time			05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00
Compound	CAS Number	LOR	Unit	EB2030421-066	EB2030421-067	EB2030421-068	EB2030421-069	EB2030421-070
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.0	8.6	7.0	9.5	9.6
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	1.11	2.24	0.052	0.087	0.136
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	692	1400	33	54	85
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	15.4	3.97	0.17	2.71	6.69
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	3070	793	34	541	1340
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	4.93	1.27	0.05	0.87	2.14
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	1.39	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	868	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	65	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	1.11	2.24	0.05	0.09	0.14
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	692	1400	33	54	85
Liming Rate excluding ANC	----	1	kg CaCO3/t	52	105	2	4	6



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	D79	D80	D81	D82	D83
Sampling date / time				05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-071	EB2030421-072	EB2030421-073	EB2030421-074	EB2030421-075	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.1	6.4	5.8	9.5	9.5	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.037	0.010	0.056	0.086	0.070	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	23	<10	35	54	44	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.05	----	----	3.71	2.66	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	410	----	----	742	531	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.66	----	----	1.19	0.85	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.06	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	35	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	3	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	<0.02	0.06	0.09	0.07	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	23	<10	35	54	44	
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	<1	3	4	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	D84	D85	D86	D87	D88
Sampling date / time				05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-076	EB2030421-077	EB2030421-078	EB2030421-079	EB2030421-080	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.4	5.7	6.9	7.2	6.0	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	3	<2	<2	2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.011	0.090	0.053	0.010	0.010	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	56	33	<10	<10	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.29	0.28	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	58	57	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.09	0.09	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.09	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	59	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	<1	4	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	0.09	0.05	<0.02	<0.02	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	59	33	<10	<10	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	4	2	<1	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	D89	D90	D91	D92	D93
Sampling date / time				05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-081	EB2030421-082	EB2030421-083	EB2030421-084	EB2030421-085	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.3	6.7	7.1	9.2	9.4	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.023	0.012	0.014	0.062	0.059	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	14	<10	<10	39	37	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.19	0.26	0.80	1.45	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	37	53	160	290	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.06	0.08	0.26	0.46	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	0.02	<0.02	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	14	<10	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	1	<1	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	<0.02	<0.02	0.06	0.06	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	14	<10	<10	39	37	
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	<1	<1	3	3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	D94	D95	D96	D97	D98
Sampling date / time				05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	05-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EB2030421-086	EB2030421-087	EB2030421-088	EB2030421-089	EB2030421-090	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.5	6.8	5.5	5.4	9.5	
Titration Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	10	7	<2	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.069	0.011	0.012	0.080	0.038	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	43	<10	<10	50	24	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.62	0.18	----	----	0.72	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	324	36	----	----	143	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.52	0.06	----	----	0.23	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.03	0.09	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	18	56	<10	
Liming Rate	----	1	kg CaCO3/t	<1	<1	1	4	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	<0.02	0.03	0.09	0.04	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	43	<10	18	56	24	
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	<1	1	4	2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	D99	----	----	----	----
Sampling date / time				05-Nov-2020 00:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	EB2030421-091	-----	-----	-----	-----	
				Result	----	----	----	----	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	6.9	----	----	----	----	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.008	----	----	----	----	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.23	----	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	47	----	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.07	----	----	----	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	----	----	----	----	
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----	
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----	
Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	----	----	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	----	----	----	----	
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	----	----	