22 October 2019

Cameron Henery, Senior Asset Management Officer
Northern Beaches Council
c/o Michael Haynes, Director
BBF Town Planners
Via email: michael@bbfplanners.com.au

Acid Sulfate Soil Assessment – Frank Gray and Mike Pawley Ovals, Curl Curl, NSW

Dear Michael,

1. Introduction and Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by BBF Town Planners on behalf of Northern Beaches Council (Council, the client) to undertake an Acid Sulfate Soil (ASS) Assessment in relation to a Development Application (DA) for new sportsground lighting at Frank Gray and Mike Pawley Ovals, Curl Curl (the site). The site location is provided in **Figure 1**, and the site layout is provided in **Figure 2, Attachment 2**. Sample locations are provided on **Figure 3, Attachment 2**, reflecting the locations of the proposed lighting.

Frank Gray and Mike Pawley Ovals are located within the greater John Fisher Park public reserves and playing fields area managed by Council. These areas have been subject to assessment of landfilling and acid sulfate soils are known to exist in some areas below the disturbed fill. Greendale Creek runs east-west, directly north of the site. The area including both ovals is currently covered by an Environmental Management Plan (EMP) which was recently updated by JBS&G for Council (JBS&G 2019a[1]).

Furthermore, JBS&G have recently undertaken a Preliminary Contamination Site Assessment during September 2019 across the current site (JBS&G 2019b[2]).

JBS&G understand the light pole design and installation will comprise 2 m long x 2 m wide x 0.6 m deep square concrete footings per light pole. Given this, the depth of soil investigation has been limited to the top 1.0 m below ground surface.

2. Objectives

The objective of this assessment was to investigate areas designated to confirm whether potential acid sulfate soils (PASS) / ASS will be encountered and to obtain data to assess such conditions and associated constraints for the proposed development and enable appropriate management consistent with the EMP (JBS&G 2019a) and/or specific ASS Management Plan (ASSMP) if required.

1 Environmental Management Plan, John Fisher Park, Curl Curl, NSW, JBS&G, 55351-119299 (Rev 1), 22 March 2019 (JBS&G 2019a).
2 Preliminary Site Investigation, Frank Gray and Mike Pawley Ovals, Curl Curl, NSW, JBS&G, 57312-124495 (Rev 0), 22 October 2019 (JBS&G 2019b).

3. Scope of Works

The scope of work undertaken by JBS&G in order to achieve the objectives of the assessment included:

- Review of the previous site investigation provided by the client and ASS desktop information;
- Advance six hand excavated test holes to 1.0 m below ground surface (bgs) in six key locations (BH001 to BH006) associated with the future excavation works for light pole installation;
- Qualitative field screening of soils to assess PASS conditions (pH_F and pH_{FOX}) at each sample location and soil horizon;
- Collection of soil samples for acid sulfate soil investigation purposes;
- Selected laboratory analysis on soil samples based on field ASS testing for Suspension Peroxide Combined Acidity and Sulphur (sPOCAS); and
- Preparation of a letter report to document the targeted acid sulfate soil assessment results and provide recommendations for ASS management (if required).

4. Desktop Information

4.1 Topography

Review of topographic information obtained from the Spatial Information Exchange Viewer (LPI 2018[3]) regional topographic map indicated that the site lies at an elevation of approximately 4 m Australian Height Datum (AHD). The site exists within a generally flat estuarine plain with gentle regional slopes toward the south and east toward Curl Curl Lagoon and the Pacific Ocean, respectively.

4.2 Geology and Soils

Reference to the 1:100 000 Geological Series Sydney Geological Survey of NSW Sheet 9130 (DMR 1983[4]), indicates that the site is underlain by Holocene Quaternary alluvial/fluvial deposits. These deposits are characterised by the presence silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in place and common shell layers. The geology map indicates man-made fill overlies alluvial/fluvial sediments at the site and surrounding area. The nature of fill is noted to be varied, with a combination of putrescible and non-putrescible waste mixed with sandy material and sandstone boulders[5].

4.3 Acid Sulfate Soils

In accordance with publicly available NSW Department of Planning, Industry and Environment Acid Sulphate Soils Risk Mapping (NSW DPI&E EPI, 2019), the site has been zoned into the following classifications:

North and central portion of the site (along Greendale Creek) has been classified into Class 4, considered ASS conditions likely to be found beyond 2 metres below the natural ground surface; and

[3] *'Spatial Information Exchange Viewer'*, NSW Land and Property Information, Accessed 18 September 2019, https://maps.six.nsw.gov.au/

[4] *1:100 000 Sydney Geological Map Sheet 9130 Edition 1.* Department of Mineral Resources, Published 1983, DMR 1983;

[5] *John Fisher Park and Abbott Road Land Plan of Management*. Warringah Council, November 2001. Obtained via https://files.northernbeaches.nsw.gov.au/sites/default/files/test-gab/jfpappendices.pdf Accessed 18 September 2019

Southern portion of the site has been classified into Class 5, considered unlikely to contain acid sulfate soil conditions (located within 500m on adjacent class 1-4 land).

Review of the Acid Sulfate Soil Risk Map for Sydney Heads[6] indicated the site is located in an area of disturbed terrain, including areas historically impacted by reclamation of low-lying wetlands, dredging, mining or urban development. JBS&G (2019b) identified that Greendale Creek previously meandered through the northern half of site until it was diverted to the current course in the 1960s and the former channel filled in to form the two ovals.

Acid sulfate soil risk classification mapping is shown on **Figure 2, Attachment 2.**

5. Sampling Methodology and Laboratory Analysis

A total of six soil sampling locations were selected targeting areas where excavations for light poles is proposed. The sampling locations are shown on **Figure 3, Attachment 2**. Each sample location was manually hand excavated using an extendable hand auger to a maximum depth of 1.0 m bgs. Field soil samples were collected directly from the hand auger and were immediately transferred into sealed zip-lock bags, surrounded by ice within a pre-cooled esky. A new pair of disposable nitrile gloves was used to collect each soil sample.

Soil samples were collected at every change in soil horizon. Soil samples were transported under chain of custody conditions to a National Association of Testing Authorities (NATA) accredited laboratory (Eurofins MGT).

Field tests were completed on all samples collected, comprising of mixing a subsample of the soil at a ratio of 1:5 soil to deionised water. The resulting soil suspension was measured for pH with the use of a calibrated pH meter. A second subsample of soil was collected and mixed at a ratio of 1:5 soil to hydrogen peroxide. The resulting suspension was measured for pH (pH_{OX}).

Representative samples were selected for laboratory analysis of sPOCAS based on field test results. The selection of samples for laboratory analysis was based on the pH differences identified during the field tests between the 1:5 water and 1:5 hydrogen peroxide values and visual observations of reactivity i.e. heat generation, bubbles, presence of shells etc. A large pH range or significant pH drop identified during field testing was used as an indicator for the presence of PASS.

5.1 Sampling and Lithological Description

The field investigation program was conducted on 11 September 2019 which included a site inspection, hand excavation and sampling of material from a variety of depths by a trained and experienced JBS&G Environmental Consultant. A total of six test pits (BH001 to BH006) in targeted location were advanced between 0.65 m bgs and 1.0 m bgs into underlying soils (PASS) **Figure 3, Attachment 2**.

<u>Visual lithological observations identified turf underlain by the following:</u>

Brown to black gravelly sandy silt (fill topsoil) with inclusions of rootlets to depths between 0.10-0.40 m bgs;

Brown sandy gravelly clay (fill) at depths between 0.10-0.45 m bgs in BH001 only;

Greyish brown sand to depths between 0.10-0.6m bgs;

Orange to brown mottled white sand at depths between 0.35-1.0 m bgs;

BH003 and BH006 refused on gravels at 0.65 m bgs and 0.70 m bgs respectively;

[6] 'Acid Sulphate Soil Risk Map Edition Two – Sydney Heads, 1997 1:25 000 (NSW DLWC)

No asbestos, staining or odours were observed within the excavated soils.

No groundwater seepage was observed in any sample location.

A Photographic Log is provided in **Attachment 3** and Soil Profile Logs are provided in **Attachment 4**.

Field screening results identified the following:

- Field analysis was conducted on soil samples taken for ASS analysis by the addition of deionised water with some of the sample and measuring the pH at the moment of addition and again after 5 minutes of mixing. This process was then repeated with hydrogen peroxide, with large drops in pH indicating PASS.
- The largest changes in pH after the addition of hydrogen peroxide were observed in samples collected from BH001 0.2m (Δ pH 1.2), BH003 0.4m (Δ pH 2.1) and BH005 0.5 m (Δ pH 1.4), within the brown to orange sand material. All other field screening results were less than 1 pH unit, ranging from Δ 0.2 to Δ 1.0.
- The pH changed after the addition of hydrogen peroxide ranging between Δ -0.1 and Δ 0.7.
- No visual reaction was observed in any of the samples with the addition of deionised water, however pH changed ranging between Δ -0.8 and Δ 0.
- The addition of hydrogen peroxide resulted in slight reactions with minor bubbles being produced. No heat generation was noted.

Full ASS field test results are provided in **Table A, Attachment 5**.

5.2 Soil Analytical Results

Analytical results from the sPOCAS procedure undertaken by the laboratory are summarised in **Table B, Attachment 5)**. Results were compared with adopted site action criteria published in the ASSMAC (1998)[7] guidelines.

All laboratory samples reported Titratable Peroxide Acidity (TPA) and Titratable Sulfidic Acidity (TSA) concentrations < 2 mol H^+/t within the sand fill material, below the adopted action criterion for coarse soils (based on 1-1000 tonnes disturbed) of 18 mol H^+/t.

Peroxide Oxidisable Sulfur (% S_{POS}) was not detected above laboratory limits of detection (<0.02 % S) within any soil samples, and as such below the adopted site action criterion for coarse soils of 0.03 %w/w (based on 1-1000 tonnes disturbed).

The laboratory results confirm the materials encountered during the investigation program, from surface to 1.0 m bgs are not considered to be acid sulfate soils and therefore the addition of agricultural lime would not be required to neutralise the soils during excavation works.

[7] Stone, Y, Ahern C R, and Blunden B (1998). Acid Sulfate Soils Manual 1998. Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia (ASSMAC 1989).

6. Conclusions and Recommendations

Based on the inspection, field tests and review of the laboratory analytical data, and subject to the limitations in **Attachment 1**, the following conclusions are made:

- Field analysis indicated PASS at sample locations BH001, BH003 and BH005, however confirmation laboratory analysis confirmed ASS conditions are not present within these materials;
- Acid Sulfate Soil management by neutralisation will not be required during the excavation and construction of the lighting poles at the locations and depths assessed herein;
- Should more extensive or deeper excavation be required during development additional assessment of ASS may be required;
- All excavated soils should be managed in accordance with the EMP (JBS&G 2019b).
- Should you require clarification, please contact Alex Finney on 02 8245 0300 or by email afinneyjbsg.com.au.

Should you require clarification, please contact the undersigned on 08 8431 7113 or by email afinney@jbsg.com.au.

Yours sincerely:

Alex Finney
Project Manager, Contaminated Land
JBS&G Australia Pty Ltd

Reviewed/Approved by:

Matthew Bennett (CEnvP SC)
Senior Principal, Contaminated Land
JBS&G Australia Pty Ltd

Attachments:
1) Limitations
2) Figures
3) Photographic Log
4) Soil Profile Logs
5) Data Summary Tables
6) Laboratory Reports and Chain of Custody Documentation

Attachment 1 – Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquiries.

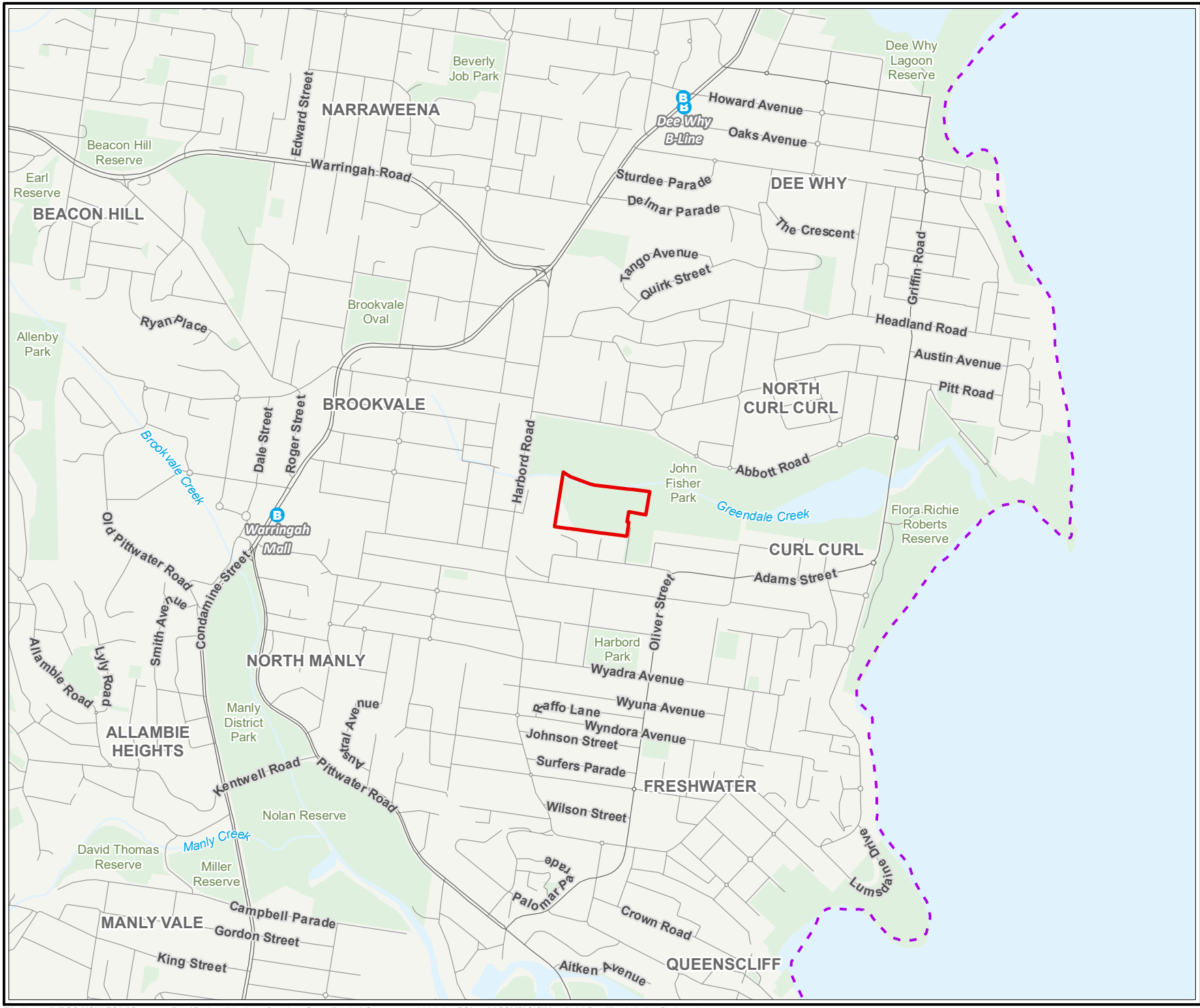
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Attachment 2 - Figures



Legend

- Approximate Site Boundary
- LGA boundary
- Primary Road
- Local Road
- Waterway
- Waterbody area
- Parks and reserves

JBS&G

Job No: 57312	
Client: Northern Beaches Council	
Version: L01 Rev 0	Date 11/09/2019
Drawn By: CA	Checked By: AF

Scale 1:20,000

0 300 600

metres

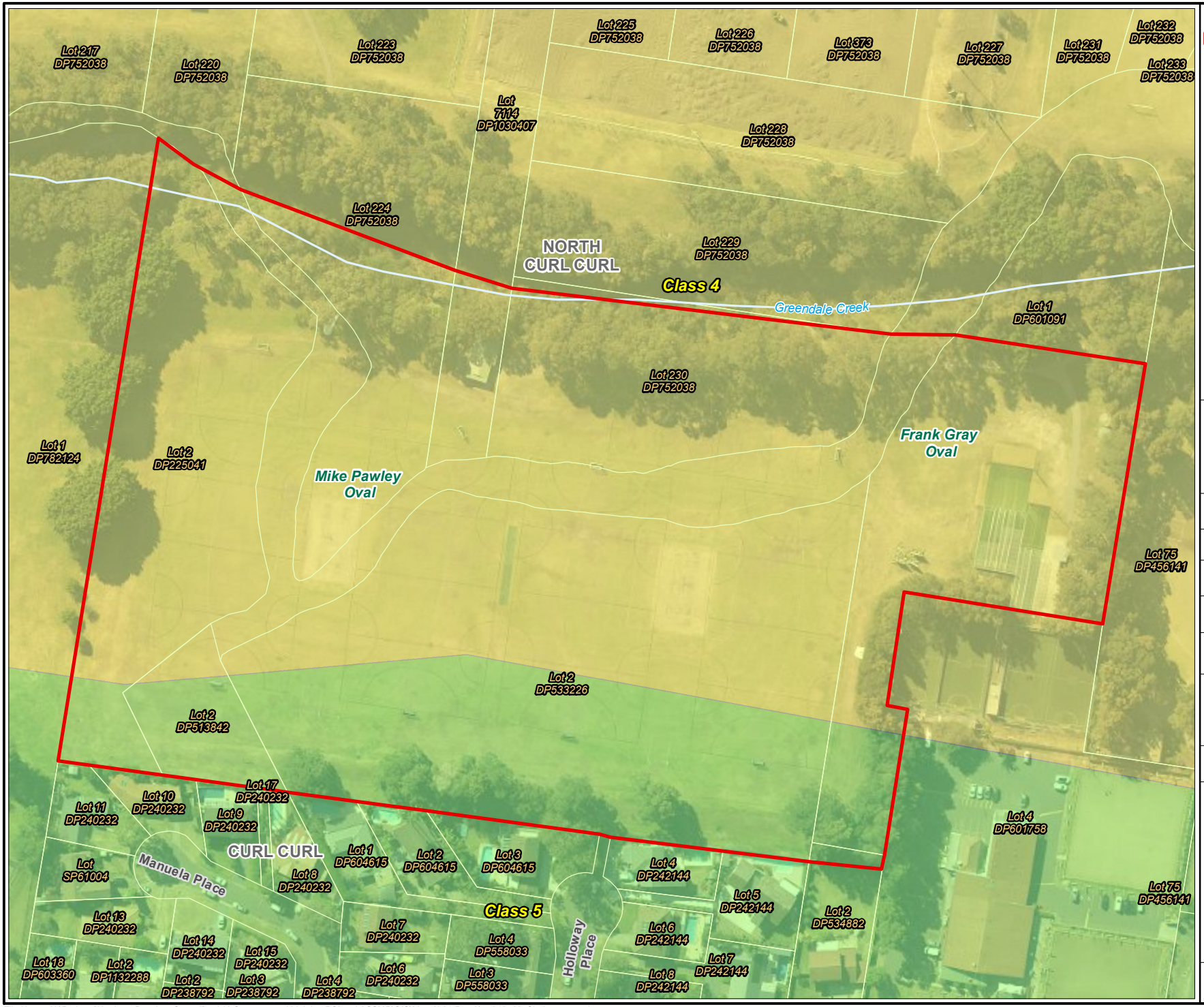
Coord. Sys. GDA 1994 MGA Zone 56

Frank Gray and Mike Pawley Ovals, Stirgess Avenue, Curl Curl, NSW

SITE LOCATION

FIGURE 1

File Name: \\JBSG-NSW-FS01\Company Data\Projects\Northern Beaches Council\57312 Sportsground Lighting PSI and ASSMP\GIS\Maps\L01 Rev A\57312_01_SiteLocation.mxd
Reference: NSW DFSI, 2019



Legend

- Approximate Site Boundary
- Cadastre (NSW LPI, 2019)
- Waterway

Acid Sulphate Soils (NSW DPI&E EPI, 2019)

Risk Classification

- Class 4
- Class 5

JBS&G

Job No: 57312

Client: Northern Beaches Council

Version: L01 Rev 0	Date 20/09/2019
Drawn By: CA	Checked By: AF

Scale 1:1,750

0 20 40

metres

Coord. Sys. GDA 1994 MGA Zone 56

Frank Gray and Mike Pawley Ovals, Stirgess Avenue, Curl Curl, NSW

SITE LAYOUT AND ACID SULPHATE SOILS RISK CLASSIFICATIONS

FIGURE 2

File Name: N:\Projects\Northern Beaches Council\57312 Sportsground Lighting PSI and ASSMP\GIS\Maps\L01 Rev A\57312_02_SiteLayout.mxd
Reference: NSW DFSI, 2019

Legend

- Approximate Site Boundary
- Waterway
- Sample Locations

JBS&G

Job No: 57312

Client: Northern Beaches Council

Version: L01 Rev 0	Date 20/09/2019
Drawn By: CA	Checked By: AF

Scale 1:1,750

0 20 40

metres

Coord. Sys. GDA 1994 MGA Zone 56

Frank Gray and Mike Pawley Ovals,
Stirgess Avenue,
Curl Curl, NSW

SAMPLE LOCATIONS

FIGURE 3

File Name: N:\Projects\Northern Beaches Council\57312 Sportsground Lighting PSI and ASSMP\GIS\Maps\L01 Rev A\57312_03_SampleLocations.mxd
Reference: NSW DFSI, 2019

Attachment 3 – Photograph Log

Photo 1: Site Overview

Photo 2: Site Overview (including BH004 Location)

Photo 3: BH001 Excavation Location

Photo 4: BH002 Excavation Location

Source:			
	Original Issue -		
Rev	Description	Drn.	Date

JBS&G **Appendix:**

Client: Northern Beaches Council / BBF Town Planners

Project: Frank Gray / Mike Pawley Oval, Curl Curl

Job No: 57312 File Name: Acid Sulfate Soil Assessment

Photo 5: BH005 Location, exposing excavated soils

Photo 6: BH002 Location

Source:			
	Original Issue -		
Rev	Description	Drn.	Date

JBS&G **Appendix:**

Client: Northern Beaches Council / BBF Town Planners

Project: Frank Gray / Mike Pawley Oval, Curl Curl

Job No: 57312 File Name: Acid Sulfate Soil Assessment

Attachment 4 – Soil Profile Logs

BH001

Project Number: 57312
Client: Northern Beaches Council
Project Name: Frank Gray/Mike Pawley Oval Assessment
Site Address: Abbott Rd, North Curl Curl NSW

Date: 11/09/2019
Logged By: Ryan Lill
Contractor: N/A
Total Hole Depth (mbgs): 1
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Hand Auger				Fill	Sandy SILT (Topsoil), black, damp, firm, non-plastic, heterogenous with inclusions of rootlets		No Odours, Staining or Asbestos Observed
		0.10		Fill	Sandy Gravelly, CLAY, damp, brown, fine sands to medium gravels, stiff, non-plastic, heterogenous		Acid Sulphate Soil Field Screen Undertaken 0.2m No Odours, Staining or Asbestos Observed
	0.5	0.45		Fill	SAND, greyish brown, moist to wet, loose, well graded, medium-dense, heterogenous becoming mottled light brown and white toward base of the unit		Acid Sulphate Soil Field Screen Undertaken 0.5m
		0.60		Fill	SAND, mottled light brown and white, moist to wet, loose, well graded, medium-dense, heterogenous	BH001 0.6-0.7	No Odours, Staining or Asbestos Observed
	1.0	1.00			Borehole BH001 terminated at 1m		No Odours, Staining or Asbestos Observed End of Hole at Program Depth

BH002

Project Number: 57312
Client: Northern Beaches Council
Project Name: Frank Gray/Mike Pawley Oval Assessment
Site Address: Abbott Rd, North Curl Curl NSW

Date: 11/09/2019
Logged By: Ryan Lill
Contractor: N/A
Total Hole Depth (mbgs): 1
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Hand Auger				Fill	Gravelly Sandy SILT (Topsoil), brown, fine grained sand to medium gravels, damp, firm to soft, non-plastic, heterogenous with inclusions of rootlets		No Odours, Staining or Asbestos Observed
		0.20		Fill	SAND, brown, medium grained, damp, loose, well sorted, heterogenous		No Odours, Staining or Asbestos Observed
		0.30		Fill	Gravelly SAND, brown with white mottling, medium grained sands to fine gravels, damp, loose, heterogenous		Acid Sulphate Soil Field Screen Undertaken 0.35m
	0.5						No Odours, Staining or Asbestos Observed
		0.50		Fill	SAND, greyish brown with white mottling, medium grained, moist to wet, medium dense, well sorted, heterogenous		Acid Sulphate Soil Field Screen Undertaken 0.6m
						BH002 0.6-0.7	No Odours, Staining or Asbestos Observed
	1.0						No Odours, Staining or Asbestos Observed
		1.00			Borehole BH002 terminated at 1m		End of Hole at Program Depth

BH003

Project Number: 57312
Client: Northern Beaches Council
Project Name: Frank Gray/Mike Pawley Oval Assessment
Site Address: Abbott Rd, North Curl Curl NSW

Date: 11/09/2019
Logged By: Ryan Lill
Contractor: N/A
Total Hole Depth (mbgs): 0.65
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Hand Auger				Fill	Sandy SILT (Topsoil), brown, damp, soft to firm, non-plastic, heterogenous with trace inclusions of gravels		No Odours, Staining or Asbestos Observed.
	0.5	0.40		Fill	Clayey SAND, orange, fine to medium grained, damp, stiff, medium plasticity, heterogenous with minor inclusions of mottled white/grey gravels	BH003 0.4-0.5	Acid Sulphate Field Screen Undertaken at 0.4m No Odours, Staining or Asbestos Observed.
	1.0	0.65			Borehole BH003 terminated at 0.65m		End of hole. Refusal on Gravels

BOREHOLE JBSG BOREHOLE - 2017.GPJ GINT STD AUSTRALIA.GDT 17/9/19

BH004

Project Number: 57312
Client: Northern Beaches Council
Project Name: Frank Gray/Mike Pawley Oval Assessment
Site Address: Abbott Rd, North Curl Curl NSW

Date: 11/09/2019
Logged By: Ryan Lill
Contractor: N/A
Total Hole Depth (mbgs): 1
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Hand Auger				Fill	Sandy SILT (Topsoil), brown, damp, firm, non-plastic, heterogenous		No Odours, Staining or Asbestos Observed.
		0.10		Fill	Silty SAND, brown with white and orange mottles, fine to medium grained, damp, loose, heterogenous		Acid Sulphate Soil Field Screen Undertaken 0.4m
	0.5						
		0.50		Fill	SAND, orangy brown, coarse, damp, loose, poorly sorted, heterogenous	BH004 0.5-0.6	No Odours, Staining or Asbestos Observed. Acid Sulphate Soil Field Screen Undertaken 0.5m
	1.0						No Odours, Staining or Asbestos Observed.
		1.00			Borehole BH004 terminated at 1m		End of Hole at Program Depth

BH005

Project Number: 57312
Client: Northern Beaches Council
Project Name: Frank Gray/Mike Pawley Oval Assessment
Site Address: Abbott Rd, North Curl Curl NSW

Date: 11/09/2019
Logged By: Ryan Lill
Contractor: N/A
Total Hole Depth (mbgs): 1
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Hand Auger				Fill	Sandy SILT (Topsoil), brown, damp, firm, non-plastic, heterogenous		No Odours, Staining or Asbestos Observed.
		0.15		Fill	Silty SAND, brown, damp, loose, heterogenous with trace inclusions of sub-angular fine gravels		Acid Sulphate Soil Field Screen Undertaken 0.2m No Odours, Staining or Asbestos Observed.
		0.40		Fill	SAND, orange, coarse, damp, loose, heterogenous with inclusion of trace gravels		Acid Sulphate Soil Field Screen Undertaken 0.5m
	0.5					BH005 0.5-0.6	No Odours, Staining or Asbestos Observed
							No Odours, Staining or Asbestos Observed
	1.0						End of Hole at Program Depth
		1.00			Borehole BH005 terminated at 1m		End of Hole at Program Depth

BH006

Project Number: 57312
Client: Northern Beaches Council
Project Name: Frank Gray/Mike Pawley Oval Assessment
Site Address: Abbott Rd, North Curl Curl NSW

Date: 11/09/2019
Logged By: Ryan Lill
Contractor: N/A
Total Hole Depth (mbgs): 0.7
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Hand Auger				Fill	Sandy Gravelly SILT (Topsoil), brown, damp, firm, non-plastic, heterogenous with inclusion of rootlets and trace fine angular gravels		No Odours, Staining or Asbestos Observed
		0.10		Fill	Sandy Gravelly SILT, brown, damp, firm, non-plastic, heterogenous		No Odours, Staining or Asbestos Observed
		0.35		Fill	SAND, orange, coarse, medium grained, damp, loose, heterogenous with trace inclusions of sub-rounded fine gravels becoming abundant toward base of unit		No Odours, Staining or Asbestos Observed
	0.5						Acid Sulphate Soil Field Screen Undertaken 0.6m
		0.70			Borehole BH006 terminated at 0.7m		End of Hole. Refusal on Gravels
	1.0						

Attachment 5 – Data Summary Tables

Table A: Acid Sulfate Soil Field Test Result
Project Number: 57312
Project Name: Frank Gray/Mike Pawley Ovals, Curl Curl - Acid Sulfate Soil Assessment
Client: BBF Town Planners / Northern Beaches Council

Soil Sample ID	Sample Depth (m)	Date	Material Description*	Deionised Water		Δ pH DI	Hydrogen Peroxide		Δ pH ox	Δ pH ox (f) / pH DI (f)	Visual Observations
				pH (i)	pH (f)		pH (i)	pH (f)			
BH001	0.2	11/09/2019	Sandy Gravelly, CLAY, damp, brown, fine sands to medium gravels, stiff, non-plastic, heterogenous	6.2	6.8	-0.6	5.5	5.6	-0.1	1.2	**Deionised Water:** No reaction observed **Hydrogen Peroxide: Slight reaction with minor bubbling**
	0.5	11/09/2019	SAND, greyish brown, moist to wet, loose, well graded, medium-dense, heterogenous	6.5	6.9	-0.4	6	5.8	0.2	1.1	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** Slight reaction with minor bubbling
BH002	0.35	11/09/2019	Gravelly SAND, brown with white mottling, medium grained sands to fine gravels, damp, loose, heterogenous	5.8	5.9	-0.1	5.7	5.6	0.1	0.3	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** No reaction observed
	0.6	11/09/2019	SAND, greyish brown with white mottling, medium grained, moist to wet, medium dense, well sorted, heterogenous	6	6.1	-0.1	5.9	5.2	0.7	0.9	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** Slight reaction with minor bubbling
BH003	0.4	11/09/2019	Clayey SAND, orange, fine to medium grained, damp, stiff, medium plasticity, heterogenous with minor inclusions of mottled white/grey gravels	7.4	7.9	-0.5	6.1	5.8	0.3	2.1	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** Slight reaction with minor bubbling
BH004	0.4	11/09/2019	Silty SAND, brown with white and orange mottles, fine to medium grained, damp, loose, heterogenous	6.1	6.9	-0.8	5.8	5.9	-0.1	1	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** No reaction observed
	0.5	11/09/2019	SAND, orangy brown, coarse, damp, loose, poorly sorted, heterogenous	6.1	6.8	-0.7	6.1	5.9	0.2	0.9	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** No reaction observed
BH005	0.2	11/09/2019	Silty SAND, brown, damp, loose, heterogenous with trace inclusions of sub-angular fine gravels	5.8	5.8	0	5.6	5.5	0.1	0.3	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** No reaction observed
	0.5	11/09/2019	SAND, orange, coarse, damp, loose, heterogenous with inclusion of trace gravels	6.5	6.6	-0.1	5.8	5.2	0.6	1.4	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** Slight reaction with minor bubbling
BH006	0.3	11/09/2019	Sandy Gravelly SILT, brown, damp, firm, non-plastic, heterogenous	5.8	5.9	-0.1	5.8	5.7	0.1	0.2	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** No reaction observed
	0.6	11/09/2019	SAND, orange, coarse, medium grained, damp, loose, heterogenous with trace inclusions of sub-rounded fine gravels	5.6	5.7	-0.1	5.7	5.5	0.2	0.2	**Deionised Water:** No reaction observed **Hydrogen Peroxide:** No reaction observed

Δ pH drop greater than 1

Table B: Acid Sulfate Soil Laboratory SPOCAS Analysis Results
Project Number: 57312
Project Name: Frank Gray/Mike Pawley Ovals, Curl Curl - Acid Sulfate Soil Assessment

				SPOCAS						Acid Sulphate Soils											Moisture
				Analysed Material	sulfidic - Acid Reacted Ca equiv. S% pyrite	Extraneous Material	HCl Extractable Sulfur Correction Factor	sulfidic - TSA equiv. S% pyrite	<2mm Fraction	>2mm Fraction	Sulfur - Peroxide Oxidisable Sulfur	Acid Neutralising Capacity - Acidity units	Acid trail - Titratable Actual Acidity	Acid trail - Titratable Peroxide Acidity	Acid trail - Titratable Sulfidic Acidity	Liming rate - SPOCAS	Net Acidity (acidity units) - SPOCAS	pH-KCL	pH-OX	Acidity - Acid Reacted Calcium	Acidity - Acid Reacted Magnesium	Acidity - Peroxide Oxidisable Sulfur	% Moisture 103oC
				%	% S	%	FACTOR	% PYRITE S	G	G	% S	MOL H+/T	MOL H+/T	MOL H+/T	MOL H+/T	KG CACO3/T	MOL H+/T	ph Units	ph Units	MOL H+/T	MOL H+/T	MOL H+/T	%
EQL				0.1	0.02	0.1	1	0.02	0.005	0.005	0.02	10	2	2	2	1	10	0.1	0.1	10	10	10	1
ASSMAC (1998) Action Criteria (Coarse 1-1000 tonnes disturbed)											0.03			18	18							
ASSMAC (1998) Action Criteria (Coarse >1000 tonnes disturbed)											0.03			18	18							
Sample ID	**Sample Depth (m)**	**Material Type**	**Sample Date**	**Lab Report Number**																		
BH001	0.6-0.7	SAND, greyish brown, moist to wet, loose, well graded, medium-dense, heterogenous	11/09/2019	676396	100	<0.02	<0.1	2	<0.02	140	<0.005	< 0.02	39	<2	<2	<2	<1	<10	6.9	6.6	<10	<10	<10	7.5
BH002	0.6-0.7	SAND, greyish brown with white mottling, medium grained, moist to wet, medium dense, well sorted, heterogenous	11/09/2019	676396	100	0.44	<0.1	2	<0.02	130	<0.005	< 0.02	330	<2	<2	<2	<1	<10	9.1	8.1	280	<10	<10	10
BH003	0.4-0.5	Clayey SAND, orange, fine to medium grained, damp, stiff, medium plasticity, heterogenous with minor inclusions of mottled white/grey gravels	11/09/2019	676396	100	0.02	<0.1	2	<0.02	120	<0.005	< 0.02	80	<2	<2	<2	<1	<10	8	7.3	12	<10	<10	13
BH004	0.5-0.6	SAND, orangy brown, coarse, damp, loose, poorly sorted, heterogenous	11/09/2019	676396	100	<0.02	<0.1	2	<0.02	140	<0.005	< 0.02	-	<2	<2	<2	<1	<10	6.4	5.9	<10	<10	<10	8.2
BH005	0.5-0.6	SAND, orange, coarse, damp, loose, heterogenous with inclusion of trace gravels	11/09/2019	676396	100	0.06	<0.1	2	<0.02	120	<0.005	< 0.02	93	<2	<2	<2	<1	<10	8.7	7.6	38	<10	<10	11

Attachment 6 – Laboratory Reports and Chain of Custody Documentation

019523

CHAIN OF CUSTODY

JBS&G

PROJECT NO.: 57312
PROJECT NAME: Curl Curl ASS
DATE NEEDED BY: STAT
PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688
SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) .....@jbsg.com.au; (3) .....@jbsg.com.au

LABORATORY BATCH NO.:
SAMPLERS: RL
QC LEVEL: NEPM (2013)

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	8 RCRA	TYPE OF ASBESTOS ANALYSIS: IDENTIFICATION	TYPE OF ASBESTOS ANALYSIS: NEPM/WA	NOTES:
BH001-0.6-0.7	Soil	11-9-11		Bag + ice		x			
BH002-0.6-0.7	↓	↓		↓		x			
BH003-0.4-0.5						x			
BH004-0.5-0.6						x			
BH005-0.5-0.6	↓	↓		↓		x			

RELINQUISHED BY:	METHOD OF SHIPMENT:	RECEIVED BY:	FOR RECEIVING LAB USE ONLY:
NAME: DATE:	CONSIGNMENT NOTE NO.	NAME: Irina D. 11/09	COOLER SEAL – Yes..... No ..... Intact ..... Broken .....
OF: JBS&G	TRANSPORT CO.	DATE: OF: Eurofins MGT 1:25 pm	COOLER TEMP ..... deg C 3.7°C
NAME: DATE:	CONSIGNMENT NOTE NO.	NAME: DATE:	COOLER SEAL – Yes..... No ..... Intact ..... Broken .....
OF:	TRANSPORT CO	OF:	COOLER TEMP ..... deg C

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

IMSO FormsO13 – Chain of Custody - Generic

676396

eurofins | Environment Testing

Melbourne
6 Monterey Road
Dandenong South Vic 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**JBS & G Australia (NSW) P/L**
Contact name:	Alex Finney
Project name:	CURL CURL ASS
Project ID:	57312
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Sep 11, 2019 1:25 PM
Eurofins reference:	**676396**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins Sample Receipt : 3.7 degrees Celsius.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Ursula Long on Phone : or by e.mail: UrsulaLong@eurofins.com

Results will be delivered electronically via e.mail to Alex Finney - afinney@jbsg.com.au.

Note: A copy of these results will also be delivered to the general JBS & G Australia (NSW) P/L email address.

eurofins | Environment Testing

ABN – 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Project Name: CURL CURL ASS
Project ID: 57312

Order No.:
Report #: 676396
Phone: 02 8245 0300
Fax:

Received: Sep 11, 2019 1:25 PM
Due: Sep 17, 2019
Priority: 5 Day
Contact Name: Alex Finney

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						SPOCAS Suite	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BH001_0.6-0.7	Sep 11, 2019		Soil	S19-Se16980	X	X
2	BH002_0.6-0.7	Sep 11, 2019		Soil	S19-Se16981	X	X
3	BH003_0.4-0.5	Sep 11, 2019		Soil	S19-Se16982	X	X
4	BH004_0.5-0.6	Sep 11, 2019		Soil	S19-Se16983	X	X
5	BH005_0.5-0.6	Sep 11, 2019		Soil	S19-Se16984	X	X
Test Counts						5	5

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Alex Finney**

Report **676396-S**
Project name CURL CURL ASS
Project ID 57312
Received Date Sep 11, 2019

Client Sample ID			**BH001_0.6-0.7**	**BH002_0.6-0.7**	**BH003_0.4-0.5**	**BH004_0.5-0.6**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S19-Se16980**	**S19-Se16981**	**S19-Se16982**	**S19-Se16983**
Date Sampled			**Sep 11, 2019**	**Sep 11, 2019**	**Sep 11, 2019**	**Sep 11, 2019**
Test/Reference	LOR	Unit				
SPOCAS Suite						
pH-KCL	0.1	pH Units	6.9	9.1	8.0	6.4
pH-OX	0.1	pH Units	6.6	8.1	7.3	5.9
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	< 2	< 2
Acid trail - Titratable Peroxide Acidity	2	mol H+/t	< 2	< 2	< 2	< 2
Acid trail - Titratable Sulfidic Acidity	2	mol H+/t	< 2	< 2	< 2	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	< 0.003	< 0.003
sulfidic - TPA equiv. S% pyrite	0.02	% pyrite S	< 0.02	< 0.02	< 0.02	< 0.02
sulfidic - TSA equiv. S% pyrite	0.02	% pyrite S	< 0.02	< 0.02	< 0.02	< 0.02
Sulfur - KCl Extractable	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
Sulfur - Peroxide	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
Sulfur - Peroxide Oxidisable Sulfur	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
acidity - Peroxide Oxidisable Sulfur	10	mol H+/t	< 10	< 10	< 10	< 10
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Calcium - KCl Extractable	0.02	% Ca	0.09	0.23	0.22	0.07
Calcium - Peroxide	0.02	% Ca	0.10	0.78	0.24	0.07
Acid Reacted Calcium	0.02	% Ca	< 0.02	0.55	0.02	< 0.02
acidity - Acid Reacted Calcium	10	mol H+/t	< 10	280	12	< 10
sulfidic - Acid Reacted Ca equiv. S% pyrite	0.02	% S	< 0.02	0.44	0.02	< 0.02
Magnesium - KCl Extractable	0.02	% Mg	< 0.02	< 0.02	< 0.02	< 0.02
Magnesium - Peroxide	0.02	% Mg	< 0.02	< 0.02	< 0.02	< 0.02
Acid Reacted Magnesium	0.02	% Mg	< 0.02	< 0.02	< 0.02	< 0.02
acidity - Acid Reacted Magnesium	10	mol H+/t	< 10	< 10	< 10	< 10
sulfidic - Acid Reacted Mg equiv. S% pyrite	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
Acid Neutralising Capacity (ANCE)	0.02	% CaCO3	0.19	1.6	0.40	n/a
Acid Neutralising Capacity - Acidity units (a-ANCE)	10	mol H+/t	39	330	80	n/a
Acid Neutralising Capacity - equivalent S% pyrite(s-ANCE)	0.02	% S	0.06	0.52	0.13	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
SPOCAS - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
SPOCAS - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
SPOCAS - Liming rate	1	kg CaCO3/t	< 1	< 1	< 1	< 1

Client Sample ID			BH001_0.6-0.7	BH002_0.6-0.7	BH003_0.4-0.5	BH004_0.5-0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Se16980	S19-Se16981	S19-Se16982	S19-Se16983
Date Sampled			Sep 11, 2019	Sep 11, 2019	Sep 11, 2019	Sep 11, 2019
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	140	130	120	140
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
% Moisture	1	%	7.5	10	13	8.2

Client Sample ID			BH005_0.5-0.6
Sample Matrix			Soil
Eurofins Sample No.			S19-Se16984
Date Sampled			Sep 11, 2019
Test/Reference	LOR	Unit	
SPOCAS Suite			
pH-KCL	0.1	pH Units	8.7
pH-OX	0.1	pH Units	7.6
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2
Acid trail - Titratable Peroxide Acidity	2	mol H+/t	< 2
Acid trail - Titratable Sulfidic Acidity	2	mol H+/t	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003
sulfidic - TPA equiv. S% pyrite	0.02	% pyrite S	< 0.02
sulfidic - TSA equiv. S% pyrite	0.02	% pyrite S	< 0.02
Sulfur - KCl Extractable	0.02	% S	< 0.02
Sulfur - Peroxide	0.02	% S	< 0.02
Sulfur - Peroxide Oxidisable Sulfur	0.02	% S	< 0.02
acidity - Peroxide Oxidisable Sulfur	10	mol H+/t	< 10
HCl Extractable Sulfur Correction Factor	1	factor	2.0
HCl Extractable Sulfur	0.02	% S	n/a
Net Acid soluble sulfur	0.02	% S	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a
Calcium - KCl Extractable	0.02	% Ca	0.22
Calcium - Peroxide	0.02	% Ca	0.29
Acid Reacted Calcium	0.02	% Ca	0.08
acidity - Acid Reacted Calcium	10	mol H+/t	38
sulfidic - Acid Reacted Ca equiv. S% pyrite	0.02	% S	0.06
Magnesium - KCl Extractable	0.02	% Mg	< 0.02
Magnesium - Peroxide	0.02	% Mg	< 0.02
Acid Reacted Magnesium	0.02	% Mg	< 0.02
acidity - Acid Reacted Magnesium	10	mol H+/t	< 10
sulfidic - Acid Reacted Mg equiv. S% pyrite	0.02	% S	< 0.02
Acid Neutralising Capacity (ANCE)	0.02	% CaCO3	0.47
Acid Neutralising Capacity - Acidity units (a-ANCE)	10	mol H+/t	93
Acid Neutralising Capacity - equivalent S% pyrite(s-ANCE)	0.02	% S	0.15
ANC Fineness Factor		factor	1.5
SPOCAS - Net Acidity (Sulfur Units)	0.02	% S	< 0.02
SPOCAS - Net Acidity (Acidity Units)	10	mol H+/t	< 10
SPOCAS - Liming rate	1	kg CaCO3/t	< 1

Client Sample ID			BH005_0.5-0.6
Sample Matrix			**Soil**
Eurofins Sample No.			**S19-Se16984**
Date Sampled			**Sep 11, 2019**
Test/Reference	LOR	Unit	
Extraneous Material			
<2mm Fraction	0.005	g	120
>2mm Fraction	0.005	g	< 0.005
Analysed Material	0.1	%	100
Extraneous Material	0.1	%	< 0.1
% Moisture	1	%	11

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
SPOCAS Suite			
SPOCAS Suite	Brisbane	Sep 12, 2019	6 Week
- Method: LTM-GEN-7050			
Extraneous Material	Brisbane	Sep 12, 2019	6 Week
- Method: LTM-GEN-7050/7070			
% Moisture	Brisbane	Sep 11, 2019	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins | Environment Testing

ABN – 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Project Name: CURL CURL ASS
Project ID: 57312

Order No.:
Report #: 676396
Phone: 02 8245 0300
Fax:

Received: Sep 11, 2019 1:25 PM
Due: Sep 16, 2019
Priority: 3 Day
Contact Name: Alex Finney

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						SPOCAS Suite	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BH001_0.6-0.7	Sep 11, 2019		Soil	S19-Se16980	X	X
2	BH002_0.6-0.7	Sep 11, 2019		Soil	S19-Se16981	X	X
3	BH003_0.4-0.5	Sep 11, 2019		Soil	S19-Se16982	X	X
4	BH004_0.5-0.6	Sep 11, 2019		Soil	S19-Se16983	X	X
5	BH005_0.5-0.6	Sep 11, 2019		Soil	S19-Se16984	X	X
Test Counts						5	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
SPOCAS Suite				Result 1	Result 2	RPD			
pH-KCL	S19-Se15429	NCP	pH Units	6.9	7.4	6.0	30%	Pass	
pH-OX	S19-Se15429	NCP	pH Units	3.7	3.7	1.0	30%	Pass	
Acid trail - Titratable Actual Acidity	S19-Se15429	NCP	mol H+/t	< 2	< 2	<1	30%	Pass	
Acid trail - Titratable Peroxide Acidity	S19-Se15429	NCP	mol H+/t	< 2	< 2	<1	30%	Pass	
Acid trail - Titratable Sulfidic Acidity	S19-Se15429	NCP	mol H+/t	< 2	< 2	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	S19-Se15429	NCP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
sulfidic - TPA equiv. S% pyrite	S19-Se15429	NCP	% pyrite S	< 0.02	< 0.02	<1	30%	Pass	
sulfidic - TSA equiv. S% pyrite	S19-Se15429	NCP	% pyrite S	< 0.02	< 0.02	<1	30%	Pass	
Sulfur - KCl Extractable	S19-Se15429	NCP	% S	< 0.02	< 0.02	<1	30%	Pass	
Sulfur - Peroxide	S19-Se15429	NCP	% S	0.05	0.04	8.0	30%	Pass	
Sulfur - Peroxide Oxidisable Sulfur	S19-Se15429	NCP	% S	0.05	0.04	8.0	30%	Pass	
acidity - Peroxide Oxidisable Sulfur	S19-Se15429	NCP	mol H+/t	30	27	8.0	30%	Pass	
HCl Extractable Sulfur	S19-Se15429	NCP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	S19-Se15429	NCP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	S19-Se15429	NCP	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	S19-Se15429	NCP	% S	n/a	n/a	n/a	30%	Pass	
Calcium - KCl Extractable	S19-Se15429	NCP	% Ca	0.08	0.08	7.0	30%	Pass	
Calcium - Peroxide	S19-Se15429	NCP	% Ca	0.09	0.08	7.0	30%	Pass	
Acid Reacted Calcium	S19-Se15429	NCP	% Ca	< 0.02	< 0.02	<1	30%	Pass	
acidity - Acid Reacted Calcium	S19-Se15429	NCP	mol H+/t	< 10	< 10	<1	30%	Pass	
sulfidic - Acid Reacted Ca equiv. S% pyrite	S19-Se15429	NCP	% S	< 0.02	< 0.02	<1	30%	Pass	
Magnesium - KCl Extractable	S19-Se15429	NCP	% Mg	< 0.02	< 0.02	<1	30%	Pass	
Magnesium - Peroxide	S19-Se15429	NCP	% Mg	< 0.02	< 0.02	<1	30%	Pass	
Acid Reacted Magnesium	S19-Se15429	NCP	% Mg	< 0.02	< 0.02	<1	30%	Pass	
acidity - Acid Reacted Magnesium	S19-Se15429	NCP	mol H+/t	< 10	< 10	<1	30%	Pass	
sulfidic - Acid Reacted Mg equiv. S% pyrite	S19-Se15429	NCP	% S	< 0.02	< 0.02	<1	30%	Pass	
Acid Neutralising Capacity (ANCE)	S19-Se15429	NCP	% CaCO3	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity - Acidity units (a-ANCE)	S19-Se15429	NCP	mol H+/t	n/a	n/a	n/a	30%	Pass	
ANC Fineness Factor	S19-Se15429	NCP	factor	1.5	1.5	<1	30%	Pass	
SPOCAS - Liming rate	S19-Se15429	NCP	kg CaCO3/t	1.0	1.0	8.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Se16980	CP	%	7.5	7.5	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5

Authorised By

Ursula Long	Analytical Services Manager
Myles Clark	Senior Analyst-SPOCAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.