

Port of Mackay

▶ Appendix H

**Sediment Characterisation Assessment
(additional areas)**

Memorandum

To:	Damian Snell	Date:	18 December 2018
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Subject:	Port of Mackay – Sediment Characterisation for additional areas: New Approach and Operational Area 2	Project:	Port of Mackay Maintenance Dredging Sediment Characterisation

1 Introduction

Advisian has been commissioned by North Queensland Bulk Ports (NQBP) to undertake a sediment sampling and characterisation assessment within the Port of Mackay (the Port) to inform and support future maintenance dredging in Operational Area 2 (i.e. new tug berths) (OP2) and provide a preliminary assessment of contaminants within an area that may be used as a future New Approach (NA) into the Port of Mackay.

The sediment sampling at OP2 and the NA was undertaken concurrently with the sediment characterisation assessment and a geotechnical properties assessment of sediments in all existing and proposed dredge areas in the Port of Mackay. The sediment characterisation assessment was completed in accordance with NQBP’s ten-year Sea Dumping Approval (2012-2022) and an associated and approved Long Term Dredge Management Plan (LTDMP), while the geotechnical properties assessment of sediments was undertaken to support a Beneficial Reuse Assessment (BRA).

The sediment characterisation assessment at OP2 and the NA was undertaken in accordance with the Sampling Analysis Plan (SAP) (Advisian, 2018). This is provided as Attachment A and incorporates a sampling intensity at OP2 consistent with the National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia, 2009).

Although the sediment characterisation assessment described in this memorandum will not be assessed by a regulatory determining authority (i.e. Great Barrier Reef Marine Park Authority (GBRMPA) or the Commonwealth Department of Environment and Energy (DoEE)), the application of an approach consistent with the NAGD allows NQBP to use the results to support an application for amendment to their Sea Dumping Approval which may allow future dredging of OP2 if required. Sampling at the NA was undertaken to provide a preliminary assessment to NQBP for planning purposes.

This technical memorandum details the results of the sediment characterisation assessment undertaken within OP2 and the NA.

1.1 Objectives

The specific objectives of the sediment characterisation assessment within OP2 and the NA are:

- Undertake the sediment characterisation in accordance with the SAP (Advisian, 2018) (Attachment A)
- Ensure sampling is undertaken consistent with industry best practice and the NAGD, 2009
- Understand the quality and contamination status of sediments in OP2 and provide a preliminary assessment of sediment contaminants in the NA
- Achieve high quality laboratory analysis results incorporating appropriate Quality Assurance (QA) / Quality Control (QC) through use of recognised and NATA accredited analytical laboratories with expertise in marine sediment quality assessment applicable to dredge material management
- Ensure data from sampling is accurately reported, summarised, analysed and stored safely to provide confidence in the efficacy of the sediment sampling, handling, testing, analysis and reporting sufficient to determine the suitability of the dredge material for placement at sea.

2 Method

The sampling methodology adopted is provided in the SAP (Attachment A).

2.1 Sampling locations and intensity

2.1.1 Phase II

The number of sampling locations is based on the anticipated dredge volumes for each dredge area in accordance with Appendix A of the NAGD, 2009. The number of locations planned to be sampled was equal to the number of locations sampled.

The sampling locations are presented on Figure 2-1 and Figure 2-2.





2.1.2 Phase III

Phase III sampling was not required as additional sample volume was collected during Phase II sampling. The additional sample volume collected would be used in the instance Phase III laboratory analysis was required to avoid remobilisation to site.

Port of Mackay Sediment Investigation

Figure 2.1
Operational Area 2 stratified
sampling locations

LEGEND

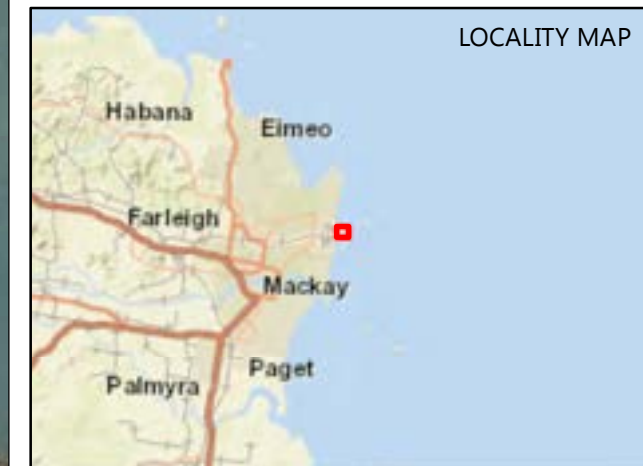
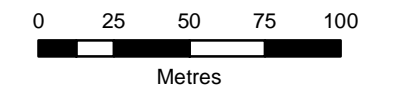
-  Sampling location
-  Sampling grid
-  Operational area 2 dredge area
-  Berths and operational areas

Source Information:
Port facility layout
Provided by NQBP - Sept 2018
Imagery - Aug 2017
Provided by NQBP - Sept 2018

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Port of Mackay Sediment Investigation

Figure 2.2 Proposed new approach sampling locations



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- Sampling location

Source Information:

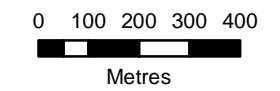
Port facility layout
 Provided by NQBP - Sept 2018
 New port approach
 Digitised from Figure 2: Proposed North-South channel footprint
 of the Mackay Improved Access Channel Rev 2 document
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2.2 Variation to the SAP

The number of sampling locations was equal to those described in the SAP; however, the planned number of horizons could not be achieved at each location due to shallow refusal. A summary of the horizons sampled is provided in Table 2-1.

2.3 Analytical summary

2.3.1 Phase II analysis

Phase II sediment analysis was consistent with the analysis outlined in the SAP (Attachment A). This includes:

- Total Organic Carbon (TOC) and moisture content
- Heavy metals and metalloids: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Zinc (Zn)
- Organotins: Monobutyltin (MBT), Dibutyltin (DBT), Tributyltin (TBT)
- Total Petroleum Hydrocarbons (TPH)
- Polycyclic Aromatic Hydrocarbons (PAH)
- Organochloride pesticides (OCP)
- Particle Size Distribution (PSD) and settling rate.

Detailed analytical summary and sampling numbers collected are provided in Table 2-1. Note that nutrients (Electrical Conductivity, Salinity, Total Soluble Salts and Organic Matter) and Acid Sulfate Soils data for OP2 were also determined. However, this data relates to another report and will not be discussed in this technical memorandum further.

2.3.2 Phase III analysis

2.3.2.1 Elutriate analysis

Elutriate analyses was undertaken using sediments prepared in a 1:4 suspension of Port of Mackay spoil ground seawater for four samples for zinc (Zn) at OP2_18 (0-0.5) and TBT in OP2_36 (0.5-1.0), OP2_36 (1.0-1.5), OP2_42 / 0.0-0.5 and OP2_44 (0.5-1.0). The elutriate concentrations at the 95th percentile for the relevant dredge area are compared to the relevant toxicant trigger level in the Australian and New Zealand Governments and Australian state and territory governments (ANZG, 2018) Guidelines for Fresh and Marine Water Quality 95% Species Protection. Allowance was made for dilution at the spoil ground when comparing elutriate concentrations against guideline values.

2.3.2.2 Bioavailability analysis

Dilute acid extraction (DAE) analysis using a weak acid (1M HCl) for Zn was undertaken for one sample: OP2_18 (0-0.5) as the total zinc concentration was greater than the NAGD Screening Level (Section 3.1.2). Similar to total metal concentrations, DAE results are compared to NAGD Screening Levels. Pore water analysis was not required.

Detailed analytical summary and sampling numbers collected are provided in Table 2-2.

Table 2-1: Phase II laboratory analysis and variation to the SAP

Sample Location ID	Horizon	Sample Method	Analysis					QA/QC	Sample obtained?
			TOC and Moisture	Metals / Organotins	TPH/PAH	OCP	PSD & settling rate	Triplicate / split duplicate	
OP2_42	0.0-0.5	PC	1	1	1	1	1		Yes
	0.5-1.0		1	1	1	1	1		Yes
	1.0-1.5		1	1	1	1	1		Yes
	1.5-2.0		1	1	1	1	1		No - refusal
	2.0-2.5		1	1	1	1	1		No - refusal
OP2_44	0.0-0.5	PC	1	1					Yes
	0.5-1.0		1	1					Yes
	1.0-1.5		1	1					No - refusal
	1.5-2.0		1	1					No - refusal
	2.0-2.5		1	1					No - refusal
OP2_45	0.0-0.5	PC	1	1			1		Yes
	0.5-1.0		1	1			1		Yes
	1.0-1.5		1	1			1		Yes
	1.5-2.0		1	1			1		No - refusal
	2.0-2.5		1	1			1		No - refusal
OP2_32	0.0-0.5	PC	1	1	1	1			Yes
	0.5-1.0		1	1	1	1			No - refusal
	1.0-1.5		1	1	1	1			No - refusal
OP2_38 T1	0.0-0.5	PC	1	1			1	Triplicate site	Yes
	0.5-1.0		1	1			1		No - refusal
	1.0-1.5		1	1			1		No - refusal
OP2_38 T2	0.0-0.5	PC	1	1					Yes
	0.5-1.0		1	1					No - refusal
	1.0-1.5		1	1					No - refusal
OP2_38 T3	0.0-0.5	PC	1	1					Yes
	0.5-1.0		1	1					No - refusal
	1.0-1.5		1	1					No - refusal
OP2_36	0.0-0.5	PC	1	1			1		Yes
	0.5-1.0		1	1			1		Yes
	1.0-1.5		1	1			1		Yes
OP2_33	0.0-0.5	PC	1	1	1	1		Split duplicate site	Yes
OP2_33 D7	0.0-0.5		1	1	1	1			Yes
OP2_33 D8	0.0-0.5		1	1	1	1			Yes
OP2_21	0.0-0.5	PC	1	1			1		Yes
OP2_18	0.0-0.5	PC	1	1					Yes
NA1	0.0-0.1	G	1	1	1	1	1		Yes
NA2	0.0-0.1	G	1	1	1	1	1		Yes
NA3	0.0-0.1	G	1	1	1	1	1		Yes
NA4	0.0-0.1	G	1	1	1	1	1		Yes

Table 2-2: Phase III laboratory analysis

Sample	Horizon	Dilute Acid Extraction (DAE) - Zn	Elutriate – Zn	Elutriate – TBT
OP2_18	0.0-0.5	1	1	
OP2_36	0.5-1.0			1
OP2_36	1.0-1.5			1
OP2_42	0.0-0.5			1
OP2_44	0.5-1.0			1

]

3 Results

3.1 Operational Area 2

3.1.1 Physical characteristics

Sediment samples were physically characterised in the field and logged at all sampling locations (refer to Attachment B).

3.1.1.1 Particle Size Distribution

Sediments within OP2 are generally consistent containing almost equal portions of sands (45%) and fines (silt 23% and clay 27%). There are also a minor portion of gravels within each sample. A summary of PSD results for OP2 are presented in Table 3-1 and Figure 3-1.

The PSD results from the triplicate site OP2_38 (0.0-0.5) (T1, T2 and T3) indicates there is minor spatial variation in textures with nearly equal portions of all textures.

3.1.1.2 Settling rate

Settling rates are provided in Table 3-1. This indicates that OP2_44 (0.0-0.5) had the fastest settling rate.



Table 3-1 Particle size distribution of sediments across OP2

Sample ID	Date Sampled	Texture					Soil Particle Density (Clay/Silt/Sand)	10% Setteability					20% Setteability				
		Clay	Silt	Sand	Gravel	Cobbles		Underflow Density	Underflow Solids	Settling Rate @ 50% of Settlement	Settling Rate @ 90% of Settlement	Clarity	Underflow Density	Underflow Solids	Settling Rate @ 50% of Settlement	Settling Rate @ 90% of Settlement	Clarity
		%	%	%	%	%		g/cm3	%	mm/min	mm/min		g/cm3	%	mm/min	mm/min	
Units	1	1	1	1	1	0.01	0.01	0.1	0.001	0.001	0.01	0.1	0.001	0.001			
PQL	1	1	1	1	1	0.01	0.01	0.1	0.001	0.001							
<i>Size (mm)</i>		<i><0.02</i>	<i>0.02-0.6</i>	<i>0.6-2</i>	<i>2-60</i>	<i>>60</i>	-										
OP2_21 (0-0.5)	28/09/2018	37	30	31	2	<1	2.66	1.24	33.7	0.4	0.017	Clear	1.31	38.1	1.6	0.009	Clear
OP2_38 (0-0.5) T1	28/09/2018	25	17	52	6	<1	2.68	1.34	37.3	2.6	0.117	Clear	1.36	40.8	1.2	0.008	Clear
OP2_38 (0-0.5) T2	28/09/2018	23	17	56	4	<1	2.68	1.26	31.8	2.2	0.067	Clear	1.29	36.9	1	0.009	Clear
OP2_38 (0-0.5) T3	28/09/2018	20	15	56	9	<1	2.69	1.4	39.5	3.2	0.117	Clear	1.38	42.8	1	0.008	Clear
OP2_44 (0-0.5)	28/09/2018	21	18	54	7	<1	2.67	1.39	40	3.8	0.2	Clear	1.36	43.4	1.2	0.033	Clear
OP2_44 (0.5-1.0)	28/09/2018	28	25	44	3	<1	2.67	1.27	32.9	2.2	0.05	Clear	1.32	37	0.8	0.008	Clear
OP2-45 (0-0.5)	28/09/2018	24	21	54	1	<1	2.77	1.24	31.7	2.8	0.067	Clear	1.29	36.8	0.8	0.008	Clear
OP2-45 (0.5-1.0)	28/09/2018	32	23	41	4	<1	2.67	1.21	29.6	2.2	0.058	Clear	1.25	34.7	0.4	0.009	Clear
OP2-45 (1.0-1.5)	28/09/2018	29	26	44	1	<1	2.66	1.22	31.5	2.4	0.017	Clear	1.31	36.4	1.2	0.008	Clear
OP2_42 / 0.0-0.5	27/09/2018	15	21	56	8	<1	2.61										
OP2_42 / 0.5-1.0	27/09/2018	27	50	22	1	<1	2.58										
OP2_42 / 1.0-1.5	27/09/2018	30	34	35	1	<1	2.63										
OP2_18 (0-0.5)	26/09/2018	34	22	40	4	<1	2.63	1.18	30.2	2	0.075	Clear	1.23	35.4	0.6	0.009	Clear
OP2_32 (0-0.5)	28/09/2018	31	19	47	3	<1	2.62	1.21	31.7	3.8	0.067	Clear	1.27	37.5	2.6	0.033	Clear
OP2_33 (0-0.5)	28/09/2018	29	25	44	2	<1	2.64										
OP2_36 (0-0.5)	28/09/2018	24	16	52	8	<1	2.64	1.21	35.2	4	0.067	Clear	1.31	40.1	3	0.025	Clear
OP2_36 (0.5-1.0)	28/09/2018	24	11	52	13	<1	2.63	1.27	40.3	3.4	0.05	Clear	1.34	44	2.8	0.025	Clear
OP2_36 (1.0-1.5)	28/09/2018	34	29	36	1	<1	2.66	1.18	31.4	2.4	0.067	Clear	1.25	35.6	0.4	0.011	Clear
Mean		27	23	45	4	<1	2.66	1.26	34.06	2.67	0.07	Clear	1.31	38.54	1.33	0.01	Clear

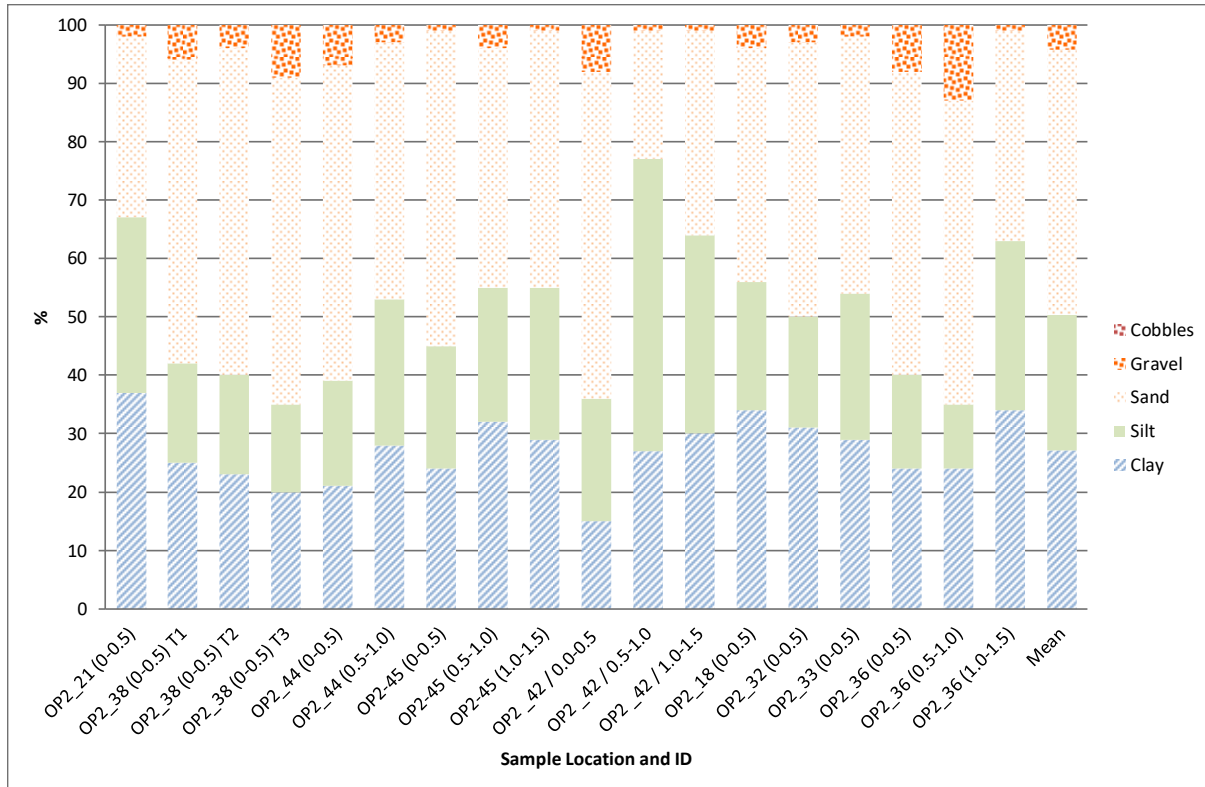


Figure 3-1 Particle size distribution of sediments in OP2

3.1.2 Chemical characteristics

The results of chemical analyses (dry weight) for sediments in OP2 are summarised below and tabulated for reference in Table 3-2. This summary includes a comparison against NAGD Screening Levels listed in Table 2, Appendix A of the NAGD. The primary laboratory reports are provided in Attachment C.

3.1.2.1 Metals and Metalloids

Metals and metalloid concentrations were below the respective NAGD Screening Levels in all OP2 samples except Zn (223mg/kg) in OP2_18 (0-0.5), which triggered Phase III analysis of this sample (refer Section 3.1.2.2 below).

3.1.2.2 Zinc Phase III sampling

Phase III results are summarised in Table 3-2. The Phase III bioavailability analysis of the Zn concentration in the OP2_18 (0-0.5) sample using DAE detected a concentration of 88.2mg/kg which is below the NAGD Screening Level of 200mg/kg.

Phase III elutriate water testing of the Zn concentration in the OP2_18 (0-0.5) sample was less than the laboratory Limit of Reporting (LOR) of 5µg/L. This is below the ANZG (2018) 95% Species Protection for Zn in marine water of 15µg/L.

3.1.2.3 Organotins

Concentrations of MBT ranged from below the LOR to 2.5µgSn/kg normalized to %TOC in OP2_44 (0.5-1.0). Concentrations of DBT ranged from below the LOR to 26µgSn/kg normalized to %TOC in OP2_44 (0.5-1.0). There are no NAGD Screening Levels for MBT or DBT.

Concentrations of TBT ranged from below the LOR to 105µgSn/kg in OP2_44 (0.5-1.0) with all but one sample (OP2_44 (0.5-1.0)) below the NAGD. When normalized to %TOC, concentrations in OP2_42 (0.0-0.5) and OP2_44 (0.5-1.0) increased to 14.86µgSn/kg and 132.46µgSn/kg respectively. Both normalized concentrations are above the NAGD Screening Level of 9µgSn/kg. The increase in concentration occurs due to the low concentration of TOC in samples. Although other OP2 samples have normalized TBT concentrations below the NAGD Screening Level of 9µgSn/kg, the 95%UCL of the mean 26.5µgSn/kg is above the NAGD Screening Level.

Due to the elevated TBT concentrations above the NAGD Screening Level, Phase III elutriate analysis was undertaken on three samples: OP2_36 (0.5-1.0), OP2_42 (0.0-0.5) and OP2_44 (0.5-1.0). The results of this analyses are detailed in Section 3.1.2.4, below.

Note that triplicate re-analysis of OP2_36 (0.5-1.0) was undertaken simultaneously with elutriate analysis. The triplicate re-analysis resulted in a normalized TBT concentration of 3.53µgSn/kg which is below the NAGD Screening Level.

3.1.2.4 Phase III Organotins

The results of the elutriate analysis of sediment samples from OP2_36 (0.5-1.0), OP2_42 (0.0-0.5) and OP2_44 (0.5-1.0) are summarised in Table 3-2.

Concentrations of TBT in elutriate for the initial dilution (i.e. four times) was <2ngSn/L in OP2_36 (0.5-1.0) (i.e. less than the LOR), <2ngSn/L in OP2_42 (0.0-0.5) and 125ngSn/L in OP2_44 (0.5-1.0). Only 125ngSn/L in OP2_44 (0.5-1.0) is above the ANZG (2018) guideline of 6ngSn/L.

The NAGD indicates that the initial dilution in the elutriate analysis greatly overestimates the potential water quality impacts and that dilutions in the order of a hundred times or more would normally be expected at the Dredge Material Placement Area (DMPA) and as such test data may be corrected. A previous investigation at the Port of Hay Point completed by PaCE in 2013 calculated a conservative bulk dilution factor of 20. This was based on the volume of the Trailer Suction hopper dredge (TSHD) Brisbane, length of dump run, depth of water at the DMPA and depth of hopper release point. For the purpose of this assessment the bulk dilution factor was increased to 25. This is still considered conservative for the disposal of sediments originating from the Port of Mackay. Using the bulk dilution factor of 25 the concentration of TBT in elutriate ranges from below the LOR to 5ngSn/L in OP2_44 (0.5-1.0). This is below the ANZG 95% species protection guideline of 6ngSn/L.

As the NAGD indicates that dilution of more than a hundred times may occur during dredging and placement it is considered that the application of a bulk dilution factor of 25 is conservative. Given application of this dilution factor, dredging and placement of material from OP2 is not anticipated to release contaminants to the water column at concentrations that may be significant to the environment.

3.1.2.5 TPH, TRH and BTEX

Concentrations of TPH and TRH were detected in most OP2 samples; however, only total TPH can be compared to a NAGD screening level of 500mg/kg. Concentrations of TPH in all samples collected were below the NAGD screening level.

Concentrations of BTEX in all OP2 samples analysed were below the LOR.

3.1.2.6 PAH

Concentrations of PAHs were detected in all OP2 samples, however, when normalised, summed and the 95%UCL calculated, these are below the NAGD screening criteria of 10,000µg/kg for total PAH.

3.1.2.7 Organochloride pesticides

Concentrations of OCPs in all samples analysed were below the LOR and therefore below the NAGD screening levels for the various OCP compounds.

Table 3-2: Summary of chemical analysis results for OP2

Sample ID	Units	PQL	NAGD PQL	NAGD Screening Level	OP2_18 (0-0.5)	OP2_21 (0-0.5)	OP2_32 (0-0.5)	OP2_33 (0-0.5)	OP2_36 (0-0.5)	OP2_36 (0.5-1.0)	OP2_36 (1.0-1.5)	OP2_38 (0-0.5) T1	OP2_42 / 0.0-0.5	OP2_42 / 0.5-1.0	OP2_42 / 1.0-1.5	OP2_44 (0-0.5)	OP2_44 (0.5-1.0)	OP2-45 (0-0.5)	OP2-45 (0.5-1.0)	OP2-45 (1.0-1.5)	Mean/ Geomean	Standard Deviation	95% UCL	Normal (N) Log-normal (L) Neither (X)
Date Sampled					26/09/18	28/09/18	28/09/18	28/09/18	28/09/18	28/09/18	28/09/18	28/09/18	27/09/18	27/09/18	27/09/18	28/09/18	28/09/18	28/09/18	28/09/18	28/09/18				
Misc																								
% Moisture	%	1	0.1	-	39.6	34.4	40.2	38.1	28.9	40	38.3	31.4	28.2	38.8	43	32	36.7	39.6	37.9	48.1	37.200	5.193		
Total Organic Carbon	%	0.02	0.1	-	0.56	0.54	0.64	0.56	0.49	0.36	0.59	0.4	0.24	0.55	0.76	0.43	0.8	0.82	0.67	0.9	0.582	0.179		
Metals and Metalloids																								
Arsenic, As	mg/kg	1	1	20 (30)	7.18	6.27	7.58	6.72	4.52	7.44	7.4	5.5	3.65	6.55	7.58	4.88	6.31	5.44	6.36	9.96	6.459	1.492	7.11	N
Cadmium, Cd	mg/kg	0.1	0.1	1.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Chromium, Cr	mg/kg	1	1	80	18.1	19.1	16.6	18.6	12.9	22.2	21.1	14.6	10.2	16.7	21	14.4	17.7	15.8	19.2	26	17.763	3.850	19.45	N
Copper, Cu	mg/kg	1	1	65	25.1	15.4	23.3	23.1	11	19.1	17.9	11.9	8.2	15.7	17	11.7	22	13.9	15.5	16.8	16.725	4.866	18.86	N
Lead, Pb	mg/kg	1	1	50	23.9	11.5	10.9	11.4	7.2	12.7	12.3	12.8	6.3	12.8	14.4	16.1	10.2	9.1	11.7	13.2	12.281	3.961	14.02	N
Mercury, Hg	mg/kg	0.01	0.01	0.15	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.01	<0.01	0.02	0.05	0.01	0.02	0.01	0.02	0.02	0.019	0.010	0.02370	X
Nickel, Ni	mg/kg	1	1	21	10.4	11.2	9.4	10.5	7.6	12.7	12.2	8.4	6.2	10.5	12.4	9.1	10	8.8	10.9	15.9	10.388	2.289	11.39	N
Zinc (total) Zn...Phase II	mg/kg	1	1	200	223	43.9	51.7	47.2	29.3	53.5	50.7	37.2	21.7	42.7	44.5	38.8	47.2	39.6	45.6	45.8	53.900	45.827	73.98	X
Zinc (DAE), Zn...Phase II	mg/kg	1	1	200	86.2																			
Zinc, Zn.....Phase II (Total) and III (DAE)	mg/kg	1	1	200	86.2	43.9	51.7	47.2	29.3	53.5	50.7	37.2	21.7	42.7	44.5	38.8	47.2	39.6	45.6	45.8	45.350	13.615	51.32	N
Elutriate (zinc)	µg/L	5	-	15*	<5																			
Organotins																								
Monobutyltin	µg Sn/kg	1	1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	<1	<1				
Normalised to % TOC	µg Sn/kg																2.50							
Dibutyltin	µg Sn/kg	1	1	-	2	2	1	<1	<1	2	2	1	1	1	<1	1	26	1	2	2				
Normalised to % TOC	µg Sn/kg				3.57	3.70	1.56	0.50	0.50	5.56	3.39	2.50	4.17	1.82	0.50	2.33	32.50	1.22	2.99	2.22	4.314	7.652	7.67	L
Tributyltin	µg Sn/kg	0.5	1	-	3.4	3.4	2.4	<0.5	2.7	1.27	1.33	1.5	3.57	0.9	<0.5	3.6	105.97	1.9	2.2	3.2				
Normalised to % TOC	µg Sn/kg				6.07	6.30	3.75	0.25	5.51	3.53	2.25989	3.75	14.86	1.64	0.25	8.37	132.46	2.32	3.28	3.56	12.384	32.214	26.500	L
Elutriate (Tributyltin) Initial dilution	ngSn/L	2	-	6*					<2				<2				125.00							
Elutriate (Tributyltin) 25 times dilution	ngSn/L	2	-	6*					<2				<2				5.00							
TPH																								
TPH C6-C9	mg/kg		10	-				<3					<3	<3	<3									
TPH C10-14	mg/kg		10	-				<3					<3	<3	3						3.000		2.76	N
TPH C15-28	mg/kg		50	-				5					4	6	8						5.750	1.708	7.76	N
TPH C29-36	mg/kg		50	-				6					<5	6	7						6.333	0.577	7.70	N
Total TPH	mg/kg			550				11					4	12	18						11.250	5.737	18.00	N
TRH																								
C6 - C10 Fraction	mg/kg	3						<3					<3	<3	<3									
C6 - C10 Fraction - BTEX	mg/kg	3						<3.0					<3.0	<3.0	<3.0									
>C10 - C16 Fraction	mg/kg	3						<3					<3	<3	3						3.000		2.76	N
>C16 - C34 Fraction	mg/kg	3						10					6	9	12						9.250	2.500	12.19	N
>C34 - C40 Fraction	mg/kg	5						<5					<5	6	5						5.500	0.707	6.09	N
>C10 - C40 Fraction (sum)	mg/kg	3						10					6	15	20						12.750	6.076	19.90	N
>C10 - C16 Fraction- Naphthalene	mg/kg	3						<3					<3	<3	3						3.000		2.76	N
BTEXN																								
Benzene	mg/kg	0.2						<0.2					<0.2	<0.2	<0.2									
Toluene	mg/kg	0.2						<0.2					<0.2	<0.2	<0.2									
Ethylbenzene	mg/kg	0.2						<0.2					<0.2	<0.2	<0.2									
meta- & para-Xylene	mg/kg	0.2						<0.2					<0.2	<0.2	<0.2									
ortho-Xylene	mg/kg	0.2						<0.2					<0.2	<0.2	<0.2									
Total Xylenes	mg/kg	0.5						<0.5					<0.5	<0.5	<0.5									
Sum of BTEX	mg/kg	0.2	200	-				<0.2					<0.2	<0.2	<0.2									
Naphthalene	mg/kg	0.2						<0.2					<0.2	<0.2	<0.2									
PAH																								
Naphthalene	µg/kg	5	5	-				<5					<5	7	7									
Normalised to % TOC	µg/kg							2.5					2.50	12.73	9.21						6.734	5.096	12.73	N
2-Methylnaphthalene	µg/kg	5	5	-				<5					<5	<5	<5									
Normalised to % TOC	µg/kg																							
Acenaphthylene	µg/kg	4	5	-				<4					<4	9	11									
Normalised to % TOC	µg/kg							2					2.00	16.36	14.47						8.709	7.786	17.87	N
Acenaphthene	µg/kg	4	5	-				<4					<4	8	<4									
Normalised to % TOC	µg/kg							2					2.00	14.55	2.00						5.136	6.273	12.52	N
Fluorene	µg/kg	4	5	-				<4					<4	6	<4									
Normalised to % TOC	µg/kg							2					2.00	10.91	2.00						4.227	4.455	9.47	N
Phenanthrene	µg/kg	4	5	-				12					5	39	18									
Normalised to % TOC	µg/kg							21.43					20.83	70.91	23.68						34.214	24.494	63.04	N

Sample ID	Units	PQL	NAGD PQL	NAGD Screening Level	OP2_18 (0-0.5)	OP2_21 (0-0.5)	OP2_32 (0-0.5)	OP2_33 (0-0.5)	OP2_36 (0-0.5)	OP2_36 (0.5-1.0)	OP2_36 (1.0-1.5)	OP2_38 (0-0.5) T1	OP2_42 / 0.0-0.5	OP2_42 / 0.5-1.0	OP2_42 / 1.0-1.5	OP2_44 (0-0.5)	OP2_44 (0.5-1.0)	OP2_45 (0-0.5)	OP2_45 (0.5-1.0)	OP2_45 (1.0-1.5)	Mean/ Geomean	Standard Deviation	95% UCL	Normal (N) Log-normal (L) Neither (X)
Date Sampled					26/09/18	28/09/18	28/09/18	28/09/18	28/09/18	28/09/18	28/09/18	28/09/18	27/09/18	27/09/18	27/09/18	28/09/18	28/09/18	28/09/18	28/09/18	28/09/18				
Anthracene	µg/kg	4	5	-				<4					<4	6	7									
Normalised to % TOC	µg/kg			-				2					2.00	10.91	9.21						6.030	4.705	11.57	N
Fluoranthene	µg/kg	4	5	-				37					10	116	62									
Normalised to % TOC	µg/kg			-				66.07					41.67	210.91	81.58						100.057	75.706	189.10	N
Pyrene	µg/kg	4	5	-				38					11	103	62									
Normalised to % TOC	µg/kg			-				67.86					45.83	187.27	81.58						95.636	62.841	169.60	N
Benz(a)anthracene	µg/kg	4	5	-				25					7	72	44									
Normalised to % TOC	µg/kg			-				44.64					29.17	130.91	57.89						65.653	45.060	118.70	N
Chrysene	µg/kg	4	5	-				22					5	56	28									
Normalised to % TOC	µg/kg			-				39.29					20.83	101.82	36.84						49.695	35.700	91.70	N
Benzo(b+)fluoranthene	µg/kg	4	5	-				26					6	71	33									
Normalised to % TOC	µg/kg			-				46.43					25.00	129.09	43.42						60.985	46.381	115.60	N
Benzo(k)fluoranthene	µg/kg	4	5	-				15					<4	34	19									
Normalised to % TOC	µg/kg			-				26.79					2.00	61.82	25.00						28.901	24.677	57.94	N
Benzo(e)pyrene	µg/kg	4	5	-				15					4	40	20									
Normalised to % TOC	µg/kg			-				26.79					16.67	72.73	26.32						35.624	25.171	65.24	N
Benzo(a)pyrene	µg/kg	4	5	-				26					6	75	44									
Normalised to % TOC	µg/kg			-				46.43					25.00	136.36	57.89						66.422	48.580	123.60	N
Perylene	µg/kg	4	5	-				9					5	21	19									
Normalised to % TOC	µg/kg			-				16.07					20.83	38.18	25.00						25.022	9.502	36.20	N
Benzo(g,h,i)perylene	µg/kg	4	5	-				16					5	44	26									
Normalised to % TOC	µg/kg			-				28.57					20.83	80.00	34.21						40.904	26.635	72.24	N
Dibenz(a,h)anthracene	µg/kg	4	5	-				4					<4	10	<4									
Normalised to % TOC	µg/kg			-				7.14					2.00	18.18	2.00						7.331	7.629	16.31	N
Indeno(1.2.3.cd)pyrene	µg/kg	4	5	-				15					4	40	22									
Normalised to % TOC	µg/kg			-				26.79					16.67	72.73	28.95						36.282	24.880	65.56	N
Coronene	µg/kg	5	5	-				<5					<5	9	5									
Normalised to % TOC	µg/kg			-				2.50					2.50	16.36	6.58						6.986	6.541	14.68	N
Sum of PAHs	µg/kg	4	100	10000				260					68	766	430									
Normalised to % TOC	µg/kg			10000				464.29					283.33	1392.73	565.79						676.534	491.546	1255.00	N
Organochloride pesticides																								
Aldrin	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
alpha-BHC	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
beta-BHC	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
delta-BHC	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
4,4'-DDD	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
4,4'-DDE	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
4,4'-DDT	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Sum of DDD + DDE + DDT	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Dieldrin	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
alpha-Endosulfan	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
beta-Endosulfan	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Endosulfan sulfate	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Endosulfan (sum)	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Endrin	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Endrin aldehyde	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Endrin ketone	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Heptachlor	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Heptachlor epoxide	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Hexachlorobenzene (HCB)	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
gamma-BHC	µg/kg	0.25						<0.25					<0.25	<0.25	<0.25									
Methoxychlor	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
cis-Chlordane	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
trans-Chlordane	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Total Chlordane (sum)	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Oxychlordane	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									
Sum of Aldrin + Dieldrin	µg/kg	0.5						<0.50					<0.50	<0.50	<0.50									

Notes

Note: When calculating averages and 95%UCLs, values below detection for individual sample results were set to half the detection levels (consistent with the NA TBT result for OP2_36 / 1.0-1.5 is the average of triplicate analysis: 1.3+1.3+1.4 µgSn/kg = 1.33 µgSn/kg
TBT result for OP2_44 / 0.5-1.0 is the average of triplicate analysis: 90.0+121+106 µgSn/kg = 105.966 µgSn/kg
Sample ID: Sample location numbers
TBT result for OP2_36 / 0.5-1.0 is the average of triplicate analysis: 1.3+1.2+1.3 µgSn/kg = 1.27 µgSn/kg
ND: Insufficient data
TBT result for OP2_42 / 0.0-0.5 is the average of triplicate analysis: 2.5+5.3+2.9µgSn/kg = 3.57µgSn/kg
-: No guidelines levels (i.e. Screening or Maximum Levels) set in NAGD for given parameter, or no analysis undertaken for a given sample
Value exceeds NAGD or agreed local screening level
Normalised to % TOC: Normalised to % TOC, over the range of TOC from 0.2 to 10%
Not tested
*: Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments (ANZG, 2018) 95% Species Protection

3.2 New Approach

3.2.1 Physical characteristics

Sediment samples were physically characterised in the field and logged at all sampling locations (refer to Attachment B).

3.2.1.1 Particle Size Distribution

Sediments within NA samples are primarily composed of sand (78%) and gravel (18%). There are minor silt (2%) and clay (4%) components. A summary of PSD results for NA is presented in Table 3-3 and Figure 3-2.

3.2.1.2 Settling rate

Settling rates are provided in Table 3-1. This indicates that NA_03 had the fastest settling rate.



Table 3-3 Particle size distribution of sediments in NA samples

Sample ID	Date Sampled	Texture					Soil Particle Density (Clay/Silt/Sand)	10% Setteability				Clarity	20% Setteability				Clarity	
		Clay	Silt	Sand	Gravel	Cobbles		Underflow Density	Underflow Solids	Settling Rate @ 50% of Settlement	Settling Rate @ 90% of Settlement		Underflow Density	Underflow Solids	Settling Rate @ 50% of Settlement	Settling Rate @ 90% of Settlement		
Units		%	%	%	%	%	g/cm3	g/cm3	%	mm/min	mm/min		g/cm3	%	mm/min	mm/min		
PQL		1	1	1	1	1	0.01	0.01	0.1	0.001	0.001		0.01	0.1	0.001	0.001		
<i>Size (mm)</i>		<0.02	0.02-0.6	0.6-2	2-60	>60	-											
NA_01	27/09/2018	6	2	71	21	<1	2.61	1.69	59.3	26	0.6	Clear	1.57	57.9	11.4	0.067	Clear	
NA_02	27/09/2018	Not enough sample for analysis																
NA_03	27/09/2018	2	2	84	12	<1	2.68	1.69	74	58.2	58.2	Clear	1.66	75.4	24.6	24.6	Clear	
NA_04	27/09/2018	<1	1	78	21	<1	2.67	1.83	78	57.8	57.8	Clear	2.03	82.2	25.4	25.4	Clear	
Mean		4	2	78	18	<1	2.65	1.74	70.43	47.33	38.87	Clear	1.75	71.83	20.47	16.69	Clear	

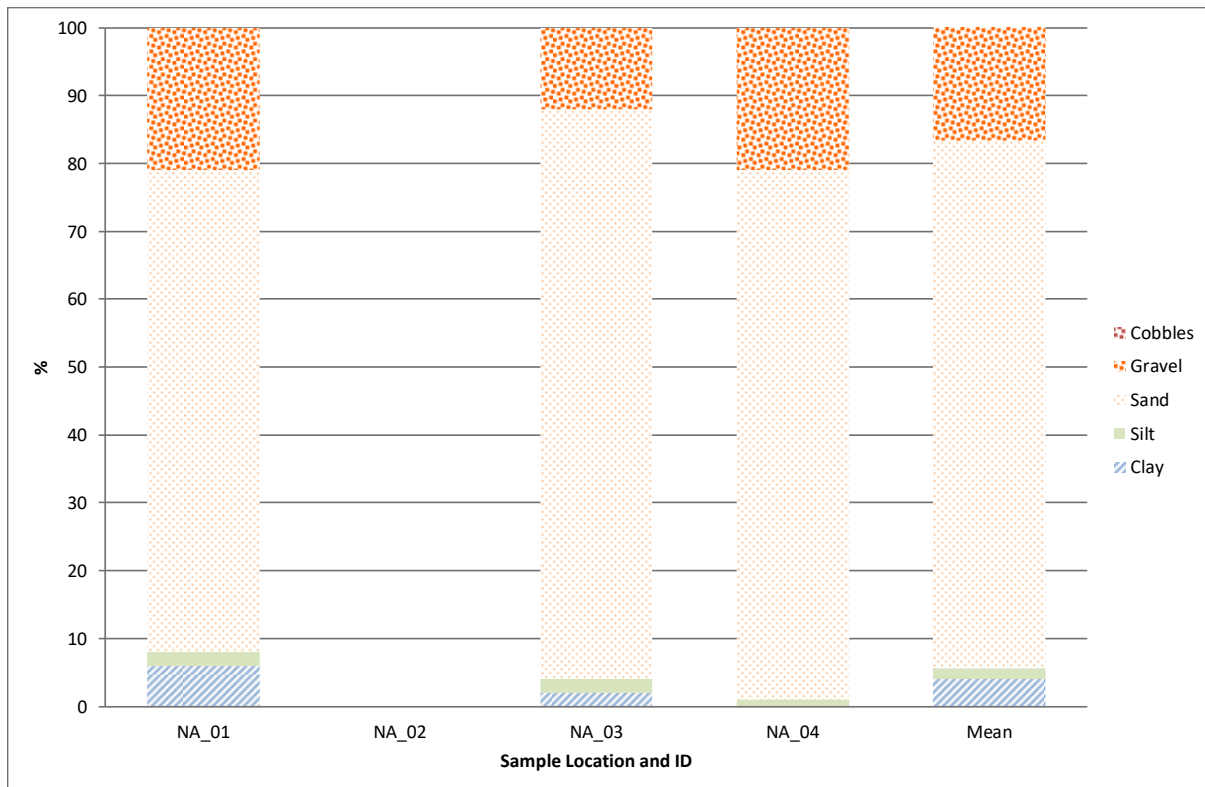


Figure 3-2 Particle size distribution of sediments in NA samples

3.2.2 Chemical characteristics

The results of chemical analyses (dry weight) for sediments in NA are summarised below. This summary includes a comparison against screening levels in Table 2, Appendix A of the NAGD. A tabulated summary of the chemical analysis is provided in Table 3-4. Primary laboratory reports are provided in Attachment C.

3.2.2.1 Metals and Metalloids

Metals and metalloid concentrations were below the respective NAGD Screening Level for all NA samples.

3.2.2.2 Organotins

All organotin compounds were less than the laboratory LORs, therefore concentrations of TBT are below the NAGD screening level of 9µgSn/kg.

3.2.2.3 TPH, TRH and BTEX

Concentrations of TPH and TRH were detected in most NA samples. However, only total TPH can be compared to a NAGD screening level of 500mg/kg. Concentrations of TPH in all samples collected were below the NAGD screening level.

Concentrations of BTEX in all NA samples analysed were below the LOR.

3.2.2.4 PAH

Concentrations of PAHs were detected in all NA samples, however, when normalised, summed and the 95%UCL calculated, these are below the NAGD screening criteria of 10,000µg/kg for total PAH.

3.2.2.5 Organochloride pesticides

Concentrations of OCPs in all NA samples analysed were below the LOR and therefore below the NAGD screening levels for the various OCP compounds.

Table 3-4: Summary of chemical analysis results for NA

Sample ID	Units	PQL	NAGD PQL	NAGD Screening Level	NA_01	NA_02	NA_03	NA_04	Mean/ Geomean	Standard Deviation	95% UCL	Normal (N) Log-normal (L) Neither (X)
					26/09/18	28/09/18	28/09/18	28/09/18				
Misc												
% Moisture	%	1	0.1	-	18.5	21.4	14.2	14.9	17.3	3.3		
Total Organic Carbon	%	0.02	0.1	-	0.28	0.29	0.25	0.18	0.3	0.0		
Metals and Metalloids												
Arsenic, As	mg/kg	1	1	20 (30)	4.88	7.2	9.04	11.5	8.2	2.8	11.5	N
Cadmium, Cd	mg/kg	0.1	0.1	1.5	<0.1	<0.1	<0.1	<0.1				
Chromium, Cr	mg/kg	1	1	80	6	4	3	4	4.3	1.3	5.7	N
Copper, Cu	mg/kg	1	1	65	2.4	1.8	1.4	1.5	1.8	0.5	2.3	N
Lead, Pb	mg/kg	1	1	50	3.5	3.1	2.4	3.2	3.1	0.5	3.6	N
Mercury, Hg	mg/kg	0.01	0.01	0.15	<0.01	<0.01	<0.01	<0.01				
Nickel, Ni	mg/kg	1	1	21	2.8	2	1.4	1.9	2.0	0.6	2.7	N
Zinc, Zn	mg/kg	1	1	200	8.9	6.1	4.8	5.8	6.4	1.8	8.5	N
Organotins												
Monobutyltin	µg Sn/kg	1	1	-	<1	<1	<1	<1				
Dibutyltin	µgSn/kg	1	1	-	<1	<1	<1	<1				
Tributyltin	µg Sn/kg	0.5	1		<0.5	<0.5	<0.5	<0.5				
TPH												
TPH C6-C9	mg/kg		10	-	<3	<3	<3	<3				
TPH C10-14	mg/kg		10	-	<3	8	<3	<3	8.0		6.9	N
TPH C15-28	mg/kg		50	-	4	29	3	4	10.0	12.7	24.9	N
TPH C29-36	mg/kg		50	-	<5	18	<5	5	11.5	9.2	15.7	N
Total TPH	mg/kg			550	4	55	3	9	17.8	25.0	47.1	N
TRH												
C6 - C10 Fraction	mg/kg	3			<3	<3	<3	<3				
C6 - C10 Fraction - BTEX	mg/kg	3			<3.0	<3.0	<3.0	<3.0				
>C10 - C16 Fraction	mg/kg	3			<3	8	<3	<3	8.0		6.9	N
>C16 - C34 Fraction	mg/kg	3			6	41	6	6	14.8	17.5	35.3	N
>C34 - C40 Fraction	mg/kg	5			<5	13	5	6	8.0	4.4	11.9	N
>C10 - C40 Fraction (sum)	mg/kg	3			6	62	11	12	22.8	26.3	53.7	N
>C10 - C16 Fraction- Naphthalene	mg/kg	3			<3	8	<3	<3	8.0		6.9	N
BTEXN												
Benzene	mg/kg	0.2			<0.2	<0.2	<0.2	<0.2				
Toluene	mg/kg	0.2			<0.2	<0.2	<0.2	<0.2				
Ethylbenzene	mg/kg	0.2			<0.2	<0.2	<0.2	<0.2				
meta- & para-Xylene	mg/kg	0.2			<0.2	<0.2	<0.2	<0.2				
ortho-Xylene	mg/kg	0.2			<0.2	<0.2	<0.2	<0.2				
Total Xylenes	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5				
Sum of BTEX	mg/kg	0.2	200	-	<0.2	<0.2	<0.2	<0.2				
Naphthalene	mg/kg	0.2			<0.2	<0.2	<0.2	<0.2				
PAH												
Naphthalene	µg/kg	5	5	-	<5	<5	<5	<5				
2-Methylnaphthalene	µg/kg	5	5	-	<5	<5	<5	<5				
Acenaphthylene	µg/kg	4	5	-	<4	<4	<4	<4				
Acenaphthene	µg/kg	4	5	-	<4	<4	<4	<4				
Fluorene	µg/kg	4	5	-	<4	<4	<4	<4				
Phenanthrene	µg/kg	4	5	-	<4	<4	<4	<4				

Sample ID	Units	PQL	NAGD PQL	NAGD Screening Level	NA_01	NA_02	NA_03	NA_04	Mean/ Geomean	Standard Deviation	95% UCL	Normal (N) Log-normal (L) Neither (X)
Date Sampled					27/09/18	27/09/18	27/09/18	27/09/18				
PAH												
Anthracene	µg/kg	4	5	-	<4	<4	<4	<4				
Fluoranthene	µg/kg	4	5	-	<4	<4	<4	<4				
Pyrene	µg/kg	4	5	-	<4	<4	<4	<4				
Benz(a)anthracene	µg/kg	4	5	-	<4	<4	<4	<4				
Chrysene	µg/kg	4	5	-	<4	<4	<4	<4				
Benzo(b+j)fluoranthene	µg/kg	4	5	-	<4	<4	<4	<4				
Benzo(k)fluoranthene	µg/kg	4	5	-	<4	<4	<4	<4				
Benzo(e)pyrene	µg/kg	4	5	-	<4	<4	<4	<4				
Benzo(a)pyrene	µg/kg	4	5	-	<4	<4	<4	<4				
Perylene	µg/kg	4	5	-	<4	<4	<4	<4				
Benzo(g,h,i)perylene	µg/kg	4	5	-	<4	<4	<4	<4				
Dibenz(a,h)anthracene	µg/kg	4	5	-	<4	<4	<4	<4				
Indeno(1.2.3.cd)pyrene	µg/kg	4	5	-	<4	<4	<4	<4				
Coronene	µg/kg	5	5	-	<5	<5	<5	<5				
Sum of PAHs	µg/kg	4	100	10000	<4	<4	<4	<4				
Organochloride pesticides												
Aldrin	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
alpha-BHC	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
beta-BHC	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
delta-BHC	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
4,4'-DDD	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
4,4'-DDE	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
4,4'-DDT	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Sum of DDD + DDE + DDT	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Dieldrin	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
alpha-Endosulfan	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
beta-Endosulfan	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Endosulfan sulfate	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Endosulfan (sum)	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Endrin	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Endrin aldehyde	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Endrin ketone	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Heptachlor	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Heptachlor epoxide	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Hexachlorobenzene (HCB)	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
gamma-BHC	µg/kg	0.25			<0.25	<0.25	<0.25	<0.25				
Methoxychlor	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
cis-Chlordane	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
trans-Chlordane	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Total Chlordane (sum)	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Oxychlordane	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				
Sum of Aldrin + Dieldrin	µg/kg	0.5			<0.50	<0.50	<0.50	<0.50				

Notes	
Note	When calculating averages and 95%UCLs, values below detection for individual sample results were set to half the detection levels (consistent with the NAGD).
PQL	Practical Quantitation Limit
Sample ID	Sample location numbers
ND	Insufficient data
-	No guidelines levels (i.e. Screening or Maximum Levels) set in NAGD for given parameter, or no analysis undertaken for a given sample
	Value exceeds NAGD or agreed local screening level
<i>Normalised to % TOC</i>	Normalised to % TOC, over the range of TOC from 0.2 to 10%
	Not tested

4 Data validation

This section examines the validity of the analytical data obtained in the study in order to provide confidence in the results presented.

4.1 Field replicates

No Relative Standard Deviation (RSD) exceedances were recorded. The results of this analysis are presented in Table 4-1.

4.2 Field split triplicate

Fourteen Relative Percentage Difference (RPD) exceedances were recorded; six metals, one TOC, two TRH and five PAH. The six metal RPD exceedances were recorded for samples analysed by SGS. For each metal, the SGS concentrations were less than those detected by ALS. This may be associated with more aggressive acid extraction methods at ALS. The single TOC and two TRH values are associated with low concentrations close to the LOR.

The RPD values for PAHs indicate variability; however, as the total PAH concentrations were below the NAGD Screening Levels these exceedances are not considered to impact data quality.



Table 4-1: Field split triplicate and field triplicate RSD results

Sample ID	Phase II																																			
	% Moisture	Total Organic Carbon	Arsenic, As	Cadmium, Cd	Chromium, Cr	Copper, Cu	Lead, Pb	Mercury, Hg	Nickel, Ni	Zinc, Zn	Monobutyltin - Phase II	Dibutyltin - Phase II	Tributyltin - Phase II	TPH C6-C9	TPH C10-14	TPH C15-28	TPH C29-36	Total TPH	C6 - C10 Fraction	C6 - C10 Fraction - BTEX	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	>C10 - C16 Fraction-Naphthalene	TRH C37-C40	Benzene (F0)	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Sum of BTEX			
Field Triplicate																																				
OP2_38 (0-0.5) T1	31.4	0.4	5.5	<0.1	14.6	11.9	12.8	0.01	8.4	37.2	<1	1	1.5																							
OP2_38 (0-0.5) T2	30.4	0.64	4.67	<0.1	13.1	11.1	7.7	0.01	7.4	30.1	<1	2	4.4																							
OP2_38 (0-0.5) T3	35.8	0.49	4.79	<0.1	12.8	9.7	7.1	0.01	7.2	27.3	<1	1	3.3																							
RSD	9%	24%	9%	ND	7%	10%	34%	0%	8%	16%	ND	43%	48%																							
Split replicate																																				
OP2_33 (0-0.5)	59.7	0.56	6.72	<0.1	18.6	23.1	11.4	0.02	10.5	47.2	<1	<1	<0.5	<3	<3	5	6	11	<3	<3.0	<3	10	<5	10	<3	NT	NT	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
D7	60	0.51	7.46	<0.1	20	29.5	11.1	0.02	11.3	54.3	<1	<1	<0.5	<3	<3	<3	<5	<3	<3	<3.0	<3	4	<5	4	<3	NT	NT	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
RPD	1%	9%	10%	ND	7%	24%	3%	0.00	7%	14%	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	86%	ND	86%	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
D8	63	1.2	2	<0.3	3.1	11	6	<0.05	2.2	18	NT	NT	<0.1	<20	<20	<45	<45	<110	<25	<25	<25	<90	<120	<210	<25	<100	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.6		
RPD	5%	73%	108%	ND	143%	71%	62%	ND	131%	90%	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Sample ID	Total Xylenes	Naphthalene	Naphthalene	2-Methylnaphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b+g)fluoranthene	Benzo(k)fluoranthene	Benzo(e)pyrene	Benzo(a)pyrene	Perylene	Benzo(g,h,i)perylene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Coronene	Sum of PAHs	Total PAH (NEPM/WHO 16)	Carcinogenic PAHs, BaP TEQ <LOR=0	Carcinogenic PAHs, BaP TEQ <LOR=LOR	Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	1-methylnaphthalene	Aldrin	alpha-BHC	beta-BHC	delta-BHC	4,4'-DDD			
Field Triplicate																																				
OP2_38 (0-0.5) T1																																				
OP2_38 (0-0.5) T2																																				
OP2_38 (0-0.5) T3																																				
RSD																																				
Split replicate																																				
OP2_33 (0-0.5)	<0.5	<0.2	<5	<5	<4	<4	<4	12	<4	37	38	25	22	26	15	15	26	9	16	4	15	<5	260	NT	NT	NT	NT	NT	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50		
D7	<0.5	<0.2	<5	<5	6	<4	<4	16	5	67	58	36	30	28	12	20	36	12	23	5	20	6	380	NT	NT	NT	NT	NT	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50		
RPD	ND	ND	ND	ND	ND	ND	ND	29%	ND	58%	42%	36%	31%	7%	22%	29%	32%	29%	36%	22%	29%	ND	38%	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
D8	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NT	<0.1	NT	<0.1	<0.1	<0.1	NT	<0.8	<0.8	<0.2	<0.3	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	NT			
RPD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Notes																																				
Relative percent difference (RPD) or relative standard deviation (RSD) outside suggested NAGD data validation level.																																				
ND Not Determinable																																				
NT Not Tested																																				

4.3 Laboratory analysis

A summary of the laboratory QA/QC analysis is summarised in Table 4-2.

Table 4-2 QA/QC laboratory outlier summary table

QA/QC Method	Laboratory Outliers	Comments
Laboratory control spikes (LCS)	ALS (EB1823888): Outliers (recoveries greater than the upper control limit (36-128%)) were reported for MBT in ALS sample QC-2049812-002	These exceedances suggest a high bias in MBT, however, MBT concentrations in primary samples were all below the respective laboratory LOR (except in OP2_44 (0.5-1.0)) therefore these outliers are not considered to impact data quality.
	ALS (EB1828261): None	
	ALS (EB1826955): None	
	ALS (EB1828216): None	
	ALS (EB1828853): None	
	SGS (SE184870) DDT in sample LB158638	This exceedance does impact data quality as MB and MS are within acceptance ranges.
Laboratory Duplicates	ALS (EB1823470): None	
	ALS (EB1823888): Pb and Zn outliers greater than the laboratory acceptable range (0-20%) and the NAGD's RPD acceptable range of $\pm 30-35$ per cent for duplicate samples OP2_44 (0-0.5) and OP2_36 (0.5-1.0)	These outliers indicate variation in concentrations, however as there are no MB or LCS outliers and primary concentrations are below the NAGD Screening Levels these outliers do not impact data quality.
	ALS (EB1826955): RPD for Zn exceeds the LOR based limits.	This outlier indicates variation in concentrations. This is confirmed by the primary analysis. As all concentrations were above the NAGD Screening Level this outlier does not impact data quality.
	ALS (EB1828216): None	
	ALS (EB1828261): None	
	ALS (EB1828853): None	
	SGS (SE184870) As, Ni, Pb outliers exist for SGS sample LB158641.007	These outliers indicate variation in concentrations, however as there are no MB or LCS outliers and primary concentrations are below the NAGD Screening Levels these outliers do not impact data quality.

QA/QC Method	Laboratory Outliers	Comments
Matrix Spikes (MS)	ALS (EB1823888): MS outliers recorded for MBT in D7 and MBT, DBT and TBT in OP2_44 (0.5-1.0) MS outliers were recorded for MBT in OP2_42 (0.5-1.0)	MS recoveries less than the lower data quality objectives for MBT and could not be determined for DBT and TBT as background concentrations were greater than 4x the spike level. However, as MB and LCS were within acceptable limits these MS outliers do not impact data quality.
	ALS (EB1826955): None	
	ALS (EB1828216): None	
	ALS (EB1828261): None	
	ALS (EB1828853): None	
	SGS (SE184870) MS outliers recorded for dieldrin, TPH, TRH and m/p-xylene in sample LB158638	As MB, LCS samples were within the acceptable range these MS outliers do not impact data quality.
Surrogate Spikes	ALS (EB1828261): Surrogates outliers for organotins occurred for NA_04. The outliers were greater than the laboratory criteria (55-135%).	Surrogate recoveries greater than the acceptance criteria suggest concentrations of organotins are estimations with a high bias. However, as primary concentrations were below the laboratory LOR or below the NAGD Screening Level in all primary samples these outliers do not impact data quality.
	ALS (EB1823888): None	
	ALS (EB1826955): None	
	ALS (EB1828216): Recovery greater than the upper data quality objective for Elutriate Blank 2	This indicates organotins are estimations with a high bias. However, as the concentration of TBT in the elutriate blank were below the laboratory LOR this outlier does not impact data quality.
	ALS (EB1828261): Outlier greater than the upper data quality objective for organotins in NA_04	This indicates organotins are estimations with a high bias. However, as primary concentrations were below the laboratory LOR in all primary samples these outliers do not impact data quality.
	ALS (EB1828853): None SGS (SE184870): None	
Holding times	ALS (EB1823888): Exceedances occurred for moisture content, TOC, Hg, TRH, TPH, BTEXN, organotins, OCP and PAHs for OP2_42 (0-0.5), (0.5-1.0), (1.0-1.5).	The primary concentrations for all these analytes are below the NAGD Screening Levels and consistent with concentrations for other samples therefore not considered to impact data quality or the outcome of this assessment.

QA/QC Method	Laboratory Outliers	Comments
	ALS (EB1826955): Exceedances occurred for moisture content in OP2_18 (0-0.5)	As the moisture content for this analysis is comparable to moisture content in the original analysis in EB1823888 this outlier does not impact data quality.
	ALS (EB1828216): Exceedances occurred for organotins, non-volatiles in elutriate and moisture content.	As the laboratory refrigerate samples during storage it is unlikely that organotins, moisture content or non-volatile concentrations were impacted due to extended holding times. This exceedance is considered not to impact data quality.
	ALS (EB1828261): Exceedances occurred for moisture content, TOC, metals, TPH, TRH, BTEXN, organotins, OCP, PAH in all NA samples	The primary concentrations for all these analytes are below the LOR or NAGD Screening Levels these outliers do not impact data quality or the outcome of this assessment.
	ALS (EB1828853): None	
	SGS (SE184870): None	
Frequency of quality control samples	ALS (EB1823888): None	
	ALS (EB1828216): Outliers exist for MS in organotin compounds.	As no method blanks, LCS or MS exist this outlier does not impact data quality
	ALS (EB1828261): outliers existing for laboratory duplicates and MS.	As no method blanks, LCS or MS exist this outlier does not impact data quality
	ALS (EB1826955): Exceedances for metals and organotins	As this workorder was a request for the analysis of two samples it does not impact data quality.
	ALS (EB1828853): None	

4.4 Outliers

Outliers are identified when individual sample concentrations exceed two standard deviations (NAGD, 2009). Where concentrations (or normalised concentrations) were above the Screening Levels, the stored portion of the sample was reanalysed (labelled R1, R2 and R3) in triplicate, and if the original result was not confirmed, it was discarded (TBT only) in favour of the mean of the triplicates. Where the parameter was something other than TBT (i.e. Zn), the original result was retained and included in the mean of the triplicate analysis.

Outliers and concentrations identified above the Screening Levels, the associated initial concentration and concentrations of the reanalysis are provided in Table 4-3.



Table 4-3: Outliers

Sample ID	Analyte	Units	Outlier assessment						Phase 2 triplicate reanalysis result						Phase 3 analysis		
			Mean	Initial SD	2 x SD greater than the mean	Original concentration	Original normalised concentration	Original result outlier?	Repeat 1	Repeat 2	Repeat 3	Average	Average result outlier?	Normalised value	Note	Elutriate (Tributyltin) Initial dilution	Elutriate (Tributyltin) 25 times dilution
Guideline						9	9		9	9	9	9		9		6	6
OP2_44 (0.5-1.0)	TBT	µgSn/kg	13.86	38.69	77.39	148	185.0	Yes	90.9	121	106	105.97	Yes	132.5	This value raises the 95%UCL value of the dataset above guidelines	125.00	5.00
OP2_36 (1.0-1.5)	TBT	µgSn/kg	13.86	38.69	77.39	11.4	19.3	No	1.3	1.3	1.4	1.33	No	2.26		-	-
OP2_36 (0.5-1.0)	TBT	µgSn/kg	13.86	38.69	77.39	3.4	9.4	No	1.3	1.2	1.3	1.27	No	3.53		<2	<2
OP2_42 / 0.0-0.5	TBT	µgSn/kg	13.86	38.69	77.39	6	25.0	No	2.5	5.3	2.9	3.57	No	14.9	This value raises the 95%UCL value of the dataset above guidelines	<2	<2
Guideline						200			200	200	200	200					
OP2_18 (0-0.5)	Zinc	mg/kg	53.90	45.83	91.65	223.0	-	Yes	581	145	468	354.25	Yes	-	Original value retained	<5	<5
Orange highlighting indicates value exceeding NAGD Screening Level																	

5 Conclusion

The following conclusions are drawn from the sediment characterisation assessment described within this memorandum:

- Concentrations and / or 95% UCL of the mean of all chemical contaminants in OP2 are below the respective NAGD screening criteria except for TBT in OP2_42 / 0.0-0.5 and OP2_44 (0.5-1.0)
- As per Phase III laboratory analysis for OP2 samples, the TBT concentrations in elutriates are below the ANZG 95% species protection guideline of 6ngSn/L when a conservative bulk dilution factor of 25 is applied
- Concentrations and / or 95% UCL of the mean of all chemical contaminants in the four NA samples are below the respective NAGD screening criteria.

As per the NAGD assessment framework, it is considered that the sediments to be dredged from NA and Port of Mackay OP2 are suitable for unconfined ocean placement in the DMPA.

In accordance with Section 4.2.1 of the NAGD, the typical validity period for Phase II and Phase III results is five years. This means that, depending on other activities at the port, the results from this assessment may be valid until 26 September 2023.

6 References

Australian and New Zealand Governments (ANZG), 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.

Commonwealth of Australia (2009) National Assessment Guidelines for Dredging. Commonwealth of Australia, Canberra.

Ports and Coastal Environmental Pty Ltd (PaCE), 2013. Port of Hay Point Sediment Characterisation Report 2013 (Document number 2012001-001). Ormeau, PaCE.

WorleyParsons, 2010. NQBP Mackay Harbour and Spoil Ground 2009 Sediment Characterisation Report, document number 301001-00797-00-EN-REP-0001

WorleyParsons, 2010. North Queensland Bulk Ports (NQBP) Long Term Dredge Management Plan (LTDMP) Mackay Port 2010-2020, document number 301001-00797-00-EN-REP-0003 (WorleyParsons, 2010)

USEPA (2016). ProUCL: Statistical Support Software for Site Investigation and Evaluation, developed by USEPA and available online at: https://www.epa.gov/sites/production/files/2015-03/documents/proucl_one_page_fact_sheet.final_.pdf

Attachment A: Sampling Analysis Plan

Memorandum

To:	Damian Snell	Date:	26/09/2018
CC:	Steve Neale Nicholas Bainton Bill Boylson	From:	Alex Kochnieff
Doc No:	301001-02095-EN-00-MEM-001 Rev 0 – Issued for use	File Loc:	G:\301001\02095 PROJ - Port of Mackay Sediment Investigation\10.0 Engineering\10 EN-Environmental\SAP\SAP2_Tech Memo \Rev0
Subject:	Port of Mackay – Sampling Analysis Plan for additional areas and geotechnical testing for Beneficial Reuse Assessment	Project:	301001-02095

1 Introduction

Advisian has been commissioned by North Queensland Bulk Ports (NQBP) to undertake a sediment sampling and characterisation assessment within the Port of Mackay (the Port) to inform and support future maintenance dredging at Mackay. This is comprised of three components:

- 1) A contaminants assessment in accordance with NQBP's ten-year Sea Dumping Approval (2012-2022) and an associated and approved Long Term Dredge Management Plan (LTDMP) completed by WorleyParsons in 2010. This incorporates sampling at the channel and swing basin, berth pockets, tug berth incorporating Operational Area 1, Dredge Material Placement Area (DMPA) and reference sites. The field methodology for this assessment is described separately in the *Port of Mackay: Maintenance Dredging Sediment Analysis Plan (SAP)*, document number 301001-02095-00-EN-PLN-0001 (i.e. SAP 1).
- 2) An additional contaminants assessment to support future potential dredging at Operational Area 2 (i.e. new tug berths) and a new channel approach as described in this document.
- 3) A geotechnical properties assessment of sediments in all existing and proposed dredge areas (except for the new approach channel) to support a Beneficial Reuse Assessment (BRA) to appropriately identify and classify the materials for consideration of potential reuse options. This forms part of a long-term strategic assessment for ongoing management of marine sediments at the Port, known as the *Port of Mackay - Sustainable Sediment Management (SSM) Assessment for Navigational Maintenance* and is described in this document.

Field sampling for all three components will be undertaken concurrently, however, the methodology for the contaminants assessment in accordance with the Sea Dumping Approval and LTDMP is described separately in the *Port of Mackay: Maintenance Dredging Sediment Analysis Plan (SAP)*, document number 301001-02095-00-EN-PLN-0001 (i.e. SAP 1). The methodology for the additional contaminants and geotechnical properties assessment is described in this technical memorandum (i.e. SAP 2).

This SAP has been developed in accordance with the NAGD (Commonwealth of Australia, 2009) to support Phase II, and if required, Phase III contaminant assessments. Although this is not a requirement as this scope of work will not be assessed by the determining authority (i.e. Great Barrier Reef Marine Park Authority (GBRMPA) or the Commonwealth Department of Environment (DoE)), the contaminant assessment may be used by NQBP to support an amendment to their Sea Dumping Approval to allow dredging of Operational Area 2 and the New Approach.

1.1 Objective

The objective of this SAP technical memorandum are as follows:

- Ensure sampling is undertaken consistent with SAP 1, good industry practice and the NAGD, 2009
- Achieve high quality laboratory analysis results incorporating appropriate Quality Assurance (QA) / Quality Control (QC) through use of recognised and NATA accredited analytical laboratories with expertise in marine sediment quality assessment applicable to dredge material management
- Ensure data from sampling is accurately reported, summarised, analysed and stored safely to provide confidence in the efficacy of the sediment sampling, handling, testing, analysis and reporting sufficient to determine the suitability of the dredge material for placement of sediments and understanding the geotechnical properties of sediment to inform the BRA.

1.2 Scope

- Identify contaminants required for analysis based on potential contaminant sources
- Determine the location and number of samples required to provide an adequate dataset for calculating the upper 95 percentile confidence limit (95% UCL) of the mean to compare to screening levels of contaminants
- Define the types of analysis required for sediments
- Identify and describe industry good practice field sampling protocols (i.e. collection and handling) to ensure sampling is undertaken to gain a representative understanding of the material
- Identify and describe appropriate QA/QC procedures for sample collection, handling and laboratory analysis in accordance with NAGD, 2009 to ensure high quality laboratory analysis results are achieved.
- Present the reporting framework for the presentation of data, results and conclusions to address the needs of NQBP and the BRA.

2 Contamination Assessment

2.1 Contaminant Sampling Locations

The number of sampling locations is based on the anticipated dredge volumes for each dredge area in accordance with Appendix A of the NAGD, 2009. The estimated dredge volume is known for Operational Area 2; however, it is unknown for the proposed new approach. As such, nine sampling locations, in accordance with the NAGD, are proposed for Operational Area 2, while four locations are proposed for the New Approach. Four locations are considered adequate to provide a preliminary indication of potential contamination. The number of locations are provided in Table 1 and presented on Figure 1 and Figure 2.

Note that a single surface grab (i.e. H-11) was collected within Operational Area 2 by WorleyParsons in 2010. The results for this sample indicated there was minor concentrations of Tributyl-tin (TBT) ($0.6 \mu\text{gSn/kg}$ and $0.8 \mu\text{gSn/kg}$ normalised to % Total Organic Carbon (TOC)). This is below the NAGD screening level of $9 \mu\text{gSn/kg}$ for TBT.





Table 1: Number of sampling locations

Dredge Area	Estimated Maximum Dredge Volume ²	Sampling locations required as per NADG (2009)	Number of grid squares	Sampling locations with currency from previous work	Number of sampling locations
Operational Area 2	27,000	9	45	No	9
Northern Approach	unknown	N/A	N/A	No	4
Total					13

Port of Mackay Sediment Investigation

Figure 1
Operational Area 2 stratified
sampling locations

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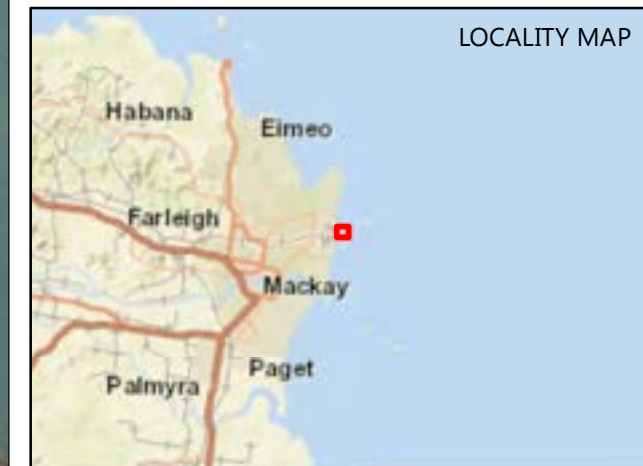
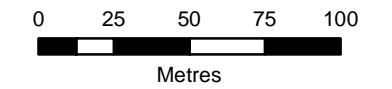
-  Sampling location
-  Sampling grid
-  Operational area 2 dredge area
-  Berths and operational areas

Source Information:
Port facility layout
Provided by NQBP - Sept 2018
Imagery - Aug 2017
Provided by NQBP - Sept 2018

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Coordinate System: GDA 1994 MGA Zone 55
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18/09/2018 Rev: A ISSUED FOR INFORMATION Org: KM Chk: NB

Port of Mackay Sediment Investigation

Figure 2 Proposed new approach sampling locations



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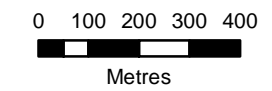
- Sampling location

Source Information:
 Port facility layout
 Provided by NQBP - Sept 2018
 New port approach
 Digitised from Figure 2: Proposed North-South channel footprint
 of the Mackay Improved Access Channel Rev 2 document
 supplied by NQBP
 Imagery - Web Service
 Dept of Natural Resources and Energy

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 18/09/2018 Rev: A ISSUED FOR INFORMATION Org: KM Chk: NB

2.2 Sampling methodology

Table 2 outlines the sampling methodology that will be adopted to obtain representative data for the assessment.

Table 2: Contamination assessment methodology

Activity	Details
Sampling vessel	The vessel (the 'Brynda') proposed to be used for sampling is commercially registered and licensed for operation within the study area.
Sample collection	<p>Samples will be collected using two methods: 1) a boat deployed piston corer and 2) a boat deployed grab sampler.</p> <p>Piston coring: A 2.2m piston corer will be used to collect sediment only from Operational Area 2. The piston corer is constructed of stainless steel, has an internal barrel length of 2.2m and an internal diameter of 62mm. The corer is lowered over the side of the vessel to the seabed via extension rod whereupon it is used to collect a sediment core to a depth of at least 2.2m (or refusal whichever occurs first) depending upon the sampling location and sediment material encountered. Once a sediment core has been collected, the piston corer is retrieved and the sediment core extruded into a plastic core tray for logging and processing.</p> <p>Grab Sampling: Sediment from all other locations will be collected with a Van-veen grab (0.25m³) deployed from the sampling vessel by hand. This method is described in SAP 1 (Advisian, 2018).</p>
Sediment logging	Sediment logging will be consistent with logging described in SAP 1 (Advisian, 2018)
Sediment sampling and storage	<p>Operational Area 2 (piston coring)</p> <p>Once logging is completed the core is split into half meter horizons (0.0-0.5m, 0.5-1.0m, 1.0-1.5m, 1.5-2.0m and 2.0-2.2m) and placed separately into stainless steel mixing bowls where sediments are homogenized using powderless nitrile gloves.</p> <p>All other locations (grab sampling)</p> <p>Grab samples will be placed directly into a stainless-steel mixing bowls for homogenization using powderless nitrile gloves.</p> <p>Homogenised sediment material is then placed into laboratory supplied 250 ml and 125 ml glass jars for chemical analysis leaving zero head space. Label information is completed on each sample container and the containers stored on ice in eskies.</p>
Decontamination	<p>Decontamination between samples included washing of all sampling equipment with ambient sea water and a laboratory grade detergent (Decon 90), and successive rinsing with deionised water.</p> <p>Note that separate decontamination procedures apply when PFAS analysis is required. These are described in SAP 1.</p>
Dispatch	All samples collected will be delivered to ALS Mackay daily. They will be stored in Mackay until all samples from SAP 2 area are collected and can be dispatched together. Note that samples from future proposed dredging areas will be separated from samples collected for existing dredge area (i.e. SAP1 areas). ALS Mackay will dispatch samples to ALS Brisbane for analysis. Split triplicate samples will be dispatched to SGS.

2.3 Contaminant laboratory analysis

Phase II sediment analysis will be consistent with the contaminants outlined in SAP 1 (Advisian, 2018). Detailed analytical summary and sampling numbers at each SAP 2 area is provided in Table 3.

Phase III analysis hold samples will include the collection of one additional 250ml jar at all locations. In addition, 40 litres of seawater from the DMPA will be obtained in the event further testing is needed. If samples are outside of holding times additional sediment sampling may be required.

Table 3: Sampling locations at proposed future dredging areas

Site	Grid ID / Sample Location ID	GPS ID	Horizon	Analysis										QA/QC		Containers		
				TOC and Moisture	Metals / Organotins	TPH/PAH	OCP	Radionuclides	PSD & settling rate	PFAS	ASS (Scr)	EC/Cl-/Soluble Salts/OM	Triplcate?	Dupli cate?	250ml Jars	Extra jars for potential elutriate, DAE analysis	Plastic jars (PFAS)	Zip lock Bags
OP2-1	OP2_42	OP2_01	0.0-0.5	1	1	1	1		1							2	1	2
OP2-1			0.5-1.0	1	1	1	1		1							2	1	2
OP2-1			1.0-1.5	1	1	1	1		1							2	1	2
OP2-1			1.5-2.0	1	1	1	1		1							2	1	2
OP2-1			2.0-2.5	1	1	1	1		1							2	1	2
OP2-2	OP2_44	OP2_02	0.0-0.5	1	1							1	1			2	1	2
OP2-2			0.5-1.0	1	1							1	1			2	1	2
OP2-2			1.0-1.5	1	1							1	1			2	1	2
OP2-2			1.5-2.0	1	1							1	1			2	1	2
OP2-2			2.0-2.5	1	1							1	1			2	1	2
OP2-3	OP2_45	OP2_03	0.0-0.5	1	1				1						2	1	2	
OP2-3			0.5-1.0	1	1				1						2	1	2	
OP2-3			1.0-1.5	1	1				1						2	1	2	
OP2-3			1.5-2.0	1	1				1						2	1	2	
OP2-3			2.0-2.5	1	1				1						2	1	2	
OP2-4	OP2_32	OP2_04	0.0-0.5	1	1	1	1								2	1	2	
OP2-4			0.5-1.0	1	1	1	1								2	1	2	
OP2-4			1.0-1.5	1	1	1	1								2	1	2	
OP2-5 T1	OP2_38	OP2_05	0.0-0.5	1	1				1						2	1	2	
OP2-5 T1			0.5-1.0	1	1				1						2	1	2	
OP2-5 T1			1.0-1.5	1	1				1						2	1	2	
OP2-5 T2			0.0-0.5	1	1									yes	2	1	1	
OP2-5 T2			0.5-1.0	1	1									yes	2	1	1	
OP2-5 T2			1.0-1.5	1	1									yes	2	1	1	
OP2-5 T3			0.0-0.5	1	1										2	1	1	
OP2-5 T3			0.5-1.0	1	1										2	1	1	
OP2-5 T3			1.0-1.5	1	1										2	1	1	
OP2-6	OP2_36	OP2_06	0.0-0.5	1	1				1						2	1	2	
OP2-6			0.5-1.0	1	1				1						2	1	2	
OP2-6			1.0-1.5	1	1				1						2	1	2	
OP2-7	OP2_33	OP2_07	0.0-0.5	1	1	1	1								2	1	2	
D7			0.0-0.5	1	1	1	1							yes	2	1	1	
D8			0.0-0.5	1	1	1	1								2	1	1	
OP2-8	OP2_21	OP2_08	0.0-0.5	1	1				1					2	1	2		
OP2-9	OP2_18	OP2_09	0.0-0.5	1	1						1	1		2	1	2		
NA1	NA_01	NA_01	0.0-0.1	1	1	1	1		1					2	1	2		
NA2	NA_02	NA_02	0.0-0.1	1	1	1	1		1					2	1	2		
NA3	NA_03	NA_03	0.0-0.1	1	1	1	1		1					2	1	2		
NA4	NA_04	NA_04	0.0-0.1	1	1	1	1		1					2	1	2		

NOTES:
 Triplicate samples Triplicate split sample OP2: Operational Area 2 NA: New Approach

2.4 Reporting

Reporting for the additional areas (i.e. Operational Area 2 and the New Approach) will be reported separately to the all other areas as a single factual technical memorandum. Other areas will be reported as a Sediment Characterisation Report in accordance with the Sea Dumping Approval and LTDMP. The factual technical memorandum will be generated following completion of the fieldwork and receipt of laboratory results. This will include:

- Introduction
- Mapping of sampling locations including any variations made to the SAP
- Summary data tables with colour-coded results for any parameters for which the Screening Levels are exceeded at the 95%UCL of the mean
- Comparison and interpretation of results
- Conclusions
- Appendices containing sampling data sheets, grab sheets and images, all laboratory reports and associated QAQC reporting.

A draft contamination assessment memorandum will be submitted to NQBP for review, and following receipt of comments, the memorandum will be finalised.

3 Geotechnical Assessment

The sediment geotechnical properties assessment will be completed concurrently with the sediment contaminants characterisation. This is described below.

3.1 Geotechnical sampling locations

Geotechnical samples will be collected and logged at a subset of the contaminant sampling locations. As such the sample collection methods are the same as those described in Table 2 above. The sampling locations are identified on Figure 3 and Table 4. The sample locations have been determined with consideration of the volume of dredge material, location and extent of dredge area and the type of material (and variability) previously encountered in these areas as described by Golder Associates (2013).

A phased approach will be undertaken as described in Section 3.2 to promote appropriate and cost-efficient testing, noting that due to the potentially high moisture content and fine nature of samples, material consolidation tests may extend beyond three weeks analysis time.

Table 4: Expected material type and proposed sample numbers

Dredge area	Indicative dredge volume (m ³)	Material type (Golder Associates, 2013)	Proposed sample numbers		
			Phase 1	Phase 2 Fine-grained	Phase 2 Coarse-grained
Channel and swing basin	80,000	Silty Clay to Sand	5	1	1
Berth pockets	27,000	Silty Clay to Clayey Silt	4	-	-
Tug berths	10,000	Sandy Clay to Sand	1	-	-
Operational Area 2	27,000	N/A	4	1	
Totals	144,000		14	2	1

3.2 Geotechnical laboratory analysis

Geotechnical samples will be dispatched to two separate laboratories specialising in geotechnical analysis. These include Trilabs and Wagners in Brisbane. The geotechnical analysis will be undertaken in two phases as follows:

Phase 1A

- Particle size distribution by sieve and hydrometer
- Field moisture content
- Carbonate content
- Particle density / specific gravity

Phase 1B

The following will be completed on all Phase 1A samples identified as having fines content (particles <0.075mm) greater than 12% (i.e. silt or clay)

- Atterberg limits and linear shrinkage

Phase 2

All Phase 1 samples will be retained for Phase 2 testing following review of initial results. The following tests will be completed depending on the results of the initial testing:

- Permeability
- 1-Dimensional consolidation (8 loadings)
- Minimum / maximum density
- Direct shear box (100mm, single stage)
- Consolidated isotropic undrained (CIU) triaxial test (3 stages)
- Standard compaction

Phase 1 and 2 sample analysis will be completed by Trilabs. Wagner will complete additional testing for potential cement re use options. This will consist of X-ray Diffraction and X-ray Fluorescence tests undertaken on an initial small number of samples (nominally two) as representative of the maintenance dredge material. This will improve the understanding of the material re-use options.

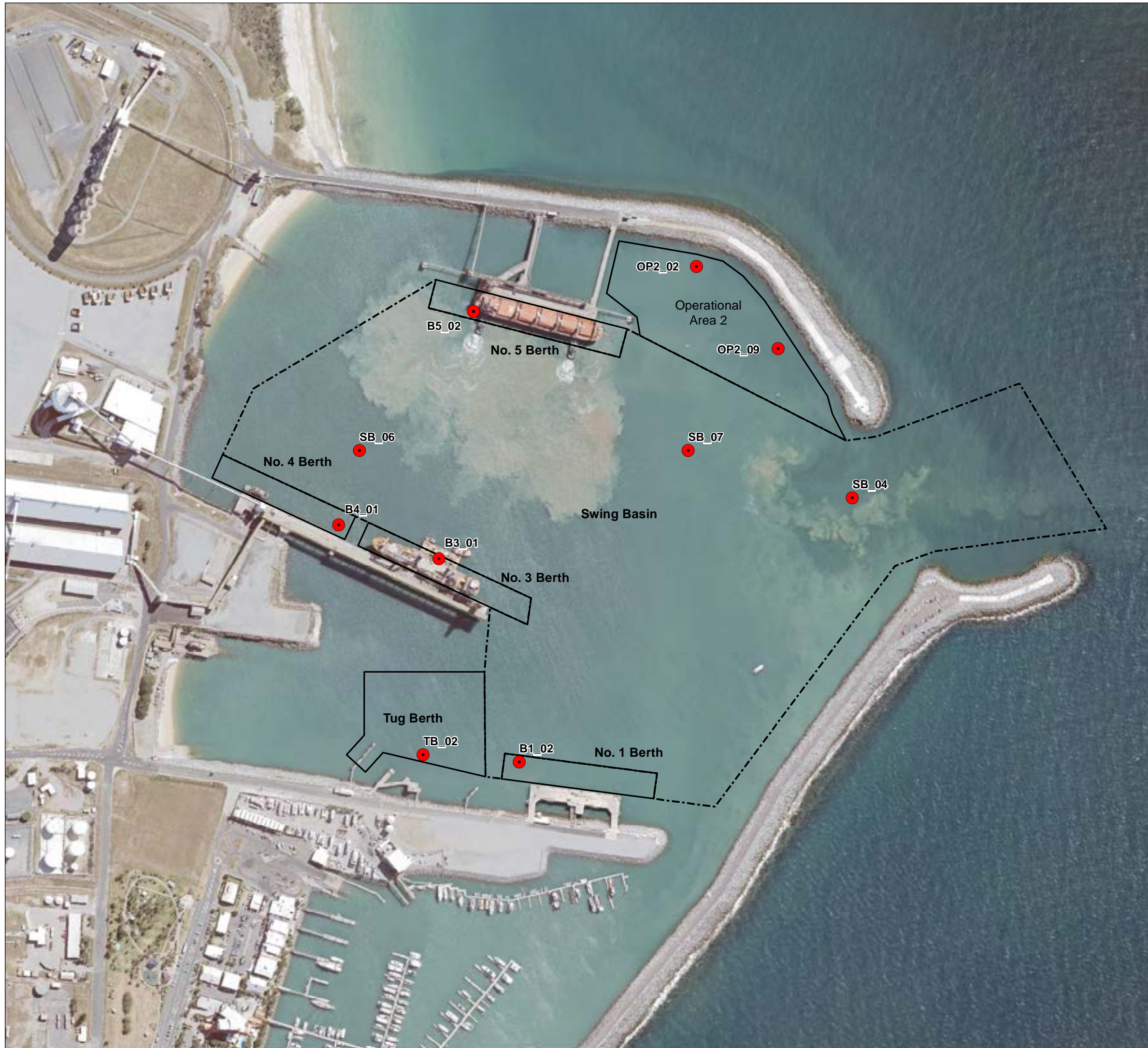
A defined quantity of sediment sampling and testing for the purposes of this investigation has been summarised in Table 5. Should field observation identify that varied sampling and analysis intensity should occur additional samples may be taken and laboratory testing authorisation sought from NQBP prior to execution.

Table 5: Geotechnical and cement laboratory testing

Test	Nominal sample number
Moisture content and Particle size distribution (sieve and hydrometer)	14
Carbonate content	14
Atterberg Limits and Linear Shrinkage	14
Particle Density (>2.36mm fraction, to be combined with <2.36mm fraction from hydrometer testing for total particle density)	14
Minimum/maximum density	2
Standard compaction	2
Constant Head Permeability	2
Falling Head Permeability	2
1D consolidation (8 loadings)	2
Direct shear box (100mm) – Single Stage	2
Consolidated isotropic undrained triaxial test – 3 Stage	2
Cement laboratory: X-ray Diffraction and X-ray Fluorescence tests	4

Port of Mackay Sediment Investigation

Figure 3 Geotechnical sampling locations



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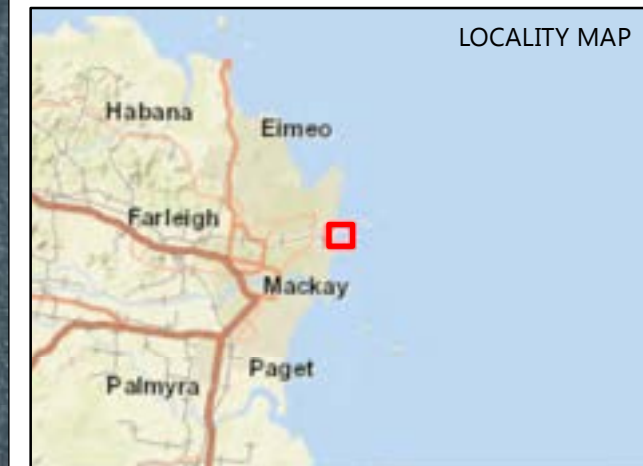
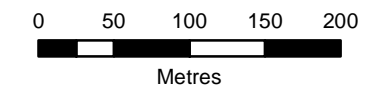
- Geotech sampling location
- Berths and operational areas
- Swing basin

Source Information:
 Port facility layout
 Provided by NQBP - Sept 2018
 Imagery - Aug 2017
 Provided by NQBP - Sept 2018

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4 Summary of sampling and analysis in all areas

In addition to the contaminant and geotechnical laboratory analysis, Acid Sulfate Soils (ASS) and nutrient parameters including Electrical Conductivity (EC), Chloride (Cl⁻), soluble salts (SS) and organic matter (OM) will be analysed at the same locations as geotechnical parameters. These analyses will inform the BRA.

A summary of all sampling locations for both SAP1 and SAP 2 are provided in Table 6.



Table 6: Sampling locations and laboratory analysis

SAP	Site	Grid ID / Sample Location ID	GPS ID	Horizon	Analysis								QA/QC		Containers						
					TOC and Moisture	Metals / Organotins	TPH/PAH	OCP	Radionuclides	PSD & settling rate	PFAS	ASS (S _{cr})	EC / Cl- / SS / OM	Triplicate?	Split Duplicates?	250ml Jars	Extra jars for potential elutriate, DAE analysis	Plastic jars (PFAS)	Zip lock Bags	Geotech bags (5kg bags)	
1	CSB-1 T1	SB_02	SB_01	0.0-0.5	1	1				1				yes		2	1		2		
1	CSB-1 T2			0.0-0.5	1	1					1						2			1	
1	CSB-1 T3			0.0-0.5	1	1						1						2			1
1	CSB-2	SB_16	SB_02	0.0-0.5	1	1				1						2	1		2		
1	CSB-3	SB_40	SB_03	0.0-0.5	1	1										2	1		2		
1	CSB-4	SB_45	SB_04	0.0-0.5	1	1				1	1	1	1			2	1	1	2	2	
1	CSB-5	SB_50	SB_05	0.0-0.5	1	1										2	1		2		
1	CSB-6	SB_52	SB_06	0.0-0.5	1	1				1		1	1			2	1		2	2	
1	CSB-7	SB_58	SB_07	0.0-0.5	1	1						1	1			2	1		2	2	
1	CSB-8	SB_79	SB_08	0.0-0.5	1	1				1				yes		2	1		2		
1	D1			0.0-0.5	1	1					1						2			1	
1	D2			0.0-0.5	1	1					1							2			1
1	BP-1 T1	B1_02	B1_01	0.0-0.5	1	1	1			1		1	1	yes		2	1		2	2	
1	BP-1 T2			0.0-0.5	1	1	1				1						2	1		1	
1	BP-1 T3			0.0-0.5	1	1	1				1						2	1		1	
1	BP-2	B1_07	B1_02	0.0-0.5	1	1	1									2	1		2		
1	BP-3	B3_14	B3_01	0.0-0.5	1	1	1			1		1	1			2	1		2	2	
1	BP-4	B4_01	B4_01	0.0-0.5	1	1	1			1		1	1			2	1		2	2	
1	BP-5	B5_08	B5_01	0.0-0.5	1	1	1					1	1			2	1		2	2	
1	BP-6	B5_10	B5_02	0.0-0.5	1	1	1			1	1			yes		2	1	1	2		
1	D3			0.0-0.5	1	1	1			1								2			1



SAP	Site	Grid ID / Sample Location ID	GPS ID	Horizon	Analysis									QA/QC		Containers				
					TOC and Moisture	Metals / Organotins	TPH/PAH	OCP	Radionuclides	PSD & settling rate	PFAS	ASS (S _{CR})	EC / Cl- / SS / OM	Triplicate?	Split Duplicates?	250ml Jars	Extra jars for potential elutriate, DAE analysis	Plastic jars (PFAS)	Zip lock Bags	Geotech bags (5kg bags)
1	D4			0.0-0.5	1	1	1				1					2			1	
1	TB-1	TB_02	TB_01	0.0-0.5	1	1	1	1	1	1							2		2	
1	TB-2 T1	TB_05	TB_02	0.0-0.5	1	1	1	1	1			1	1	yes		2	2		2	2
1	TB-2 T2			0.0-0.5	1	1	1	1	1							2	2		1	
1	TB-2 T3			0.0-0.5	1	1	1	1	1							2	2		1	
1	TB-3	TB_12	TB_03	0.0-0.5	1	1	1	1	1							2	2		2	
1	TB-4	TB_18	TB_04	0.0-0.5	1	1	1	1	1	1	1					2	2	1	2	
1	TB-5	TB_26	TB_05	0.0-0.5	1	1	1	1	1							2	2		2	
1	TB-6	TB_29	TB_06	0.0-0.5	1	1	1	1	1	1				yes		2	2		2	
1	D5			0.0-0.5	1	1	1	1	1	1					2			1		
1	D6			0.0-0.5	1	1	1	1	1	1					2			1		
1	REF-1	REF_01	REF_01	0.0-0.5	1	1	1			1	1					2	1		2	
1	REF-2	REF_02	REF_02	0.0-0.5	1	1	1			1						2	1		2	
1	REF-3	REF_03	REF_03	0.0-0.5	1	1	1			1						2	1		2	
1	DMPA-1 T1	SG_01	SG_01	0.0-0.5	1	1	1			1				yes		2	1		2	
1	DMPA-1 T2			0.0-0.5	1	1	1			1					2			1		
1	DMPA-1 T3			0.0-0.5	1	1	1			1					2			1		
1	DMPA-2	SG_02	SG_02	0.0-0.5	1	1	1			1	1					2	1	1	2	
1	DMPA-3	SG_03	SG_03	0.0-0.5	1	1	1			1						2	1		2	
1	H-3	H-3	H-3	0.0-0.5	1	1					1					2	2	1	2	
2	OP2-1	OP2_42	OP2_01	0.0-0.5	1	1	1	1		1						2	1		2	
2	OP2-1			0.5-1.0	1	1	1	1		1							2	1		2



SAP	Site	Grid ID / Sample Location ID	GPS ID	Horizon	Analysis									QA/QC		Containers					
					TOC and Moisture	Metals / Organotins	TPH/PAH	OCP	Radionuclides	PSD & settling rate	PFAS	ASS (S _{CR})	EC / Cl- / SS / OM	Triplicate?	Split Duplicates?	250ml Jars	Extra jars for potential elutriate, DAE analysis	Plastic jars (PFAS)	Zip lock Bags	Geotech bags (5kg bags)	
2	OP2-1			1.0-1.5	1	1	1	1		1						2	1		2		
2	OP2-1			1.5-2.0	1	1	1	1		1						2	1		2		
2	OP2-1			2.0-2.5	1	1	1	1		1						2	1		2		
2	OP2-2	OP2_44	OP2_02	0.0-0.5	1	1						1	1			2	1		2	2	
2	OP2-2			0.5-1.0	1	1							1	1			2	1		2	2
2	OP2-2			1.0-1.5	1	1							1	1			2	1		2	2
2	OP2-2			1.5-2.0	1	1							1	1			2	1		2	2
2	OP2-2			2.0-2.5	1	1						1	1			2	1		2	2	
2	OP2-3	OP2_45	OP2_03	0.0-0.5	1	1				1						2	1		2		
2	OP2-3			0.5-1.0	1	1					1						2	1		2	
2	OP2-3			1.0-1.5	1	1					1						2	1		2	
2	OP2-3			1.5-2.0	1	1					1						2	1		2	
2	OP2-3			2.0-2.5	1	1					1						2	1		2	
2	OP2-4	OP2_32	OP2_04	0.0-0.5	1	1	1	1								2	1		2		
2	OP2-4			0.5-1.0	1	1	1	1									2	1		2	
2	OP2-4			1.0-1.5	1	1	1	1									2	1		2	
2	OP2-5 T1	OP2_38	OP2_05	0.0-0.5	1	1				1				yes		2	1		2		
2	OP2-5 T1			0.5-1.0	1	1					1						2	1		2	
2	OP2-5 T1			1.0-1.5	1	1					1						2	1		2	
2	OP2-5 T2			0.0-0.5	1	1											2	1		1	
2	OP2-5 T2			0.5-1.0	1	1											2	1		1	
2	OP2-5 T2			1.0-1.5	1	1											2	1		1	





SAP	Site	Grid ID / Sample Location ID	GPS ID	Horizon	Analysis									QA/QC		Containers					
					TOC and Moisture	Metals / Organotins	TPH/PAH	OCP	Radionuclides	PSD & settling rate	PFAS	ASS (S _{CR})	EC / Cl- / SS / OM	Triplicate?	Split Duplicates?	250ml Jars	Extra jars for potential elutriate, DAE analysis	Plastic jars (PFAS)	Zip lock Bags	Geotech bags (5kg bags)	
2	OP2-5 T3			0.0-0.5	1	1										2	1		1		
2	OP2-5 T3			0.5-1.0	1	1										2	1		1		
2	OP2-5 T3			1.0-1.5	1	1										2	1		1		
2	OP2-6			0.0-0.5	1	1				1						2	1		2		
2	OP2-6	OP2_36	OP2_06	0.5-1.0	1	1				1						2	1		2		
2	OP2-6			1.0-1.5	1	1				1						2	1		2		
2	OP2-7			0.0-0.5	1	1	1	1								2	1		2		
2	D7	OP2_33	OP2_07	0.0-0.5	1	1	1	1						yes		2	1		1		
2	D8			0.0-0.5	1	1	1	1								2	1		1		
2	OP2-8	OP2_21	OP2_08	0.0-0.5	1	1				1						2	1		2		
2	OP2-9	OP2_18	OP2_09	0.0-0.5	1	1					1	1				2	1		2	2	
2	NA1	-	NA_01	0.0-0.1	1	1	1	1		1						2	1		2		
2	NA2	-	NA_02	0.0-0.1	1	1	1	1		1						2	1		2		
2	NA3	-	NA_03	0.0-0.1	1	1	1	1		1						2	1		2		
2	NA4	-	NA_04	0.0-0.1	1	1	1	1		1						2	1		2		
Rinsate blank						5															
Field blank (volatiles)							1														
40L of seawater																					



NOTES

Triplicate samples; Split Triplicate samples

CSB: Channel Swing Basin; BP: Berth Pockets; TB: Tug Berth; OP2: Operational Area 2; NA: New Approach

Attachment B: Field logs

General Location of Sampling		Port of Mackay – Northern Approach								
Site Number		NA_01								
Date/Sample Time		27/09/18								
Water Depth at Site		~18m								
Type of Core Sampler		Grab								
Depth Retained		0.1m								
Weather Conditions / Sea state		Fine, sunny / choppy								
Comments										
PSD (%)										
Gravel (21%)		Sand (71%)		Silt & Clay (8%)						
Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour	
0 – 0.1	Sand	Gravelly SAND	Moist	Dense	Coarse	NIL	5%	30%	Marine	
General Location of Sampling		Port of Mackay – Northern Approach								
Site Number		NA_02								
Date/Sample Time		27/09/18								
Water Depth at Site		~18m								
Type of Core Sampler		Grab								
Depth Retained		0.1m								
Weather Conditions / Sea state		Fine, sunny / choppy								
Comments										
PSD (%)										
No enough sample volume										
Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour	
0 – 0.1	Sand	Gravelly SAND	Moist	Dense	Coarse	NIL	10%	50%	Marine	

General Location of Sampling		Port of Mackay – Northern Approach								
Site Number		NA_03								
Date/Sample Time		27/09/18								
Water Depth at Site		~18m								
Type of Core Sampler		Grab								
Depth Retained		0.1m								
Weather Conditions / Sea state		Fine, sunny / choppy								
Comments										
PSD (%)										
Gravel (12%)		Sand (84%)		Silt & Clay (4%)						
Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour	
0 – 0.1	Sand	Gravelly SAND	Moist	Dense	Coarse	NIL	10%	30%	Marine	
General Location of Sampling		Port of Mackay – Northern Approach								
Site Number		NA_04								
Date/Sample Time		27/09/18								
Water Depth at Site		~18m								
Type of Core Sampler		Grab								
Depth Retained		0.1m								
Weather Conditions / Sea state		Fine, sunny / choppy								
Comments										
PSD (%)										
Gravel (21%)		Sand (78%)		Silt & Clay (1%)						
Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour	
0 – 0.1	Sand	Gravelly SAND	Moist	Dense	Large	NIL	10%	30%	Marine	

General Location of Sampling	Port of Mackay – Operational Area 2
Site Number	OP2_42
Date/Sample Time	27/09/18, 1430
Water Depth at Site	~9m
Type of Core Sampler	Piston core
Depth Retained	1.5m
Weather Conditions / sea state	Wind 4kts / glass
Comments	Refusal at 1.5m



PSD (%)			
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)
0 – 0.5	8	56	36
0.5 – 1.0	1	22	77
1.0 – 1.5	1	35	64

Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour
0 – 0.5	Grey	Silty sandy CLAY	Wet	Soft	Coarse	Low	5%	10%	Sulphur/marine
0.5 – 1.0	Grey	CLAY	Wet	Firm	Coarse	Moderate	NIL	<5%	Sulphur/marine
1.0 – 1.5	Grey	CLAY	Wet	Firm	Coarse	Moderate	NIL	<5%	Sulphur/marine
Refusal									

General Location of Sampling	Port of Mackay – Operational Area 2		
Site Number	OP2_33		
Date/Sample Time	28/09/18, 0715		
Water Depth at Site	~7m		
Type of Core Sampler	Piston core		
Depth Retained	0.5m		
Weather Conditions / sea state	Wind 8kts / glass		
Comments	Refusal at 0.5m		
PSD (%)			
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)
0 – 0.5	2	44	54
Strata Change (m)	Colour	Field Texture	Moist.
0 – 0.5	Grey	Silty sandy CLAY	Wet



Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/ Biota	Odour
0 – 0.5	Grey	Silty sandy CLAY	Wet	Soft	Fine	Moderate	1%	<5%	Sulphur/marine

General Location of Sampling	Port of Mackay – Operational Area 2
Site Number	OP2_45
Date/Sample Time	28/09/18, 0745
Water Depth at Site	~4.7m
Type of Core Sampler	Piston core
Depth Retained	1.5m
Weather Conditions / sea state	Wind 4kts / glass
Comments	Refusal at 1.5m



PSD (%)			
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)
0 – 0.5	1	54	45
0.5 – 1.0	4	41	55
1.0 – 1.5	1	44	55

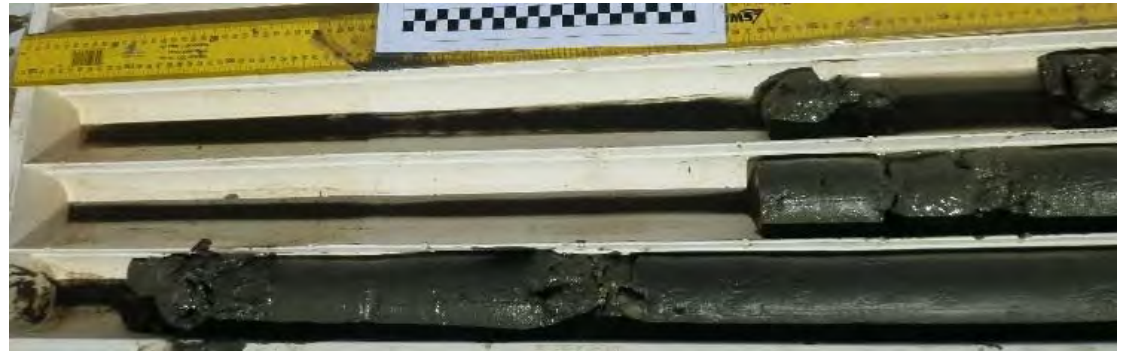
Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour
0 – 0.5	Grey	Silty sandy CLAY	Wet	Soft	Fine	Low	NIL	20%	Sulphur/marine
0.5 – 1.0	Grey	Silty sandy CLAY	Wet	Moderate	Large	Moderate	NIL	30%	Sulphur/marine
1.0 – 1.5	Grey	Silty sandy CLAY	Wet	Moderate	Large	Moderate	NIL	30%	Sulphur/marine
Refusal									

General Location of Sampling	Port of Mackay – Operational Area 2		
Site Number	OP2_32		
Date/Sample Time	28/09/18, 0800		
Water Depth at Site	~4.7m		
Type of Core Sampler	Piston core		
Depth Retained	0.5m		
Weather Conditions / sea state	Wind 8kts / glass		
Comments	Refusal at 0.5m		
PSD (%)			
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)
0 – 0.5	3	47	50
Strata Change (m)	Colour	Field Texture	Moist.
0 – 0.5	Grey	Silty sandy CLAY	Moist
Refusal			



Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/ Biota	Odour
0 – 0.5	Grey	Silty sandy CLAY	Moist	Soft	Very coarse	Low-moderate	1%	10%	Sulphur/marine
Refusal									

General Location of Sampling	Port of Mackay – Operational Area 2
Site Number	OP2_44
Date/Sample Time	28/09/18, 0930
Water Depth at Site	~8m
Type of Core Sampler	Piston core
Depth Retained	1.0m
Weather Conditions / sea state	Wind 4kts / glass
Comments	Refusal at 1.0m



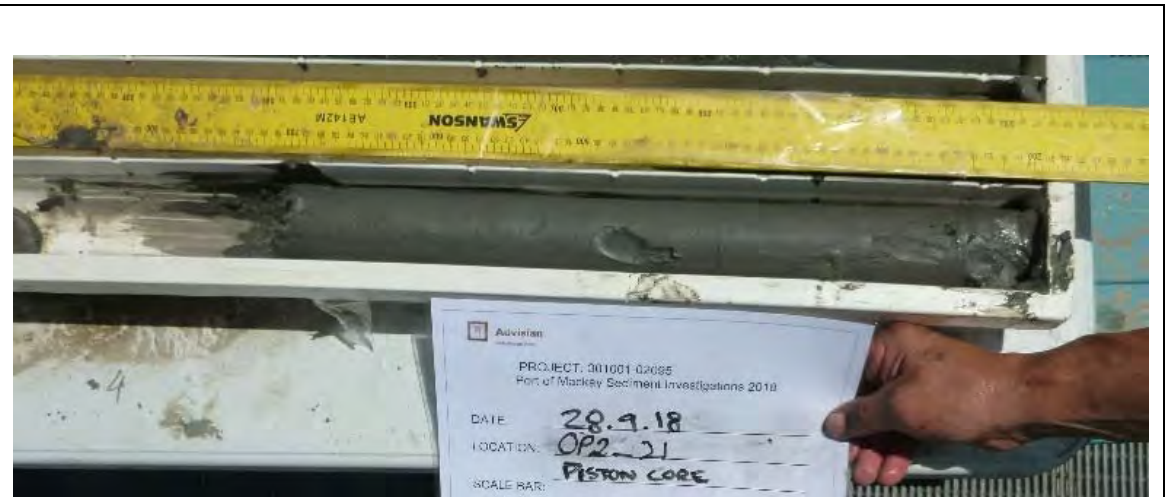
PSD (%)			
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)
0 – 0.5	7	54	39
0.5 – 1.0	3	44	53

Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour
0 – 0.5	Grey	Silty sandy CLAY with gravel	Wet	Soft	Fine to coarse	Low - Moderate	8%	5%	Sulphur/marine
0.5 – 1.0	Grey	Silty sandy CLAY with gravel	Wet	Soft	Fine to coarse	Low - Moderate	8%	5%	Sulphur/marine
Refusal									

General Location of Sampling	Port of Mackay – Operational Area 2								
Site Number	OP2_36								
Date/Sample Time	28/09/18, 1000								
Water Depth at Site	~9m								
Type of Core Sampler	Piston core								
Depth Retained	1.5m								
Weather Conditions / sea state	Wind 4kts / glass								
Comments	Refusal at 1.5m								
PSD (%)									
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)						
0 – 0.5	2	52	40						
0.5 – 1.0	8	52	35						
1.0 – 1.5	13	36	63						
Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour
0 – 0.5	Grey	Silty sandy CLAY	Moist	Soft	Fine to coarse	Low	5%	5-10%	Sulphur/marine
0.5 – 1.0	Grey	Silty sandy CLAY	Moist	Soft-firm	Fine to coarse	Moderate	5%	5-10%	Sulphur/marine
1.0 – 1.5	Grey	CLAY	Moist	Soft-firm	Fine to coarse	Moderate	1%	1%	Sulphur/marine



General Location of Sampling	Port of Mackay – Operational Area 2		
Site Number	OP2_21		
Date/Sample Time	28/09/18, 1120		
Water Depth at Site	~9m		
Type of Core Sampler	Piston core		
Depth Retained	0.5m		
Weather Conditions / sea state	Still		
Comments	Refusal at 0.5m		
PSD (%)			
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)
0 – 0.5	2%	31%	67%
Strata Change (m)	Colour	Field Texture	Moist.
0 – 0.5	Grey	Sandy CLAY	Moist



Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour
0 – 0.5	Grey	Sandy CLAY	Moist	Firm	Fine	Moderate	NIL	<5%	Sulphur/marine

General Location of Sampling		Port of Mackay – Operational Area 2							
Site Number		OP2_18							
Date/Sample Time		28/09/18, 1210							
Water Depth at Site		~8m							
Type of Core Sampler		Piston core							
Depth Retained		0.5m							
Weather Conditions / sea state		Wind 4kts / glass							
Comments									
PSD (%)									
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)						
0 – 0.5	4	40	56						
Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/ Biota	Odour
0 – 0.5	Grey	Sandy CLAY	Moist	Fine	Fine	Low	NIL	5-10%	Sulphur/marine

General Location of Sampling	Port of Mackay – Operational Area 2
Site Number	OP2_38 (T1, T2, T3)
Date/Sample Time	28/09/18, 1300
Water Depth at Site	~8m
Type of Core Sampler	Piston core
Depth Retained	0.5m
Weather Conditions / sea state	Still
Comments	Refusal at 0.5m



PSD (%)			
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)
0 – 0.5 (T1)	6%	52%	42%
0 – 0.5 (T2)	4%	56%	40%
0 – 0.5 (T3)	9%	56%	35%

Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour
0 – 0.5 (T1)	Grey	Silty sandy CLAY	Moist	Soft	Fine to coarse	Low	NIL	5-10%	Sulphur/marine
0 – 0.5 (T2)	Grey	Silty sandy CLAY	Moist	Soft	Fine to coarse	Low	NIL	5-10%	Sulphur/marine
0 – 0.5 (T3)	Grey	Silty sandy CLAY	Moist	Soft	Fine to coarse	Low	NIL	5-10%	Sulphur/marine
Refusal									

General Location of Sampling		Port of Mackay – Operational Area 2		No photo					
Site Number		OP2_24							
Date/Sample Time		28/09/18							
Water Depth at Site		~4.7m							
Type of Core Sampler		Piston core							
Depth Retained		0.5m							
Weather Conditions / sea state		Wind 8kts / glass							
Comments		Refusal at 0.5m							
PSD (%)									
Strata Change (m)	Gravel (%)	Sand (%)	Silt & Clay (%)						
0 – 0.5	0%	16%	84%						
Strata Change (m)	Colour	Field Texture	Moist.	Consist.	Sand Grain Size	Plasticity	% Stones	Shell/Grit/Biota	Odour
0 – 0.5	Grey	Silty sandy CLAY	Moist	Soft	Very coarse	Low-moderate	1%	10%	Sulphur/marine
Refusal									

Attachment C: Laboratory Certificates

CERTIFICATE OF ANALYSIS

Work Order	: EB1823888	Page	: 1 of 20
Amendment	: 3	Laboratory	: Environmental Division Brisbane
Client	: ADVISIAN PTY LTD	Contact	: Caroline Hill
Contact	: MR BILL BOYLSON	Address	: 2 Byth Street Stafford QLD Australia 4053
Address	: LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000	Telephone	: +61 7 3552 8662
Telephone	: ----	Date Samples Received	: 03-Oct-2018 09:10
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Date Analysis Commenced	: 08-Oct-2018
Order number	:	Issue Date	: 29-Nov-2018 08:21
C-O-C number	: ----		
Sampler	: NICHOLAS BAINTON		
Site	:		
Quote number	: BN/185/18		
No. of samples received	: 19		
No. of samples analysed	: 19		



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
- Surrogate Control Limits

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>
Andrew Epps	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Sarah Ashworth	Laboratory Manager - Brisbane	Brisbane Organics, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Inorganics, Stafford, QLD
Tom Maloney	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

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

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

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

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

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

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

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

- EG020-SD (Total Metals in Sediments by ICP-MS): Samples EB1823888-004 (OP2_44 (0-0.5)) and -014 (OP2_36 (0.5-1.0)) show poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- EP090 Organotin: Sample 'D7' shows poor matrix spike recovery for MBT due to matrix interference.
- **Specialty Organics analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- Amendment (30/10/2018): This report has been amended and re-released to allow the reporting of additional As analytical data.
- Amendment (2/11/2018): This report has been amended and re-released to allow the reporting of additional Chloride analytical data.
- Amendment (21/11/2018): This report has been amended and re-released to allow samples 'OP2_42...' to be added to this workorder from EB1823470.
- EA151: Due to limited sample volume settleability results were unable to be reported for samples 20-22.
- EP090 Organotin: Sample 'OP2_44 (0.5-1.0)' required dilution due to the presence of high level contaminants. LOR values have been adjusted accordingly.
- EP090 Organotin: Sample 'OP2_44 (0.5-1.0)' shows poor matrix spike recovery due to matrix interference. Confirmed by re-extraction and re-analysis.
- EP090 Organotin: Sample 'OP2_42 / 0.5-1.0' shows poor matrix spike recovery for MBT due to matrix interference. Confirmed by re-extraction and re-analysis.
- EP090 Organotin: High LCS recovery deemed acceptable as all associated analyte results are less than LOR
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- 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'.
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.
- EA151: ALS does not hold NATA accreditation for Settleability.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_44 (0-0.5)	OP2_44 (0.5-1.0)	OP2-45 (0-0.5)	OP2-45 (0.5-1.0)	OP2-45 (1.0-1.5)
Client sampling date / time				28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	
Compound	CAS Number	LOR	Unit	EB1823888-004	EB1823888-005	EB1823888-006	EB1823888-007	EB1823888-008	
				Result	Result	Result	Result	Result	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%	32.0	36.7	39.6	37.9	48.1	
EA150: Particle Sizing									
+75µm	----	1	%	58	41	46	38	39	
+150µm	----	1	%	46	29	28	29	25	
+300µm	----	1	%	34	17	15	20	11	
+425µm	----	1	%	29	14	10	16	8	
+600µm	----	1	%	23	11	6	12	5	
+1180µm	----	1	%	12	5	2	7	2	
+2.36mm	----	1	%	5	2	<1	3	<1	
+4.75mm	----	1	%	2	1	<1	1	<1	
+9.5mm	----	1	%	<1	<1	<1	<1	<1	
+19.0mm	----	1	%	<1	<1	<1	<1	<1	
+37.5mm	----	1	%	<1	<1	<1	<1	<1	
+75.0mm	----	1	%	<1	<1	<1	<1	<1	
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	21	28	24	32	29	
Silt (2-60 µm)	----	1	%	18	25	21	23	26	
Sand (0.06-2.00 mm)	----	1	%	54	44	54	41	44	
Gravel (>2mm)	----	1	%	7	3	1	4	1	
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1	
EA151: Settleability 10%									
∅ Underflow Density	----	0.01	g/cm3	1.39	1.27	1.24	1.21	1.22	
∅ Underflow Solids	----	0.1	%	40.0	32.9	31.7	29.6	31.5	
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	3.80	2.20	2.80	2.20	2.40	
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.200	0.050	0.067	0.058	0.017	
∅ Clarity	----	-	-	Clear	Clear	Clear	Clear	Clear	
EA151: Settleability 20%									
∅ Underflow Density	----	0.01	g/cm3	1.36	1.32	1.29	1.25	1.31	
∅ Underflow Solids	----	0.1	%	43.4	37.0	36.8	34.7	36.4	
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	1.20	0.800	0.800	0.400	1.20	
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.033	0.008	0.008	0.009	0.008	
∅ Clarity	----	-	-	Clear	Clear	Clear	Clear	Clear	
EA152: Soil Particle Density									
∅ Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.67	2.67	2.77	2.67	2.66	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_44 (0-0.5)	OP2_44 (0.5-1.0)	OP2-45 (0-0.5)	OP2-45 (0.5-1.0)	OP2-45 (1.0-1.5)
Client sampling date / time				28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	
Compound	CAS Number	LOR	Unit	EB1823888-004	EB1823888-005	EB1823888-006	EB1823888-007	EB1823888-008	
				Result	Result	Result	Result	Result	
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg	4.88	6.31	5.44	6.36	9.96	
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
Chromium	7440-47-3	1.0	mg/kg	14.4	17.7	15.8	19.2	26.0	
Copper	7440-50-8	1.0	mg/kg	11.7	22.0	13.9	15.5	16.8	
Lead	7439-92-1	1.0	mg/kg	16.1	10.2	9.1	11.7	13.2	
Nickel	7440-02-0	1.0	mg/kg	9.1	10.0	8.8	10.9	15.9	
Zinc	7440-66-6	1.0	mg/kg	38.8	47.2	39.6	45.6	45.8	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg	0.01	0.02	0.01	0.02	0.02	
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	0.43	0.80	0.82	0.67	0.90	
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg	<1	2	<1	<1	<1	
Dibutyltin	1002-53-5	1	µgSn/kg	1	26	1	2	2	
Tributyltin	56573-85-4	0.5	µgSn/kg	3.6	148	1.9	2.2	3.2	
EP090S: Organotin Surrogate									
Tripopyltin	----	0.5	%	102	126	111	110	82.9	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_32 (0-0.5)	OP2_38 (0-0.5) T1	OP2_38 (0-0.5) T2	OP2_38 (0-0.5) T3	OP2_36 (0-0.5)
Client sampling date / time					28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		EB1823888-009	EB1823888-010	EB1823888-011	EB1823888-012	EB1823888-013
					Result	Result	Result	Result	Result
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		4220	----	----	----	3430
EA014 Total Soluble Salts									
Total Soluble Salts	----	5	mg/kg		13700	----	----	----	11100
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		9.0	----	----	----	9.2
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		0.204	----	----	----	0.147
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		127	----	----	----	92
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		5.65	----	----	----	3.11
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		1130	----	----	----	621
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		1.81	----	----	----	1.00
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		0.20	----	----	----	0.15
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		127	----	----	----	92
Liming Rate excluding ANC	----	1	kg CaCO3/t		10	----	----	----	7
EA037: Ass Field Screening Analysis									
∅ pH (F)	----	0.1	pH Unit		8.8	----	----	----	9.0
∅ pH (Fox)	----	0.1	pH Unit		6.5	----	----	----	6.5
∅ Reaction Rate	----	1	-		3	----	----	----	3
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		40.2	31.4	30.4	35.8	28.9
EA150: Particle Sizing									
+75µm	----	1	%		----	53	55	60	----
+150µm	----	1	%		----	42	41	46	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_32 (0-0.5)	OP2_38 (0-0.5) T1	OP2_38 (0-0.5) T2	OP2_38 (0-0.5) T3	OP2_36 (0-0.5)
Client sampling date / time				28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	
Compound	CAS Number	LOR	Unit	EB1823888-009	EB1823888-010	EB1823888-011	EB1823888-012	EB1823888-013	
				Result	Result	Result	Result	Result	
EA150: Particle Sizing - Continued									
+300µm	----	1	%	----	30	32	34	----	
+425µm	----	1	%	----	24	27	29	----	
+600µm	----	1	%	----	19	19	22	----	
+1180µm	----	1	%	----	10	9	12	----	
+2.36mm	----	1	%	----	4	1	7	----	
+4.75mm	----	1	%	----	2	<1	4	----	
+9.5mm	----	1	%	----	<1	<1	<1	----	
+19.0mm	----	1	%	----	<1	<1	<1	----	
+37.5mm	----	1	%	----	<1	<1	<1	----	
+75.0mm	----	1	%	----	<1	<1	<1	----	
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	----	25	23	20	----	
Silt (2-60 µm)	----	1	%	----	17	17	15	----	
Sand (0.06-2.00 mm)	----	1	%	----	52	56	56	----	
Gravel (>2mm)	----	1	%	----	6	4	9	----	
Cobbles (>6cm)	----	1	%	----	<1	<1	<1	----	
EA151: Settleability 10%									
∅ Underflow Density	----	0.01	g/cm3	----	1.34	1.26	1.40	----	
∅ Underflow Solids	----	0.1	%	----	37.3	31.8	39.5	----	
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	----	2.60	2.20	3.20	----	
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	----	0.117	0.067	0.117	----	
∅ Clarity	----	-	-	----	Clear	Clear	Clear	----	
EA151: Settleability 20%									
∅ Underflow Density	----	0.01	g/cm3	----	1.36	1.29	1.38	----	
∅ Underflow Solids	----	0.1	%	----	40.8	36.9	42.8	----	
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	----	1.20	1.00	1.00	----	
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	----	0.008	0.009	0.008	----	
∅ Clarity	----	-	-	----	Clear	Clear	Clear	----	
EA152: Soil Particle Density									
∅ Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	2.68	2.68	2.69	----	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg	10800	----	----	----	8020	
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg	7.58	5.50	4.67	4.79	4.52	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_32 (0-0.5)	OP2_38 (0-0.5) T1	OP2_38 (0-0.5) T2	OP2_38 (0-0.5) T3	OP2_36 (0-0.5)
Client sampling date / time					28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		EB1823888-009	EB1823888-010	EB1823888-011	EB1823888-012	EB1823888-013
					Result	Result	Result	Result	Result
EG020-SD: Total Metals in Sediments by ICPMS - Continued									
Cadmium	7440-43-9	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	7440-47-3	1.0	mg/kg		16.6	14.6	13.1	12.8	12.9
Copper	7440-50-8	1.0	mg/kg		23.3	11.9	11.1	9.7	11.0
Lead	7439-92-1	1.0	mg/kg		10.9	12.8	7.7	7.1	7.2
Nickel	7440-02-0	1.0	mg/kg		9.4	8.4	7.4	7.2	7.6
Zinc	7440-66-6	1.0	mg/kg		51.7	37.2	30.1	27.3	29.3
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg		0.02	0.01	0.01	0.01	0.01
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.64	0.40	0.64	0.49	0.49
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.6	----	----	----	1.0
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg		1	1	2	1	<1
Tributyltin	56573-85-4	0.5	µgSn/kg		2.4	1.5	4.4	3.3	2.7
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		108	108	110	94.8	91.2



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID			OP2_36 (0.5-1.0)	OP2_36 (1.0-1.5)	OP2_33 (0-0.5)	D7	OP2_21 (0-0.5)
Client sampling date / time		28-Sep-2018 00:00			28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	EB1823888-014	EB1823888-015	EB1823888-016	EB1823888-017	EB1823888-018	
				Result	Result	Result	Result	Result	
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm	4360	4080	----	----	----	
EA014 Total Soluble Salts									
Total Soluble Salts	----	5	mg/kg	14200	13300	----	----	----	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	9.1	9.1	----	----	----	
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	0.140	0.210	----	----	----	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	88	131	----	----	----	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.38	4.38	----	----	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	475	875	----	----	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.76	1.40	----	----	----	
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	0.14	0.21	----	----	----	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	88	131	----	----	----	
Liming Rate excluding ANC	----	1	kg CaCO3/t	6	10	----	----	----	
EA037: Ass Field Screening Analysis									
∅ pH (F)	----	0.1	pH Unit	8.8	8.8	----	----	----	
∅ pH (Fox)	----	0.1	pH Unit	6.6	6.6	----	----	----	
∅ Reaction Rate	----	1	-	2	3	----	----	----	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%	40.0	38.3	38.1	36.1	34.4	
EA150: Particle Sizing									
+75µm	----	1	%	----	----	----	----	27	
+150µm	----	1	%	----	----	----	----	17	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_36 (0.5-1.0)	OP2_36 (1.0-1.5)	OP2_33 (0-0.5)	D7	OP2_21 (0-0.5)
Client sampling date / time					28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		EB1823888-014	EB1823888-015	EB1823888-016	EB1823888-017	EB1823888-018
				Result	Result	Result	Result	Result	Result
EA150: Particle Sizing - Continued									
+300µm	----	1	%	----	----	----	----	----	11
+425µm	----	1	%	----	----	----	----	----	9
+600µm	----	1	%	----	----	----	----	----	7
+1180µm	----	1	%	----	----	----	----	----	3
+2.36mm	----	1	%	----	----	----	----	----	<1
+4.75mm	----	1	%	----	----	----	----	----	<1
+9.5mm	----	1	%	----	----	----	----	----	<1
+19.0mm	----	1	%	----	----	----	----	----	<1
+37.5mm	----	1	%	----	----	----	----	----	<1
+75.0mm	----	1	%	----	----	----	----	----	<1
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	----	----	----	----	----	37
Silt (2-60 µm)	----	1	%	----	----	----	----	----	30
Sand (0.06-2.00 mm)	----	1	%	----	----	----	----	----	31
Gravel (>2mm)	----	1	%	----	----	----	----	----	2
Cobbles (>6cm)	----	1	%	----	----	----	----	----	<1
EA151: Settleability 10%									
∅ Underflow Density	----	0.01	g/cm3	----	----	----	----	----	1.24
∅ Underflow Solids	----	0.1	%	----	----	----	----	----	33.7
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	----	----	----	----	----	0.400
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	----	----	----	----	----	0.017
∅ Clarity	----	-	-	----	----	----	----	----	Clear
EA151: Settleability 20%									
∅ Underflow Density	----	0.01	g/cm3	----	----	----	----	----	1.31
∅ Underflow Solids	----	0.1	%	----	----	----	----	----	38.1
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	----	----	----	----	----	1.60
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	----	----	----	----	----	0.009
∅ Clarity	----	-	-	----	----	----	----	----	Clear
EA152: Soil Particle Density									
∅ Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	----	----	----	----	2.66
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg	11900	10200	----	----	----	----
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg	7.44	7.40	6.72	7.46	6.27	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_36 (0.5-1.0)	OP2_36 (1.0-1.5)	OP2_33 (0-0.5)	D7	OP2_21 (0-0.5)
Client sampling date / time					28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		EB1823888-014	EB1823888-015	EB1823888-016	EB1823888-017	EB1823888-018
				Result	Result	Result	Result	Result	Result
EG020-SD: Total Metals in Sediments by ICPMS - Continued									
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	7440-47-3	1.0	mg/kg	22.2	21.1	18.6	20.0	19.1	19.1
Copper	7440-50-8	1.0	mg/kg	19.1	17.9	23.1	29.5	15.4	15.4
Lead	7439-92-1	1.0	mg/kg	12.7	12.3	11.4	11.1	11.5	11.5
Nickel	7440-02-0	1.0	mg/kg	12.7	12.2	10.5	11.3	11.2	11.2
Zinc	7440-66-6	1.0	mg/kg	53.5	50.7	47.2	54.3	43.9	43.9
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg	0.02	0.02	0.02	0.02	0.02	0.02
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	0.36	0.59	0.56	0.51	0.54	0.54
EP004: Organic Matter									
Organic Matter	----	0.5	%	1.4	1.5	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg	----	----	<3	<3	----	----
>C16 - C34 Fraction	----	3	mg/kg	----	----	10	4	----	----
>C34 - C40 Fraction	----	5	mg/kg	----	----	<5	<5	----	----
>C10 - C40 Fraction (sum)	----	3	mg/kg	----	----	10	4	----	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg	----	----	<3	<3	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg	----	----	<3	<3	----	----
C10 - C14 Fraction	----	3	mg/kg	----	----	<3	<3	----	----
C15 - C28 Fraction	----	3	mg/kg	----	----	5	<3	----	----
C29 - C36 Fraction	----	5	mg/kg	----	----	6	<5	----	----
[^] C10 - C36 Fraction (sum)	----	3	mg/kg	----	----	11	<3	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg	----	----	<3	<3	----	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg	----	----	<3.0	<3.0	----	----
EP080-SD: BTEXN									
Benzene	71-43-2	0.2	mg/kg	----	----	<0.2	<0.2	----	----
Toluene	108-88-3	0.2	mg/kg	----	----	<0.2	<0.2	----	----
Ethylbenzene	100-41-4	0.2	mg/kg	----	----	<0.2	<0.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	----	----	<0.2	<0.2	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_36 (0.5-1.0)	OP2_36 (1.0-1.5)	OP2_33 (0-0.5)	D7	OP2_21 (0-0.5)
Client sampling date / time					28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		EB1823888-014	EB1823888-015	EB1823888-016	EB1823888-017	EB1823888-018
				Result	Result	Result	Result	Result	Result
EP080-SD: BTEXN - Continued									
ortho-Xylene	95-47-6	0.2	mg/kg	----	----	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg	----	----	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg	----	----	<0.2	<0.2	----	----
Naphthalene	91-20-3	0.2	mg/kg	----	----	<0.2	<0.2	----	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg	<1	<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg	2	2	<1	<1	2	2
Tributyltin	56573-85-4	0.5	µgSn/kg	3.4	11.4	<0.5	<0.5	3.4	3.4
EP131A: Organochlorine Pesticides									
Aldrin	309-00-2	0.50	µg/kg	----	----	<0.50	<0.50	----	----
alpha-BHC	319-84-6	0.50	µg/kg	----	----	<0.50	<0.50	----	----
beta-BHC	319-85-7	0.50	µg/kg	----	----	<0.50	<0.50	----	----
delta-BHC	319-86-8	0.50	µg/kg	----	----	<0.50	<0.50	----	----
4,4'-DDD	72-54-8	0.50	µg/kg	----	----	<0.50	<0.50	----	----
4,4'-DDE	72-55-9	0.50	µg/kg	----	----	<0.50	<0.50	----	----
4,4'-DDT	50-29-3	0.50	µg/kg	----	----	<0.50	<0.50	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.50	µg/kg	----	----	<0.50	<0.50	----	----
Dieldrin	60-57-1	0.50	µg/kg	----	----	<0.50	<0.50	----	----
alpha-Endosulfan	959-98-8	0.50	µg/kg	----	----	<0.50	<0.50	----	----
beta-Endosulfan	33213-65-9	0.50	µg/kg	----	----	<0.50	<0.50	----	----
Endosulfan sulfate	1031-07-8	0.50	µg/kg	----	----	<0.50	<0.50	----	----
^ Endosulfan (sum)	115-29-7	0.50	µg/kg	----	----	<0.50	<0.50	----	----
Endrin	72-20-8	0.50	µg/kg	----	----	<0.50	<0.50	----	----
Endrin aldehyde	7421-93-4	0.50	µg/kg	----	----	<0.50	<0.50	----	----
Endrin ketone	53494-70-5	0.50	µg/kg	----	----	<0.50	<0.50	----	----
Heptachlor	76-44-8	0.50	µg/kg	----	----	<0.50	<0.50	----	----
Heptachlor epoxide	1024-57-3	0.50	µg/kg	----	----	<0.50	<0.50	----	----
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	----	----	<0.50	<0.50	----	----
gamma-BHC	58-89-9	0.25	µg/kg	----	----	<0.25	<0.25	----	----
Methoxychlor	72-43-5	0.50	µg/kg	----	----	<0.50	<0.50	----	----
cis-Chlordane	5103-71-9	0.50	µg/kg	----	----	<0.50	<0.50	----	----
trans-Chlordane	5103-74-2	0.50	µg/kg	----	----	<0.50	<0.50	----	----
^ Total Chlordane (sum)	----	0.50	µg/kg	----	----	<0.50	<0.50	----	----
Oxychlordane	27304-13-8	0.50	µg/kg	----	----	<0.50	<0.50	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_36 (0.5-1.0)	OP2_36 (1.0-1.5)	OP2_33 (0-0.5)	D7	OP2_21 (0-0.5)
Client sampling date / time					28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		EB1823888-014	EB1823888-015	EB1823888-016	EB1823888-017	EB1823888-018
				Result	Result	Result	Result	Result	Result
EP131A: Organochlorine Pesticides - Continued									
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg	----	----	<0.50	<0.50	----	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg	----	----	<5	<5	----	----
2-Methylnaphthalene	91-57-6	5	µg/kg	----	----	<5	<5	----	----
Acenaphthylene	208-96-8	4	µg/kg	----	----	<4	6	----	----
Acenaphthene	83-32-9	4	µg/kg	----	----	<4	<4	----	----
Fluorene	86-73-7	4	µg/kg	----	----	<4	<4	----	----
Phenanthrene	85-01-8	4	µg/kg	----	----	12	16	----	----
Anthracene	120-12-7	4	µg/kg	----	----	<4	5	----	----
Fluoranthene	206-44-0	4	µg/kg	----	----	37	67	----	----
Pyrene	129-00-0	4	µg/kg	----	----	38	58	----	----
Benzo(a)anthracene	56-55-3	4	µg/kg	----	----	25	36	----	----
Chrysene	218-01-9	4	µg/kg	----	----	22	30	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	----	----	26	28	----	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg	----	----	15	12	----	----
Benzo(e)pyrene	192-97-2	4	µg/kg	----	----	15	20	----	----
Benzo(a)pyrene	50-32-8	4	µg/kg	----	----	26	36	----	----
Perylene	198-55-0	4	µg/kg	----	----	9	12	----	----
Benzo(g,h,i)perylene	191-24-2	4	µg/kg	----	----	16	23	----	----
Dibenz(a,h)anthracene	53-70-3	4	µg/kg	----	----	4	5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	----	----	15	20	----	----
Coronene	191-07-1	5	µg/kg	----	----	<5	6	----	----
^ Sum of PAHs	----	4	µg/kg	----	----	260	380	----	----
EP080-SD: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	----	----	87.1	95.2	----	----
Toluene-D8	2037-26-5	0.2	%	----	----	98.1	98.7	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	----	----	108	107	----	----
EP090S: Organotin Surrogate									
Tripolytin	----	0.5	%	102	124	90.8	89.4	128	
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%	----	----	80.3	67.1	----	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%	----	----	79.3	91.3	----	----
Anthracene-d10	1719-06-8	10	%	----	----	88.6	83.5	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_36 (0.5-1.0)	OP2_36 (1.0-1.5)	OP2_33 (0-0.5)	D7	OP2_21 (0-0.5)
Client sampling date / time				28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	
Compound	CAS Number	LOR	Unit	EB1823888-014	EB1823888-015	EB1823888-016	EB1823888-017	EB1823888-018	
				Result	Result	Result	Result	Result	
EP132T: Base/Neutral Extractable Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	10	%	----	----	76.3	79.2	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	OP2_18 (0-0.5)	OP2_42 / 0.0-0.5	OP2_42 / 0.5-1.0	OP2_42 / 1.0-1.5	----
Client sampling date / time			26-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EB1823888-019	EB1823888-020	EB1823888-021	EB1823888-022	-----
				Result	Result	Result	Result	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	4110	----	----	----	----
EA014 Total Soluble Salts								
Total Soluble Salts	----	5	mg/kg	13400	----	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.0	----	----	----	----
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	0.256	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	160	----	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	4.23	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	846	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.36	----	----	----	----
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	0.26	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	160	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	12	----	----	----	----
EA037: Ass Field Screening Analysis								
∅ pH (F)	----	0.1	pH Unit	8.8	----	----	----	----
∅ pH (Fox)	----	0.1	pH Unit	6.5	----	----	----	----
∅ Reaction Rate	----	1	-	2	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	39.6	28.2	38.8	43.0	----
EA150: Particle Sizing								
+75µm	----	1	%	----	60	13	22	----
+150µm	----	1	%	----	51	9	15	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_18 (0-0.5)	OP2_42 / 0.0-0.5	OP2_42 / 0.5-1.0	OP2_42 / 1.0-1.5	----
Client sampling date / time					26-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit		EB1823888-019	EB1823888-020	EB1823888-021	EB1823888-022	-----
				Result	Result	Result	Result	Result	----
EA150: Particle Sizing - Continued									
+300µm	----	1	%	----	44	6	10	----	----
+425µm	----	1	%	----	39	4	8	----	----
+600µm	----	1	%	----	33	2	6	----	----
+1180µm	----	1	%	----	15	1	2	----	----
+2.36mm	----	1	%	----	5	<1	<1	----	----
+4.75mm	----	1	%	----	<1	<1	<1	----	----
+9.5mm	----	1	%	----	<1	<1	<1	----	----
+19.0mm	----	1	%	----	<1	<1	<1	----	----
+37.5mm	----	1	%	----	<1	<1	<1	----	----
+75.0mm	----	1	%	----	<1	<1	<1	----	----
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	----	15	27	30	----	----
Silt (2-60 µm)	----	1	%	----	21	50	34	----	----
Sand (0.06-2.00 mm)	----	1	%	----	56	22	35	----	----
Gravel (>2mm)	----	1	%	----	8	1	1	----	----
Cobbles (>6cm)	----	1	%	----	<1	<1	<1	----	----
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	2.61	2.58	2.63	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg	9570	----	----	----	----	----
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg	7.18	3.65	6.55	7.58	----	----
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----	----
Chromium	7440-47-3	1.0	mg/kg	18.1	10.2	16.7	21.0	----	----
Copper	7440-50-8	1.0	mg/kg	25.1	8.2	15.7	17.0	----	----
Lead	7439-92-1	1.0	mg/kg	23.9	6.3	12.8	14.4	----	----
Nickel	7440-02-0	1.0	mg/kg	10.4	6.2	10.5	12.4	----	----
Zinc	7440-66-6	1.0	mg/kg	223	21.7	42.7	44.5	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg	0.02	----	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg	----	<0.01	0.02	0.05	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	0.56	0.24	0.55	0.76	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_18 (0-0.5)	OP2_42 / 0.0-0.5	OP2_42 / 0.5-1.0	OP2_42 / 1.0-1.5	----
Client sampling date / time					26-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit		EB1823888-019	EB1823888-020	EB1823888-021	EB1823888-022	-----
				Result	Result	Result	Result	Result	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.5	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg		----	<3	<3	3	----
>C16 - C34 Fraction	----	3	mg/kg		----	6	9	12	----
>C34 - C40 Fraction	----	5	mg/kg		----	<5	6	5	----
>C10 - C40 Fraction (sum)	----	3	mg/kg		----	6	15	20	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg		----	<3	<3	3	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg		----	<3	<3	<3	----
C10 - C14 Fraction	----	3	mg/kg		----	<3	<3	3	----
C15 - C28 Fraction	----	3	mg/kg		----	4	6	8	----
C29 - C36 Fraction	----	5	mg/kg		----	<5	6	7	----
^ C10 - C36 Fraction (sum)	----	3	mg/kg		----	4	12	18	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		----	<3	<3	<3	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		----	<3.0	<3.0	<3.0	----
EP080-SD: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.2	mg/kg		----	<0.2	<0.2	<0.2	----
Ethylbenzene	100-41-4	0.2	mg/kg		----	<0.2	<0.2	<0.2	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg		----	<0.2	<0.2	<0.2	----
ortho-Xylene	95-47-6	0.2	mg/kg		----	<0.2	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	<0.2	<0.2	----
Naphthalene	91-20-3	0.2	mg/kg		----	<0.2	<0.2	<0.2	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	----
Dibutyltin	1002-53-5	1	µgSn/kg		2	1	1	<1	----
Tributyltin	56573-85-4	0.5	µgSn/kg		3.4	6.0	0.9	<0.5	----
EP131A: Organochlorine Pesticides									
Aldrin	309-00-2	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
alpha-BHC	319-84-6	0.50	µg/kg		----	<0.50	<0.50	<0.50	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_18 (0-0.5)	OP2_42 / 0.0-0.5	OP2_42 / 0.5-1.0	OP2_42 / 1.0-1.5	----
Client sampling date / time					26-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit		EB1823888-019	EB1823888-020	EB1823888-021	EB1823888-022	-----
					Result	Result	Result	Result	----
EP131A: Organochlorine Pesticides - Continued									
beta-BHC	319-85-7	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
delta-BHC	319-86-8	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
4.4`-DDD	72-54-8	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
4.4`-DDE	72-55-9	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
4.4`-DDT	50-29-3	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
Dieldrin	60-57-1	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
alpha-Endosulfan	959-98-8	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
beta-Endosulfan	33213-65-9	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
Endosulfan sulfate	1031-07-8	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
^ Endosulfan (sum)	115-29-7	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
Endrin	72-20-8	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
Endrin aldehyde	7421-93-4	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
Endrin ketone	53494-70-5	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
Heptachlor	76-44-8	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
Heptachlor epoxide	1024-57-3	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
gamma-BHC	58-89-9	0.25	µg/kg		----	<0.25	<0.25	<0.25	----
Methoxychlor	72-43-5	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
cis-Chlordane	5103-71-9	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
trans-Chlordane	5103-74-2	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
^ Total Chlordane (sum)	----	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
Oxychlordane	27304-13-8	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg		----	<0.50	<0.50	<0.50	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		----	<5	7	10	----
2-Methylnaphthalene	91-57-6	5	µg/kg		----	<5	<5	<5	----
Acenaphthylene	208-96-8	4	µg/kg		----	<4	9	11	----
Acenaphthene	83-32-9	4	µg/kg		----	<4	8	<4	----
Fluorene	86-73-7	4	µg/kg		----	<4	6	<4	----
Phenanthrene	85-01-8	4	µg/kg		----	5	39	18	----
Anthracene	120-12-7	4	µg/kg		----	<4	6	7	----
Fluoranthene	206-44-0	4	µg/kg		----	10	116	62	----
Pyrene	129-00-0	4	µg/kg		----	11	103	62	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_18 (0-0.5)	OP2_42 / 0.0-0.5	OP2_42 / 0.5-1.0	OP2_42 / 1.0-1.5	----
Client sampling date / time				26-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	----	
Compound	CAS Number	LOR	Unit	EB1823888-019	EB1823888-020	EB1823888-021	EB1823888-022	-----	
				Result	Result	Result	Result	----	
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
Benz(a)anthracene	56-55-3	4	µg/kg	----	7	72	44	----	
Chrysene	218-01-9	4	µg/kg	----	5	56	28	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	----	6	71	33	----	
Benzo(k)fluoranthene	207-08-9	4	µg/kg	----	<4	34	19	----	
Benzo(e)pyrene	192-97-2	4	µg/kg	----	4	40	20	----	
Benzo(a)pyrene	50-32-8	4	µg/kg	----	6	75	44	----	
Perylene	198-55-0	4	µg/kg	----	5	21	19	----	
Benzo(g,h,i)perylene	191-24-2	4	µg/kg	----	5	44	26	----	
Dibenz(a,h)anthracene	53-70-3	4	µg/kg	----	<4	10	<4	----	
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	----	4	40	22	----	
Coronene	191-07-1	5	µg/kg	----	<5	9	5	----	
^ Sum of PAHs	----	4	µg/kg	----	68	766	430	----	
EP080-SD: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	----	76.5	87.3	87.1	----	
Toluene-D8	2037-26-5	0.2	%	----	69.3	80.4	78.0	----	
4-Bromofluorobenzene	460-00-4	0.2	%	----	78.4	85.9	86.5	----	
EP090S: Organotin Surrogate									
Tripopyltin	----	0.5	%	113	127	83.4	102	----	
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%	----	75.9	62.7	50.7	----	
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%	----	81.9	80.8	119	----	
Anthracene-d10	1719-06-8	10	%	----	112	124	112	----	
4-Terphenyl-d14	1718-51-0	10	%	----	77.2	85.2	86.8	----	



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080-SD: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	51	145
Toluene-D8	2037-26-5	42	144
4-Bromofluorobenzene	460-00-4	58	142
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	119
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	55	135
Anthracene-d10	1719-06-8	70	136
4-Terphenyl-d14	1718-51-0	57	127

QUALITY CONTROL REPORT

Work Order	: EB1823888	Page	: 1 of 19
Amendment	: 3		
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR BILL BOYLSON	Contact	: Caroline Hill
Address	: LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8662
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Date Samples Received	: 03-Oct-2018
Order number	:	Date Analysis Commenced	: 08-Oct-2018
C-O-C number	: ----	Issue Date	: 29-Nov-2018
Sampler	: NICHOLAS BAINTON		
Site	:		
Quote number	: BN/185/18		
No. of samples received	: 19		
No. of samples analysed	: 19		



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 Quality Control Report contains the following information:

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

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>
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Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
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Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Inorganics, Stafford, QLD
Tom Maloney	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: SOIL

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QC Lot: 1968797)									
EB1823888-016	OP2_33 (0-0.5)	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.02	0.02	0.00	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QC Lot: 1968837)									
EB1823888-004	OP2_44 (0-0.5)	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.01	0.01	0.00	0% - 20%
EB1823888-014	OP2_36 (0.5-1.0)	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.02	0.02	0.00	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QC Lot: 2049807)									
EB1823888-020	OP2_42 / 0.0-0.5	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	<0.01	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 1968828)									
EB1823888-019	OP2_18 (0-0.5)	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	4110	4110	0.00	0% - 20%
EB1823844-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	115	130	11.8	0% - 20%
EA033-A: Actual Acidity (QC Lot: 2004237)									
EB1823888-009	OP2_32 (0-0.5)	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.00	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.00	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.0	9.1	1.10	0% - 20%
EA033-B: Potential Acidity (QC Lot: 2004237)									
EB1823888-009	OP2_32 (0-0.5)	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.204	0.202	0.985	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	127	126	1.17	0% - 50%
EA033-C: Acid Neutralising Capacity (QC Lot: 2004237)									
EB1823888-009	OP2_32 (0-0.5)	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	5.65	5.61	0.728	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.81	1.80	0.720	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1130	1120	0.717	0% - 20%
EA037: Ass Field Screening Analysis (QC Lot: 1971291)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA037: Ass Field Screening Analysis (QC Lot: 1971291) - continued									
EB1823534-016	Anonymous	EA037: pH (F)	----	0.1	pH Unit	8.2	8.1	1.23	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	5.7	5.6	1.77	0% - 20%
EB1823534-026	Anonymous	EA037: pH (F)	----	0.1	pH Unit	7.9	7.8	1.27	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	8.8	8.8	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1968805)									
EB1823888-016	OP2_33 (0-0.5)	EA055: Moisture Content	----	0.1	%	38.1	38.5	0.985	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1968841)									
EB1823844-001	Anonymous	EA055: Moisture Content	----	0.1	%	20.5	20.7	0.942	0% - 20%
EB1823888-008	OP2-45 (1.0-1.5)	EA055: Moisture Content	----	0.1	%	48.1	48.2	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2049813)									
EB1823888-020	OP2_42 / 0.0-0.5	EA055: Moisture Content	----	0.1	%	28.2	29.0	2.86	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 2019038)									
EB1823888-009	OP2_32 (0-0.5)	ED045G: Chloride	16887-00-6	10	mg/kg	10800	10500	2.28	0% - 20%
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 1968796)									
EB1823888-016	OP2_33 (0-0.5)	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020-SD: Arsenic	7440-38-2	1	mg/kg	6.72	6.77	0.694	No Limit
		EG020-SD: Chromium	7440-47-3	1	mg/kg	18.6	18.9	1.36	0% - 50%
		EG020-SD: Copper	7440-50-8	1	mg/kg	23.1	24.4	5.54	0% - 20%
		EG020-SD: Lead	7439-92-1	1	mg/kg	11.4	9.8	15.6	0% - 50%
		EG020-SD: Nickel	7440-02-0	1	mg/kg	10.5	11.0	4.77	0% - 50%
		EG020-SD: Zinc	7440-66-6	1	mg/kg	47.2	47.6	0.969	0% - 20%
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 1968836)									
EB1823888-004	OP2_44 (0-0.5)	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020-SD: Arsenic	7440-38-2	1	mg/kg	4.88	4.93	1.10	No Limit
		EG020-SD: Chromium	7440-47-3	1	mg/kg	14.4	13.5	6.53	0% - 50%
		EG020-SD: Copper	7440-50-8	1	mg/kg	11.7	11.2	4.57	0% - 50%
		EG020-SD: Lead	7439-92-1	1	mg/kg	16.1	# 8.4	62.5	0% - 50%
		EG020-SD: Nickel	7440-02-0	1	mg/kg	9.1	7.7	17.0	No Limit
		EG020-SD: Zinc	7440-66-6	1	mg/kg	38.8	# 61.6	45.5	0% - 20%
EB1823888-014	OP2_36 (0.5-1.0)	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020-SD: Arsenic	7440-38-2	1	mg/kg	7.44	7.20	3.26	No Limit
		EG020-SD: Chromium	7440-47-3	1	mg/kg	22.2	21.5	3.12	0% - 20%
		EG020-SD: Copper	7440-50-8	1	mg/kg	19.1	19.4	1.71	0% - 50%
		EG020-SD: Lead	7439-92-1	1	mg/kg	12.7	13.4	5.01	0% - 50%
		EG020-SD: Nickel	7440-02-0	1	mg/kg	12.7	12.4	2.18	0% - 50%
		EG020-SD: Zinc	7440-66-6	1	mg/kg	53.5	# 66.9	22.3	0% - 20%
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 2049806)									
EB1823888-020	OP2_42 / 0.0-0.5	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020-SD: Arsenic	7440-38-2	1	mg/kg	3.65	4.01	9.27	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 2049806) - continued									
EB1823888-020	OP2_42 / 0.0-0.5	EG020-SD: Chromium	7440-47-3	1	mg/kg	10.2	10.2	0.00	0% - 50%
		EG020-SD: Copper	7440-50-8	1	mg/kg	8.2	8.8	7.13	No Limit
		EG020-SD: Lead	7439-92-1	1	mg/kg	6.3	6.4	2.16	No Limit
		EG020-SD: Nickel	7440-02-0	1	mg/kg	6.2	6.3	0.00	No Limit
		EG020-SD: Zinc	7440-66-6	1	mg/kg	21.7	25.6	16.5	0% - 20%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 1985740)									
EB1823888-004	OP2_44 (0-0.5)	EP003: Total Organic Carbon	----	0.02	%	0.43	0.44	0.00	0% - 20%
EB1823888-014	OP2_36 (0.5-1.0)	EP003: Total Organic Carbon	----	0.02	%	0.36	0.39	8.70	0% - 50%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 2056778)									
EB1823888-020	OP2_42 / 0.0-0.5	EP003: Total Organic Carbon	----	0.02	%	0.24	0.24	0.00	0% - 50%
EP004: Organic Matter (QC Lot: 1968422)									
EB1823888-009	OP2_32 (0-0.5)	EP004: Organic Matter	----	0.5	%	1.6	1.5	0.00	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1968790)									
EB1823888-016	OP2_33 (0-0.5)	EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1968804)									
EB1823888-016	OP2_33 (0-0.5)	EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
		EP071-SD: C15 - C28 Fraction	----	3	mg/kg	5	<3	54.6	No Limit
		EP071-SD: C10 - C36 Fraction (sum)	----	3	mg/kg	11	<3	114	No Limit
		EP071-SD: C29 - C36 Fraction	----	5	mg/kg	6	<5	24.4	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 2049809)									
EB1823888-020	OP2_42 / 0.0-0.5	EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
		EP071-SD: C15 - C28 Fraction	----	3	mg/kg	4	4	0.00	No Limit
		EP071-SD: C10 - C36 Fraction (sum)	----	3	mg/kg	4	4	0.00	No Limit
		EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	<5	0.00	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 2049811)									
EB1823888-020	OP2_42 / 0.0-0.5	EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QC Lot: 1968790)									
EB1823888-016	OP2_33 (0-0.5)	EP080-SD: C6 - C10 Fraction	C6_C10	3	mg/kg	<3	<3	0.00	No Limit
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QC Lot: 1968804)									
EB1823888-016	OP2_33 (0-0.5)	EP071-SD: >C10 - C16 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
		EP071-SD: >C16 - C34 Fraction	----	3	mg/kg	10	3	97.8	No Limit
		EP071-SD: >C10 - C40 Fraction (sum)	----	3	mg/kg	10	3	108	No Limit
		EP071-SD: >C34 - C40 Fraction	----	5	mg/kg	<5	<5	0.00	No Limit
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QC Lot: 2049809)									
EB1823888-020	OP2_42 / 0.0-0.5	EP071-SD: >C10 - C16 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
		EP071-SD: >C16 - C34 Fraction	----	3	mg/kg	6	6	0.00	No Limit
		EP071-SD: >C10 - C40 Fraction (sum)	----	3	mg/kg	6	6	0.00	No Limit
		EP071-SD: >C34 - C40 Fraction	----	5	mg/kg	<5	<5	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)	
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QC Lot: 2049811)										
EB1823888-020	OP2_42 / 0.0-0.5	EP080-SD: C6 - C10 Fraction	C6_C10	3	mg/kg	<3	<3	0.00	No Limit	
EP080-SD: BTEXN (QC Lot: 1968790)										
EB1823888-016	OP2_33 (0-0.5)	EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
		EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
		EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
		EP080-SD: meta- & para-Xylene	108-38-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
			106-42-3							
		EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
		EP080-SD: Total Xylenes	----	0.2	mg/kg	<0.5	<0.5	0.00	No Limit	
		EP080-SD: Naphthalene	91-20-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
EP080-SD: BTEXN (QC Lot: 2049811)										
EB1823888-020	OP2_42 / 0.0-0.5	EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
		EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
		EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
		EP080-SD: meta- & para-Xylene	108-38-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
			106-42-3							
		EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
		EP080-SD: Total Xylenes	----	0.2	mg/kg	<0.5	<0.5	0.00	No Limit	
		EP080-SD: Naphthalene	91-20-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit	
EP090: Organotin Compounds (QC Lot: 1968803)										
EB1823888-016	OP2_33 (0-0.5)	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	0.00	No Limit	
		EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	<1	0.00	No Limit	
		EP090: Dibutyltin	1002-53-5	1	µgSn/kg	<1	<1	0.00	No Limit	
EP090: Organotin Compounds (QC Lot: 1968838)										
EB1823888-004	OP2_44 (0-0.5)	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	3.6	1.9	59.0	No Limit	
		EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	<1	0.00	No Limit	
		EP090: Dibutyltin	1002-53-5	1	µgSn/kg	1	1	0.00	No Limit	
EB1823888-014	OP2_36 (0.5-1.0)	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	3.4	3.6	6.13	No Limit	
		EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	<1	0.00	No Limit	
		EP090: Dibutyltin	1002-53-5	1	µgSn/kg	2	2	0.00	No Limit	
EP090: Organotin Compounds (QC Lot: 2049812)										
EB1823888-020	OP2_42 / 0.0-0.5	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	6.0	3.9	42.3	0% - 50%	
		EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	<1	0.00	No Limit	
		EP090: Dibutyltin	1002-53-5	1	µgSn/kg	1	1	0.00	No Limit	
EP131A: Organochlorine Pesticides (QC Lot: 1972855)										
EB1823888-016	OP2_33 (0-0.5)	EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	0.00	No Limit	
		EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.50	<0.50	0.00	No Limit	
		EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.50	<0.50	0.00	No Limit	
		EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.50	<0.50	0.00	No Limit	



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP131A: Organochlorine Pesticides (QC Lot: 1972855) - continued									
EB1823888-016	OP2_33 (0-0.5)	EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: 4.4'-DDD	72-54-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: 4.4'-DDE	72-55-9	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: 4.4'-DDT	50-29-3	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	<0.50	0.00	No Limit		
EP131A: Organochlorine Pesticides (QC Lot: 2050937)									
EB1823888-020	OP2_42 / 0.0-0.5	EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	0.00	No Limit
		EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: 4.4'-DDD	72-54-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: 4.4'-DDE	72-55-9	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: 4.4'-DDT	50-29-3	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	<0.50	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP131A: Organochlorine Pesticides (QC Lot: 2050937) - continued									
EB1823888-020	OP2_42 / 0.0-0.5	EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1972856)									
EB1823888-016	OP2_33 (0-0.5)	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	12	13	0.00	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	37	50	29.5	0% - 50%
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	38	45	17.2	0% - 50%
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	25	32	25.2	No Limit
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	22	25	10.1	No Limit
		EP132B-SD: Benzo(b+j)fluoranthene	205-99-2	4	µg/kg	26	29	11.7	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	15	21	31.9	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	15	18	13.4	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	26	30	13.4	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	9	10	0.00	No Limit
		EP132B-SD: Benzo(g,h,i)perylene	191-24-2	4	µg/kg	16	19	14.9	No Limit
		EP132B-SD: Dibenz(a,h)anthracene	53-70-3	4	µg/kg	4	4	0.00	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	15	17	14.0	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	260	313	18.5	0% - 20%
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.00	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.00	No Limit
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	0.00	No Limit		
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2050948)									
EB1823888-020	OP2_42 / 0.0-0.5	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	5	<4	26.7	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	10	9	11.6	No Limit
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	11	9	11.9	No Limit
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	7	7	0.00	No Limit
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	5	6	21.2	No Limit

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 Work Order : EB1823888 Amendment 3
 Client : ADVISIAN PTY LTD
 Project : 301001.02018 - Port of Mackay Sediment Sampling



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2050948) - continued									
EB1823888-020	OP2_42 / 0.0-0.5	EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	6	10	41.1	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	4	5	29.7	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	6	8	21.8	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	5	4	0.00	No Limit
		EP132B-SD: Benzo(g,h,i)perylene	191-24-2	4	µg/kg	5	6	20.3	No Limit
		EP132B-SD: Dibenz(a,h)anthracene	53-70-3	4	µg/kg	<4	<4	0.00	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	4	5	27.4	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	68	69	1.46	0% - 50%
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.00	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.00	No Limit
		EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	0.00	No Limit



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

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

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 1968797)									
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.0555 mg/kg	98.5	70	130	
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 1968837)									
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.0555 mg/kg	94.6	70	130	
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 2049807)									
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.0555 mg/kg	97.3	70	130	
EA010: Conductivity (1:5) (QCLot: 1968828)									
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	99.8	97	103	
EA033-A: Actual Acidity (QCLot: 2004237)									
EA033: pH KCl (23A)	----	----	pH Unit	----	4.6 pH Unit	95.6	70	130	
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	17.7 mole H+ / t	108	70	130	
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----	
EA033-B: Potential Acidity (QCLot: 2004237)									
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.25483 % S	90.2	70	130	
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----	
EA033-C: Acid Neutralising Capacity (QCLot: 2004237)									
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	10 % CaCO3	104	70	130	
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----	
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----	
ED045G: Chloride by Discrete Analyser (QCLot: 2019038)									
ED045G: Chloride	16887-00-6	10	mg/kg	<10 <10	50 mg/kg 5000 mg/kg	104 105	83 83	119 119	
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1968796)									
EG020-SD: Arsenic	7440-38-2	1	mg/kg	<1.00	116 mg/kg	104	80	124	
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	0.8 mg/kg	102	87	122	
EG020-SD: Chromium	7440-47-3	1	mg/kg	<1.0	20.5 mg/kg	99.6	79	129	
EG020-SD: Copper	7440-50-8	1	mg/kg	<1.0	52.9 mg/kg	97.1	85	118	
EG020-SD: Lead	7439-92-1	1	mg/kg	<1.0	66.3 mg/kg	97.0	86	119	
EG020-SD: Nickel	7440-02-0	1	mg/kg	<1.0	14.7 mg/kg	101	77	123	
EG020-SD: Zinc	7440-66-6	1	mg/kg	<1.0	183 mg/kg	71.7	71	127	
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1968836)									
EG020-SD: Arsenic	7440-38-2	1	mg/kg	<1.00	116 mg/kg	110	80	124	
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	0.8 mg/kg	104	87	122	
EG020-SD: Chromium	7440-47-3	1	mg/kg	<1.0	20.5 mg/kg	114	79	129	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike	Spike Recovery (%)		Recovery Limits (%)	
					Concentration	LCS	Low	High	
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1968836) - continued									
EG020-SD: Copper	7440-50-8	1	mg/kg	<1.0	52.9 mg/kg	104	85	118	
EG020-SD: Lead	7439-92-1	1	mg/kg	<1.0	66.3 mg/kg	100	86	119	
EG020-SD: Nickel	7440-02-0	1	mg/kg	<1.0	14.7 mg/kg	110	77	123	
EG020-SD: Zinc	7440-66-6	1	mg/kg	<1.0	183 mg/kg	73.5	71	127	
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 2049806)									
EG020-SD: Arsenic	7440-38-2	1	mg/kg	<1.00	116 mg/kg	98.6	80	124	
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	0.8 mg/kg	101	87	122	
EG020-SD: Chromium	7440-47-3	1	mg/kg	<1.0	20.5 mg/kg	105	79	129	
EG020-SD: Copper	7440-50-8	1	mg/kg	<1.0	52.9 mg/kg	100	85	118	
EG020-SD: Lead	7439-92-1	1	mg/kg	<1.0	66.3 mg/kg	116	86	119	
EG020-SD: Nickel	7440-02-0	1	mg/kg	<1.0	14.7 mg/kg	99.1	77	123	
EG020-SD: Zinc	7440-66-6	1	mg/kg	<1.0	112 mg/kg	118	71	127	
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 1985740)									
EP003: Total Organic Carbon	----	0.02	%	<0.02	17.6 %	100	70	130	
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 2056778)									
EP003: Total Organic Carbon	----	0.02	%	<0.02	0.44 %	100	70	130	
EP004: Organic Matter (QCLot: 1968422)									
EP004: Organic Matter	----	0.5	%	<0.5	80 %	100	83	115	
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1968790)									
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	16 mg/kg	98.4	66	120	
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1968804)									
EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	157 mg/kg	95.4	43	126	
EP071-SD: C15 - C28 Fraction	----	3	mg/kg	<3	245 mg/kg	108	66	140	
EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	----	----	----	----	
EP071-SD: C10 - C36 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----	
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 2049809)									
EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	157 mg/kg	107	43	126	
EP071-SD: C15 - C28 Fraction	----	3	mg/kg	<3	245 mg/kg	108	66	140	
EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	----	----	----	----	
EP071-SD: C10 - C36 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----	
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 2049811)									
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	16 mg/kg	75.8	66	120	
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 1968790)									
EP080-SD: C6 - C10 Fraction	C6_C10	3	mg/kg	<3	18.5 mg/kg	98.3	66	119	
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 1968804)									
EP071-SD: >C10 - C16 Fraction	----	3	mg/kg	<3	227 mg/kg	100.0	40	134	
EP071-SD: >C16 - C34 Fraction	----	3	mg/kg	<3	162 mg/kg	110	66	136	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 1968804) - continued								
EP071-SD: >C34 - C40 Fraction	----	5	mg/kg	<5	----	----	----	----
EP071-SD: >C10 - C40 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 2049809)								
EP071-SD: >C10 - C16 Fraction	----	3	mg/kg	<3	227 mg/kg	106	40	134
EP071-SD: >C16 - C34 Fraction	----	3	mg/kg	<3	162 mg/kg	112	66	136
EP071-SD: >C34 - C40 Fraction	----	5	mg/kg	<5	----	----	----	----
EP071-SD: >C10 - C40 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 2049811)								
EP080-SD: C6 - C10 Fraction	C6_C10	3	mg/kg	<3	18.5 mg/kg	73.2	66	119
EP080-SD: BTEXN (QCLot: 1968790)								
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	95.0	73	105
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	1 mg/kg	100	73	105
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	1 mg/kg	99.6	67	104
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	2 mg/kg	94.6	66	106
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	1 mg/kg	101	68	105
EP080-SD: Total Xylenes	----	0.2	mg/kg	<0.2	----	----	----	----
EP080-SD: Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----
EP080-SD: Naphthalene	91-20-3	0.2	mg/kg	<0.2	1 mg/kg	95.6	72	115
EP080-SD: BTEXN (QCLot: 2049811)								
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	81.1	73	105
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	1 mg/kg	77.7	73	105
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	1 mg/kg	76.2	67	104
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	2 mg/kg	77.0	66	106
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	1 mg/kg	77.7	68	105
EP080-SD: Total Xylenes	----	0.2	mg/kg	<0.2	----	----	----	----
EP080-SD: Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----
EP080-SD: Naphthalene	91-20-3	0.2	mg/kg	<0.2	1 mg/kg	80.1	72	115
EP090: Organotin Compounds (QCLot: 1968803)								
EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	1.25 µgSn/kg	110	36	128
EP090: Dibutyltin	1002-53-5	1	µgSn/kg	<1	1.25 µgSn/kg	92.5	42	132
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	71.3	52	139
EP090: Organotin Compounds (QCLot: 1968838)								
EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	1.25 µgSn/kg	125	36	128
EP090: Dibutyltin	1002-53-5	1	µgSn/kg	<1	1.25 µgSn/kg	125	42	132
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	103	52	139
EP090: Organotin Compounds (QCLot: 2049812)								



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike	Spike Recovery (%)		Recovery Limits (%)	
					Concentration	LCS	Low	High	
EP090: Organotin Compounds (QCLot: 2049812) - continued									
EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	1.25 µgSn/kg	# 156	36	128	
EP090: Dibutyltin	1002-53-5	1	µgSn/kg	<1	1.25 µgSn/kg	127	42	132	
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	112	52	139	
EP131A: Organochlorine Pesticides (QCLot: 1972855)									
EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	5 µg/kg	77.9	38	139	
EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	5 µg/kg	91.9	18	136	
EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	5 µg/kg	85.0	31	131	
EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	5 µg/kg	119	37	140	
EP131A: 4,4'-DDD	72-54-8	0.5	µg/kg	<0.50	5 µg/kg	54.1	26	141	
EP131A: 4,4'-DDE	72-55-9	0.5	µg/kg	<0.50	5 µg/kg	66.7	35	129	
EP131A: 4,4'-DDT	50-29-3	0.5	µg/kg	<0.50	5 µg/kg	94.7	23	138	
EP131A: Sum of DDD + DDE + DDT	72-54-8/72-5-9/50-2	0.5	µg/kg	<0.50	----	----	----	----	
EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	5 µg/kg	107	30	140	
EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	5 µg/kg	81.4	38	140	
EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	5 µg/kg	92.4	32	152	
EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	5 µg/kg	125	36	155	
EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	----	----	----	----	
EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	5 µg/kg	142	26	158	
EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	5 µg/kg	94.2	20	118	
EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	5 µg/kg	81.9	13	135	
EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	5 µg/kg	114	39	155	
EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	5 µg/kg	78.2	34	148	
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	5 µg/kg	49.4	26	152	
EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	5 µg/kg	67.0	31	137	
EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	5 µg/kg	148	36	152	
EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	5 µg/kg	52.9	36	142	
EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	5 µg/kg	74.0	30	138	
EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.25	----	----	----	----	
EP131A: Organochlorine Pesticides (QCLot: 2050937)									
EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	5 µg/kg	50.8	38	139	
EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	5 µg/kg	50.2	18	136	
EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	5 µg/kg	56.6	31	131	
EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	5 µg/kg	56.2	37	140	
EP131A: 4,4'-DDD	72-54-8	0.5	µg/kg	<0.50	5 µg/kg	29.8	26	141	
EP131A: 4,4'-DDE	72-55-9	0.5	µg/kg	<0.50	5 µg/kg	41.2	35	129	
EP131A: 4,4'-DDT	50-29-3	0.5	µg/kg	<0.50	5 µg/kg	67.3	23	138	
EP131A: Sum of DDD + DDE + DDT	72-54-8/72-5-9/50-2	0.5	µg/kg	<0.50	----	----	----	----	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike	Spike Recovery (%)		Recovery Limits (%)	
					Concentration	LCS	Low	High	
EP131A: Organochlorine Pesticides (QCLot: 2050937) - continued									
EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	5 µg/kg	52.3	30	140	
EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	5 µg/kg	52.6	38	140	
EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	5 µg/kg	53.4	32	152	
EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	5 µg/kg	64.6	36	155	
EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	----	----	----	----	
EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	5 µg/kg	68.0	26	158	
EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	5 µg/kg	60.7	20	118	
EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	5 µg/kg	51.7	13	135	
EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	5 µg/kg	60.1	39	155	
EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	5 µg/kg	54.7	34	148	
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	5 µg/kg	33.5	26	152	
EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	5 µg/kg	47.2	31	137	
EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	5 µg/kg	88.6	36	152	
EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	5 µg/kg	38.5	36	142	
EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	5 µg/kg	44.5	30	138	
EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.25	----	----	----	----	
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1972856)									
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	97.0	63	129	
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	25 µg/kg	121	64	128	
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	94.7	65	129	
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	92.5	68	132	
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	92.7	68	124	
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	89.7	64	134	
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	91.4	65	131	
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	89.8	64	130	
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	88.7	67	133	
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	96.6	62	130	
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	88.6	65	133	
EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	<4	25 µg/kg	90.7	68	120	
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	87.3	61	133	
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	25 µg/kg	86.6	63	127	
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	90.7	66	118	
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	25 µg/kg	89.0	69	119	
EP132B-SD: Benzo(g,h,i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	93.2	66	120	
EP132B-SD: Dibenz(a,h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	91.8	64	122	
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	92.9	64	120	
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	25 µg/kg	94.8	68	136	
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----	



Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 2050948)								
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	83.8	63	129
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	25 µg/kg	97.1	64	128
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	100	65	129
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	97.4	68	132
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	98.9	68	124
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	104	64	134
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	92.3	65	131
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	98.6	64	130
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	98.9	67	133
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	100	62	130
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	101	65	133
EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	<4	25 µg/kg	104	68	120
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	100.0	61	133
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	25 µg/kg	107	63	127
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	109	66	118
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	25 µg/kg	103	69	119
EP132B-SD: Benzo(g,h,i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	102	66	120
EP132B-SD: Dibenz(a,h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	94.6	64	122
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	97.6	64	120
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	25 µg/kg	89.4	68	136
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%)	Recovery Limits (%)	
					MS	Low	High
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 1968797)							
EB1823888-017	D7	EG035T-LL: Mercury	7439-97-6	0.5 mg/kg	83.2	70	130
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 1968837)							
EB1823888-005	OP2_44 (0.5-1.0)	EG035T-LL: Mercury	7439-97-6	0.5 mg/kg	90.8	70	130
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 2049807)							
EB1823888-021	OP2_42 / 0.5-1.0	EG035T-LL: Mercury	7439-97-6	0.5 mg/kg	92.6	70	130
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1968796)							
EB1823888-017	D7	EG020-SD: Arsenic	7440-38-2	50 mg/kg	94.6	70	130



Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1968796) - continued							
EB1823888-017	D7	EG020-SD: Cadmium	7440-43-9	25 mg/kg	91.8	70	130
		EG020-SD: Chromium	7440-47-3	50 mg/kg	109	70	130
		EG020-SD: Copper	7440-50-8	50 mg/kg	96.4	70	130
		EG020-SD: Lead	7439-92-1	50 mg/kg	98.7	70	130
		EG020-SD: Nickel	7440-02-0	50 mg/kg	96.4	70	130
		EG020-SD: Zinc	7440-66-6	50 mg/kg	87.0	70	130
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1968836)							
EB1823888-005	OP2_44 (0.5-1.0)	EG020-SD: Arsenic	7440-38-2	50 mg/kg	104	70	130
		EG020-SD: Cadmium	7440-43-9	25 mg/kg	97.5	70	130
		EG020-SD: Chromium	7440-47-3	50 mg/kg	118	70	130
		EG020-SD: Copper	7440-50-8	50 mg/kg	105	70	130
		EG020-SD: Lead	7439-92-1	50 mg/kg	110	70	130
		EG020-SD: Nickel	7440-02-0	50 mg/kg	104	70	130
		EG020-SD: Zinc	7440-66-6	50 mg/kg	127	70	130
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 2049806)							
EB1823888-021	OP2_42 / 0.5-1.0	EG020-SD: Arsenic	7440-38-2	50 mg/kg	94.2	70	130
		EG020-SD: Cadmium	7440-43-9	25 mg/kg	96.8	70	130
		EG020-SD: Chromium	7440-47-3	50 mg/kg	105	70	130
		EG020-SD: Copper	7440-50-8	50 mg/kg	102	70	130
		EG020-SD: Lead	7439-92-1	50 mg/kg	128	70	130
		EG020-SD: Nickel	7440-02-0	50 mg/kg	103	70	130
		EG020-SD: Zinc	7440-66-6	50 mg/kg	85.5	70	130
EP004: Organic Matter (QCLot: 1968422)							
EB1823888-013	OP2_36 (0-0.5)	EP004: Organic Matter	----	2 %	78.5	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1968790)							
EB1823888-017	D7	EP080-SD: C6 - C9 Fraction	----	8 mg/kg	71.5	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1968804)							
EB1823888-017	D7	EP071-SD: C10 - C14 Fraction	----	157 mg/kg	94.7	70	130
		EP071-SD: C15 - C28 Fraction	----	245 mg/kg	102	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 2049809)							
EB1823888-021	OP2_42 / 0.5-1.0	EP071-SD: C10 - C14 Fraction	----	157 mg/kg	100	70	130
		EP071-SD: C15 - C28 Fraction	----	245 mg/kg	106	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 2049811)							
EB1823888-021	OP2_42 / 0.5-1.0	EP080-SD: C6 - C9 Fraction	----	8 mg/kg	82.0	70	130
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 1968790)							
EB1823888-017	D7	EP080-SD: C6 - C10 Fraction	C6_C10	8 mg/kg	72.4	70	130



Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 1968804)							
EB1823888-017	D7	EP071-SD: >C10 - C16 Fraction	----	227 mg/kg	97.2	70	130
		EP071-SD: >C16 - C34 Fraction	----	162 mg/kg	104	70	130
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 2049809)							
EB1823888-021	OP2_42 / 0.5-1.0	EP071-SD: >C10 - C16 Fraction	----	227 mg/kg	101	70	130
		EP071-SD: >C16 - C34 Fraction	----	162 mg/kg	112	70	130
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 2049811)							
EB1823888-021	OP2_42 / 0.5-1.0	EP080-SD: C6 - C10 Fraction	C6_C10	8 mg/kg	83.4	70	130
EP080-SD: BTEXN (QCLot: 1968790)							
EB1823888-017	D7	EP080-SD: Benzene	71-43-2	2 mg/kg	71.9	70	130
		EP080-SD: Toluene	108-88-3	2 mg/kg	74.8	70	130
EP080-SD: BTEXN (QCLot: 2049811)							
EB1823888-021	OP2_42 / 0.5-1.0	EP080-SD: Benzene	71-43-2	2 mg/kg	77.0	70	130
		EP080-SD: Toluene	108-88-3	2 mg/kg	73.6	70	130
EP090: Organotin Compounds (QCLot: 1968803)							
EB1823888-017	D7	EP090: Monobutyltin	78763-54-9	1.25 µgSn/kg	# 27.0	35	130
		EP090: Dibutyltin	1002-53-5	1.25 µgSn/kg	104	20	130
		EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	90.7	20	130
EP090: Organotin Compounds (QCLot: 1968838)							
EB1823888-005	OP2_44 (0.5-1.0)	EP090: Monobutyltin	78763-54-9	1.25 µgSn/kg	# 7.90	35	130
		EP090: Dibutyltin	1002-53-5	1.25 µgSn/kg	# Not Determined	20	130
		EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	# Not Determined	20	130
EP090: Organotin Compounds (QCLot: 2049812)							
EB1823888-021	OP2_42 / 0.5-1.0	EP090: Monobutyltin	78763-54-9	1.25 µgSn/kg	# 18.4	35	130
		EP090: Dibutyltin	1002-53-5	1.25 µgSn/kg	81.0	20	130
		EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	63.8	20	130
EP131A: Organochlorine Pesticides (QCLot: 1972855)							
EB1823888-016	OP2_33 (0-0.5)	EP131A: Aldrin	309-00-2	5 µg/kg	65.6	23	153
		EP131A: alpha-BHC	319-84-6	5 µg/kg	81.7	18	156
		EP131A: beta-BHC	319-85-7	5 µg/kg	66.4	25	153
		EP131A: delta-BHC	319-86-8	5 µg/kg	103	25	147
		EP131A: 4.4'-DDD	72-54-8	5 µg/kg	46.1	26	150
		EP131A: 4.4'-DDE	72-55-9	5 µg/kg	83.7	31	125
		EP131A: 4.4'-DDT	50-29-3	5 µg/kg	99.4	23	163
		EP131A: Dieldrin	60-57-1	5 µg/kg	68.3	30	140



Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low High	
EP131A: Organochlorine Pesticides (QCLot: 1972855) - continued							
EB1823888-016	OP2_33 (0-0.5)	EP131A: alpha-Endosulfan	959-98-8	5 µg/kg	74.2	29	135
		EP131A: beta-Endosulfan	33213-65-9	5 µg/kg	91.2	23	141
		EP131A: Endosulfan sulfate	1031-07-8	5 µg/kg	117	16	156
		EP131A: Endrin	72-20-8	5 µg/kg	136	18	162
		EP131A: Endrin aldehyde	7421-93-4	5 µg/kg	61.6	20	116
		EP131A: Endrin ketone	53494-70-5	5 µg/kg	95.0	13	151
		EP131A: Heptachlor	76-44-8	5 µg/kg	87.0	24	170
		EP131A: Heptachlor epoxide	1024-57-3	5 µg/kg	59.8	28	140
		EP131A: Hexachlorobenzene (HCB)	118-74-1	5 µg/kg	54.0	18	144
		EP131A: gamma-BHC	58-89-9	5 µg/kg	74.9	22	158
		EP131A: Methoxychlor	72-43-5	5 µg/kg	154	24	158
		EP131A: cis-Chlordane	5103-71-9	5 µg/kg	48.2	27	139
		EP131A: trans-Chlordane	5103-74-2	5 µg/kg	49.9	30	138
EP131A: Organochlorine Pesticides (QCLot: 2050937)							
EB1823888-020	OP2_42 / 0.0-0.5	EP131A: Aldrin	309-00-2	5 µg/kg	61.1	23	153
		EP131A: alpha-BHC	319-84-6	5 µg/kg	52.8	18	156
		EP131A: beta-BHC	319-85-7	5 µg/kg	54.2	25	153
		EP131A: delta-BHC	319-86-8	5 µg/kg	67.9	25	147
		EP131A: 4.4'-DDD	72-54-8	5 µg/kg	65.0	26	150
		EP131A: 4.4'-DDE	72-55-9	5 µg/kg	55.5	31	125
		EP131A: 4.4'-DDT	50-29-3	5 µg/kg	49.8	23	163
		EP131A: Dieldrin	60-57-1	5 µg/kg	65.5	30	140
		EP131A: alpha-Endosulfan	959-98-8	5 µg/kg	59.9	29	135
		EP131A: beta-Endosulfan	33213-65-9	5 µg/kg	81.2	23	141
		EP131A: Endosulfan sulfate	1031-07-8	5 µg/kg	63.9	16	156
		EP131A: Endrin	72-20-8	5 µg/kg	82.2	18	162
		EP131A: Endrin aldehyde	7421-93-4	5 µg/kg	99.1	20	116
		EP131A: Endrin ketone	53494-70-5	5 µg/kg	60.6	13	151
		EP131A: Heptachlor	76-44-8	5 µg/kg	57.3	24	170
		EP131A: Heptachlor epoxide	1024-57-3	5 µg/kg	58.4	28	140
		EP131A: Hexachlorobenzene (HCB)	118-74-1	5 µg/kg	42.3	18	144
		EP131A: gamma-BHC	58-89-9	5 µg/kg	53.8	22	158
		EP131A: Methoxychlor	72-43-5	5 µg/kg	65.5	24	158
		EP131A: cis-Chlordane	5103-71-9	5 µg/kg	55.2	27	139
EP131A: trans-Chlordane	5103-74-2	5 µg/kg	63.7	30	138		
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1972856)							
EB1823888-016	OP2_33 (0-0.5)	EP132B-SD: Naphthalene	91-20-3	25 µg/kg	86.2	70	130
		EP132B-SD: 2-Methylnaphthalene	91-57-6	25 µg/kg	110	70	130
		EP132B-SD: Acenaphthylene	208-96-8	25 µg/kg	94.2	70	130



Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report				
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%)		
				Low	High			
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1972856) - continued								
EB1823888-016	OP2_33 (0-0.5)	EP132B-SD: Acenaphthene	83-32-9	25 µg/kg	84.9	70	130	
		EP132B-SD: Fluorene	86-73-7	25 µg/kg	85.1	70	130	
		EP132B-SD: Phenanthrene	85-01-8	25 µg/kg	70.2	70	130	
		EP132B-SD: Anthracene	120-12-7	25 µg/kg	85.3	70	130	
		EP132B-SD: Fluoranthene	206-44-0	25 µg/kg	71.7	70	130	
		EP132B-SD: Pyrene	129-00-0	25 µg/kg	94.2	70	130	
		EP132B-SD: Benz(a)anthracene	56-55-3	25 µg/kg	91.6	70	130	
		EP132B-SD: Chrysene	218-01-9	25 µg/kg	98.6	70	130	
		EP132B-SD: Benzo(b+j)fluoranthene	205-99-2	25 µg/kg	84.6	70	130	
			205-82-3					
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	25 µg/kg	96.9	70	130	
		EP132B-SD: Benzo(e)pyrene	192-97-2	25 µg/kg	90.7	70	130	
		EP132B-SD: Benzo(a)pyrene	50-32-8	25 µg/kg	79.4	70	130	
		EP132B-SD: Perylene	198-55-0	25 µg/kg	109	70	130	
		EP132B-SD: Benzo(g,h,i)perylene	191-24-2	25 µg/kg	105	70	130	
		EP132B-SD: Dibenz(a,h)anthracene	53-70-3	25 µg/kg	120	70	130	
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	25 µg/kg	109	70	130	
EP132B-SD: Coronene	191-07-1	25 µg/kg	110	70	130			
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 2050948)								
EB1823888-020	OP2_42 / 0.0-0.5	EP132B-SD: Naphthalene	91-20-3	25 µg/kg	101	70	130	
		EP132B-SD: 2-Methylnaphthalene	91-57-6	25 µg/kg	92.5	70	130	
		EP132B-SD: Acenaphthylene	208-96-8	25 µg/kg	115	70	130	
		EP132B-SD: Acenaphthene	83-32-9	25 µg/kg	95.2	70	130	
		EP132B-SD: Fluorene	86-73-7	25 µg/kg	102	70	130	
		EP132B-SD: Phenanthrene	85-01-8	25 µg/kg	100	70	130	
		EP132B-SD: Anthracene	120-12-7	25 µg/kg	109	70	130	
		EP132B-SD: Fluoranthene	206-44-0	25 µg/kg	128	70	130	
		EP132B-SD: Pyrene	129-00-0	25 µg/kg	110	70	130	
		EP132B-SD: Benz(a)anthracene	56-55-3	25 µg/kg	103	70	130	
		EP132B-SD: Chrysene	218-01-9	25 µg/kg	81.4	70	130	
		EP132B-SD: Benzo(b+j)fluoranthene	205-99-2	25 µg/kg	107	70	130	
			205-82-3					
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	25 µg/kg	89.4	70	130	
		EP132B-SD: Benzo(e)pyrene	192-97-2	25 µg/kg	97.5	70	130	
		EP132B-SD: Benzo(a)pyrene	50-32-8	25 µg/kg	123	70	130	
		EP132B-SD: Perylene	198-55-0	25 µg/kg	99.7	70	130	
		EP132B-SD: Benzo(g,h,i)perylene	191-24-2	25 µg/kg	109	70	130	
		EP132B-SD: Dibenz(a,h)anthracene	53-70-3	25 µg/kg	96.4	70	130	
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	25 µg/kg	112	70	130	

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 Work Order : EB1823888 Amendment 3
 Client : ADVISIAN PTY LTD
 Project : 301001.02018 - Port of Mackay Sediment Sampling



Sub-Matrix: **SOIL**

				<i>Matrix Spike (MS) Report</i>			
				<i>Spike</i>	<i>SpikeRecovery(%)</i>	<i>Recovery Limits (%)</i>	
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Method: Compound</i>	<i>CAS Number</i>	<i>Concentration</i>	<i>MS</i>	<i>Low</i>	<i>High</i>
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 2050948) - continued							
EB1823888-020	OP2_42 / 0.0-0.5	EP132B-SD: Coronene	191-07-1	25 µg/kg	104	70	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EB1823888	Page	: 1 of 14
Amendment	: 3		
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR BILL BOYLSON	Telephone	: +61 7 3552 8662
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Date Samples Received	: 03-Oct-2018
Site	:	Issue Date	: 29-Nov-2018
Sampler	: NICHOLAS BAINTON	No. of samples received	: 19
Order number	:	No. of samples analysed	: 19

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Laboratory Control outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

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



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG020-SD: Total Metals in Sediments by ICPMS	EB1823888--004	OP2_44 (0-0.5)	Lead	7439-92-1	62.5 %	0% - 50%	RPD exceeds LOR based limits
EG020-SD: Total Metals in Sediments by ICPMS	EB1823888--004	OP2_44 (0-0.5)	Zinc	7440-66-6	45.5 %	0% - 20%	RPD exceeds LOR based limits
EG020-SD: Total Metals in Sediments by ICPMS	EB1823888--014	OP2_36 (0.5-1.0)	Zinc	7440-66-6	22.3 %	0% - 20%	RPD exceeds LOR based limits
Laboratory Control Spike (LCS) Recoveries							
EP090: Organotin Compounds	QC-2049812-002	----	Monobutyltin	78763-54-9	156 %	36-128%	Recovery greater than upper control limit
Matrix Spike (MS) Recoveries							
EP090: Organotin Compounds	EB1823888--017	D7	Monobutyltin	78763-54-9	27.0 %	35-130%	Recovery less than lower data quality objective
EP090: Organotin Compounds	EB1823888--005	OP2_44 (0.5-1.0)	Monobutyltin	78763-54-9	7.90 %	35-130%	Recovery less than lower data quality objective
EP090: Organotin Compounds	EB1823888--021	OP2_42 / 0.5-1.0	Monobutyltin	78763-54-9	18.4 %	35-130%	Recovery less than lower data quality objective
EP090: Organotin Compounds	EB1823888--005	OP2_44 (0.5-1.0)	Dibutyltin	1002-53-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP090: Organotin Compounds	EB1823888--005	OP2_44 (0.5-1.0)	Tributyltin	56573-85-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	Extraction / Preparation			Analysis			
	Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved OP2_18 (0-0.5)		09-Oct-2018	03-Oct-2018	6	----	----	----
Soil Glass Jar - Unpreserved OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	09-Oct-2018	05-Oct-2018	4	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	----	----	----	21-Nov-2018	11-Oct-2018	41
ED045G: Chloride by Discrete Analyser							
Soil Glass Jar - Unpreserved OP2_18 (0-0.5)		06-Nov-2018	24-Oct-2018	13	----	----	----



Matrix: **SOIL**

Method Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
ED045G: Chloride by Discrete Analyser - Analysis Holding Time Compliance						
Soil Glass Jar - Unpreserved OP2_32 (0-0.5), OP2_36 (0.5-1.0), OP2_36 (0-0.5), OP2_36 (1.0-1.5)	06-Nov-2018	26-Oct-2018	11	----	----	----
EG035T: Total Recoverable Mercury by FIMS (Low Level)						
Soil Glass Jar - Unpreserved OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5, OP2_42 / 0.5-1.0,	23-Nov-2018	25-Oct-2018	29	28-Nov-2018	25-Oct-2018	34
EP003: Total Organic Carbon (TOC) in Soil						
Pulp Bag OP2_42 / 0.5-1.0, OP2_42 / 1.0-1.5	26-Nov-2018	25-Oct-2018	32	26-Nov-2018	25-Oct-2018	32
Snap Lock Bag OP2_42 / 0.0-0.5	26-Nov-2018	25-Oct-2018	32	26-Nov-2018	25-Oct-2018	32
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions						
Soil Glass Jar - Unpreserved OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5, OP2_42 / 0.5-1.0,	23-Oct-2018	11-Oct-2018	12	----	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons						
Soil Glass Jar - Unpreserved OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5, OP2_42 / 0.5-1.0,	23-Oct-2018	11-Oct-2018	12	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons						
Soil Glass Jar - Unpreserved OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5, OP2_42 / 0.5-1.0,	23-Oct-2018	11-Oct-2018	12	24-Oct-2018	11-Oct-2018	13
EP080-SD: BTEXN						
Soil Glass Jar - Unpreserved OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5, OP2_42 / 0.5-1.0,	23-Oct-2018	11-Oct-2018	12	24-Oct-2018	11-Oct-2018	13
EP090: Organotin Compounds						
Soil Glass Jar - Unpreserved OP2_42 / 0.5-1.0	01-Nov-2018	11-Oct-2018	21	----	----	----
Soil Glass Jar - Unpreserved OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	23-Oct-2018	11-Oct-2018	12	----	----	----
EP131A: Organochlorine Pesticides						
Soil Glass Jar - Unpreserved OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5, OP2_42 / 0.5-1.0,	30-Oct-2018	11-Oct-2018	19	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons						



Matrix: **SOIL**

Method Container / Client Sample ID(s)	Extraction / Preparation			Analysis			
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue	
EP132B: Polynuclear Aromatic Hydrocarbons - Analysis Holding Time Compliance							
Soil Glass Jar - Unpreserved OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	29-Oct-2018	11-Oct-2018	18	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010) OP2_18 (0-0.5)	26-Sep-2018	09-Oct-2018	03-Oct-2018	✖	09-Oct-2018	06-Nov-2018	✔	
Soil Glass Jar - Unpreserved (EA010) OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	28-Sep-2018	09-Oct-2018	05-Oct-2018	✖	09-Oct-2018	06-Nov-2018	✔
EA033-A: Actual Acidity								
Snap Lock Bag - frozen (EA033) OP2_18 (0-0.5)	26-Sep-2018	26-Oct-2018	26-Sep-2019	✔	26-Oct-2018	24-Jan-2019	✔	
Snap Lock Bag - frozen (EA033) OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	28-Sep-2018	26-Oct-2018	28-Sep-2019	✔	26-Oct-2018	24-Jan-2019	✔
EA033-B: Potential Acidity								
Snap Lock Bag - frozen (EA033) OP2_18 (0-0.5)	26-Sep-2018	26-Oct-2018	26-Sep-2019	✔	26-Oct-2018	24-Jan-2019	✔	
Snap Lock Bag - frozen (EA033) OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	28-Sep-2018	26-Oct-2018	28-Sep-2019	✔	26-Oct-2018	24-Jan-2019	✔
EA033-C: Acid Neutralising Capacity								
Snap Lock Bag - frozen (EA033) OP2_18 (0-0.5)	26-Sep-2018	26-Oct-2018	26-Sep-2019	✔	26-Oct-2018	24-Jan-2019	✔	
Snap Lock Bag - frozen (EA033) OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	28-Sep-2018	26-Oct-2018	28-Sep-2019	✔	26-Oct-2018	24-Jan-2019	✔



Matrix: SOIL

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA033-D: Retained Acidity								
Snap Lock Bag - frozen (EA033) OP2_18 (0-0.5)	26-Sep-2018	26-Oct-2018	26-Sep-2019	✓	26-Oct-2018	24-Jan-2019	✓	
Snap Lock Bag - frozen (EA033) OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	28-Sep-2018	26-Oct-2018	28-Sep-2019	✓	26-Oct-2018	24-Jan-2019	✓
EA033-E: Acid Base Accounting								
Snap Lock Bag - frozen (EA033) OP2_18 (0-0.5)	26-Sep-2018	26-Oct-2018	26-Sep-2019	✓	26-Oct-2018	24-Jan-2019	✓	
Snap Lock Bag - frozen (EA033) OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	28-Sep-2018	26-Oct-2018	28-Sep-2019	✓	26-Oct-2018	24-Jan-2019	✓
EA037: Ass Field Screening Analysis								
Snap Lock Bag - frozen (EA037) OP2_18 (0-0.5)	26-Sep-2018	10-Oct-2018	25-Mar-2019	✓	10-Oct-2018	25-Mar-2019	✓	
Snap Lock Bag - frozen (EA037) OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	28-Sep-2018	10-Oct-2018	27-Mar-2019	✓	10-Oct-2018	27-Mar-2019	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) OP2_18 (0-0.5)	26-Sep-2018	----	----	----	08-Oct-2018	10-Oct-2018	✓	
Soil Glass Jar - Unpreserved (EA055) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	27-Sep-2018	----	----	----	21-Nov-2018	11-Oct-2018	*
Soil Glass Jar - Unpreserved (EA055) OP2_44 (0-0.5), OP2-45 (0-0.5), OP2-45 (1.0-1.5), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T3, OP2_36 (0.5-1.0), OP2_33 (0-0.5), OP2_21 (0-0.5)	OP2_44 (0.5-1.0), OP2-45 (0.5-1.0), OP2_32 (0-0.5), OP2_38 (0-0.5) T2, OP2_36 (0-0.5), OP2_36 (1.0-1.5), D7,	28-Sep-2018	----	----	----	08-Oct-2018	12-Oct-2018	✓
EA150: Particle Sizing								
Snap Lock Bag (EA150H) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	27-Sep-2018	----	----	----	27-Nov-2018	26-Mar-2019	✓
Snap Lock Bag (EA150H) OP2_44 (0-0.5), OP2-45 (0-0.5), OP2-45 (1.0-1.5), OP2_38 (0-0.5) T2, OP2_21 (0-0.5)	OP2_44 (0.5-1.0), OP2-45 (0.5-1.0), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T3,	28-Sep-2018	----	----	----	19-Oct-2018	27-Mar-2019	✓



Matrix: SOIL

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA150: Soil Classification based on Particle Size								
Snap Lock Bag (EA150H) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	27-Sep-2018	----	----	----	27-Nov-2018	26-Mar-2019	✔
Snap Lock Bag (EA150H) OP2_44 (0-0.5), OP2-45 (0-0.5), OP2-45 (1.0-1.5), OP2_38 (0-0.5) T2, OP2_21 (0-0.5)	OP2_44 (0.5-1.0), OP2-45 (0.5-1.0), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T3,	28-Sep-2018	----	----	----	19-Oct-2018	27-Mar-2019	✔
EA151: Settleability 10%								
Snap Lock Bag (EA151-10) OP2_44 (0-0.5), OP2-45 (0-0.5), OP2-45 (1.0-1.5), OP2_38 (0-0.5) T2, OP2_21 (0-0.5)	OP2_44 (0.5-1.0), OP2-45 (0.5-1.0), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T3,	28-Sep-2018	----	----	----	19-Oct-2018	27-Mar-2019	✔
EA151: Settleability 20%								
Snap Lock Bag (EA151-20) OP2_44 (0-0.5), OP2-45 (0-0.5), OP2-45 (1.0-1.5), OP2_38 (0-0.5) T2, OP2_21 (0-0.5)	OP2_44 (0.5-1.0), OP2-45 (0.5-1.0), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T3,	28-Sep-2018	----	----	----	19-Oct-2018	27-Mar-2019	✔
EA152: Soil Particle Density								
Snap Lock Bag (EA152) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	27-Sep-2018	----	----	----	27-Nov-2018	26-Mar-2019	✔
Snap Lock Bag (EA152) OP2_44 (0-0.5), OP2-45 (0-0.5), OP2-45 (1.0-1.5), OP2_38 (0-0.5) T2, OP2_21 (0-0.5)	OP2_44 (0.5-1.0), OP2-45 (0.5-1.0), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T3,	28-Sep-2018	----	----	----	19-Oct-2018	27-Mar-2019	✔
ED045G: Chloride by Discrete Analyser								
Soil Glass Jar - Unpreserved (ED045G) OP2_18 (0-0.5)		26-Sep-2018	06-Nov-2018	24-Oct-2018	✖	06-Nov-2018	04-Dec-2018	✔
Soil Glass Jar - Unpreserved (ED045G) OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	28-Sep-2018	06-Nov-2018	26-Oct-2018	✖	06-Nov-2018	04-Dec-2018	✔



Matrix: SOIL

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EG020-SD: Total Metals in Sediments by ICPMS								
Soil Glass Jar - Unpreserved (EG020-SD) OP2_18 (0-0.5)	26-Sep-2018	08-Oct-2018	25-Mar-2019	✔	08-Oct-2018	25-Mar-2019	✔	
Soil Glass Jar - Unpreserved (EG020-SD) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	27-Sep-2018	23-Nov-2018	26-Mar-2019	✔	28-Nov-2018	26-Mar-2019	✔	
Soil Glass Jar - Unpreserved (EG020-SD) OP2_44 (0-0.5), OP2-45 (0-0.5), OP2-45 (1.0-1.5), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T3, OP2_36 (0.5-1.0), OP2_21 (0-0.5)	OP2_44 (0.5-1.0), OP2-45 (0.5-1.0), OP2_32 (0-0.5), OP2_38 (0-0.5) T2, OP2_36 (0-0.5), OP2_36 (1.0-1.5),	28-Sep-2018	08-Oct-2018	27-Mar-2019	✔	08-Oct-2018	27-Mar-2019	✔
Soil Glass Jar - Unpreserved (EG020-SD) OP2_33 (0-0.5),	D7	28-Sep-2018	08-Oct-2018	27-Mar-2019	✔	09-Oct-2018	27-Mar-2019	✔
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T-LL) OP2_18 (0-0.5)	26-Sep-2018	08-Oct-2018	24-Oct-2018	✔	08-Oct-2018	24-Oct-2018	✔	
Soil Glass Jar - Unpreserved (EG035T-LL) OP2_44 (0-0.5), OP2-45 (0-0.5), OP2-45 (1.0-1.5), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T3, OP2_36 (0.5-1.0), OP2_21 (0-0.5)	OP2_44 (0.5-1.0), OP2-45 (0.5-1.0), OP2_32 (0-0.5), OP2_38 (0-0.5) T2, OP2_36 (0-0.5), OP2_36 (1.0-1.5),	28-Sep-2018	08-Oct-2018	26-Oct-2018	✔	08-Oct-2018	26-Oct-2018	✔
Soil Glass Jar - Unpreserved (EG035T-LL) OP2_33 (0-0.5),	D7	28-Sep-2018	08-Oct-2018	26-Oct-2018	✔	09-Oct-2018	26-Oct-2018	✔
EG035T: Total Recoverable Mercury by FIMS (Low Level)								
Soil Glass Jar - Unpreserved (EG035T-LL) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	27-Sep-2018	23-Nov-2018	25-Oct-2018	✖	28-Nov-2018	25-Oct-2018	✖



Matrix: SOIL

Evaluation: ✘ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP003: Total Organic Carbon (TOC) in Soil								
Pulp Bag (EP003) OP2_18 (0-0.5)	26-Sep-2018	17-Oct-2018	24-Oct-2018	✔	17-Oct-2018	24-Oct-2018	✔	
Pulp Bag (EP003) OP2_42 / 0.5-1.0,	OP2_42 / 1.0-1.5	27-Sep-2018	26-Nov-2018	25-Oct-2018	✘	26-Nov-2018	25-Oct-2018	✘
Pulp Bag (EP003) OP2_44 (0-0.5), OP2-45 (0-0.5), OP2-45 (1.0-1.5), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T3, OP2_36 (0.5-1.0), OP2_33 (0-0.5), OP2_21 (0-0.5)	OP2_44 (0.5-1.0), OP2-45 (0.5-1.0), OP2_32 (0-0.5), OP2_38 (0-0.5) T2, OP2_36 (0-0.5), OP2_36 (1.0-1.5), D7,	28-Sep-2018	17-Oct-2018	26-Oct-2018	✔	17-Oct-2018	26-Oct-2018	✔
Snap Lock Bag (EP003) OP2_42 / 0.0-0.5		27-Sep-2018	26-Nov-2018	25-Oct-2018	✘	26-Nov-2018	25-Oct-2018	✘
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004) OP2_18 (0-0.5)		26-Sep-2018	10-Oct-2018	24-Oct-2018	✔	10-Oct-2018	24-Oct-2018	✔
Soil Glass Jar - Unpreserved (EP004) OP2_32 (0-0.5), OP2_36 (0.5-1.0),	OP2_36 (0-0.5), OP2_36 (1.0-1.5)	28-Sep-2018	10-Oct-2018	26-Oct-2018	✔	10-Oct-2018	26-Oct-2018	✔
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP071-SD) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	24-Oct-2018	02-Dec-2018	✔
Soil Glass Jar - Unpreserved (EP071-SD) OP2_33 (0-0.5),	D7	28-Sep-2018	08-Oct-2018	12-Oct-2018	✔	10-Oct-2018	17-Nov-2018	✔



Matrix: SOIL

Evaluation: ✘ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080-SD) OP2_42 / 0.0-0.5	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	24-Oct-2018	11-Oct-2018	✘	
Soil Glass Jar - Unpreserved (EP071-SD) OP2_42 / 0.0-0.5	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	24-Oct-2018	02-Dec-2018	✔	
Soil Glass Jar - Unpreserved (EP080-SD) OP2_42 / 0.5-1.0	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	24-Oct-2018	11-Oct-2018	✘	
Soil Glass Jar - Unpreserved (EP071-SD) OP2_42 / 0.5-1.0	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	24-Oct-2018	02-Dec-2018	✔	
Soil Glass Jar - Unpreserved (EP080-SD) OP2_42 / 1.0-1.5	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	24-Oct-2018	11-Oct-2018	✘	
Soil Glass Jar - Unpreserved (EP071-SD) OP2_42 / 1.0-1.5	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	24-Oct-2018	02-Dec-2018	✔	
Soil Glass Jar - Unpreserved (EP080-SD) OP2_33 (0-0.5), D7	28-Sep-2018	08-Oct-2018	12-Oct-2018	✔	08-Oct-2018	12-Oct-2018	✔	
Soil Glass Jar - Unpreserved (EP071-SD) OP2_33 (0-0.5), D7	28-Sep-2018	08-Oct-2018	12-Oct-2018	✔	10-Oct-2018	17-Nov-2018	✔	
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080-SD) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	24-Oct-2018	11-Oct-2018	✘
Soil Glass Jar - Unpreserved (EP080-SD) OP2_33 (0-0.5), D7	D7	28-Sep-2018	08-Oct-2018	12-Oct-2018	✔	08-Oct-2018	12-Oct-2018	✔
EP080-SD: BTEXN								
Soil Glass Jar - Unpreserved (EP080-SD) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	OP2_42 / 0.5-1.0,	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	24-Oct-2018	11-Oct-2018	✘
Soil Glass Jar - Unpreserved (EP080-SD) OP2_33 (0-0.5), D7	D7	28-Sep-2018	08-Oct-2018	12-Oct-2018	✔	08-Oct-2018	12-Oct-2018	✔



Matrix: SOIL

Evaluation: ✘ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP090: Organotin Compounds							
Soil Glass Jar - Unpreserved (EP090) OP2_18 (0-0.5)	26-Sep-2018	08-Oct-2018	10-Oct-2018	✔	16-Oct-2018	17-Nov-2018	✔
Soil Glass Jar - Unpreserved (EP090) OP2_42 / 0.5-1.0	27-Sep-2018	01-Nov-2018	11-Oct-2018	✘	01-Nov-2018	11-Dec-2018	✔
Soil Glass Jar - Unpreserved (EP090) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	27-Sep-2018	23-Oct-2018	11-Oct-2018	✘	25-Oct-2018	02-Dec-2018	✔
Soil Glass Jar - Unpreserved (EP090) OP2_33 (0-0.5), D7	28-Sep-2018	08-Oct-2018	12-Oct-2018	✔	10-Oct-2018	17-Nov-2018	✔
Soil Glass Jar - Unpreserved (EP090) OP2_44 (0-0.5), OP2_44 (0.5-1.0), OP2-45 (0-0.5), OP2-45 (0.5-1.0), OP2-45 (1.0-1.5), OP2_32 (0-0.5), OP2_38 (0-0.5) T1, OP2_38 (0-0.5) T2, OP2_38 (0-0.5) T3, OP2_36 (0-0.5), OP2_36 (0.5-1.0), OP2_36 (1.0-1.5), OP2_21 (0-0.5)	28-Sep-2018	08-Oct-2018	12-Oct-2018	✔	16-Oct-2018	17-Nov-2018	✔
EP131A: Organochlorine Pesticides							
Soil Glass Jar - Unpreserved (EP131A) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	27-Sep-2018	30-Oct-2018	11-Oct-2018	✘	23-Nov-2018	09-Dec-2018	✔
Soil Glass Jar - Unpreserved (EP131A) OP2_33 (0-0.5), D7	28-Sep-2018	10-Oct-2018	12-Oct-2018	✔	15-Oct-2018	19-Nov-2018	✔
EP132B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP132B-SD) OP2_42 / 0.0-0.5, OP2_42 / 1.0-1.5	27-Sep-2018	29-Oct-2018	11-Oct-2018	✘	23-Nov-2018	08-Dec-2018	✔
Soil Glass Jar - Unpreserved (EP132B-SD) OP2_33 (0-0.5), D7	28-Sep-2018	11-Oct-2018	12-Oct-2018	✔	15-Oct-2018	20-Nov-2018	✔



Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
ASS Field Screening Analysis	EA037	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	4	27	14.81	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organochlorine Pesticides (Ultra-trace)	EP131A	2	9	22.22	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	4	19	21.05	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	5	40.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	4	19	21.05	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	4	19	21.05	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	3	23	13.04	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	2	5	40.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	2	5	40.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chloride Soluble By Discrete Analyser	ED045G	2	5	40.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organochlorine Pesticides (Ultra-trace)	EP131A	2	9	22.22	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	3	19	15.79	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	5	40.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	3	19	15.79	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	3	19	15.79	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	2	5	40.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	2	5	40.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride Soluble By Discrete Analyser	ED045G	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organochlorine Pesticides (Ultra-trace)	EP131A	2	9	22.22	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	3	19	15.79	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	5	40.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	3	19	15.79	5.00	✓	NEPM 2013 B3 & ALS QC Standard

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 Work Order : EB1823888 Amendment 3
 Client : ADVISIAN PTY LTD
 Project : 301001.02018 - Port of Mackay Sediment Sampling



Matrix: **SOIL**

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

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Analytical Methods							
Method Blanks (MB) - Continued							
Total Metals in Sediments by ICPMS	EG020-SD	3	19	15.79	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	2	5	40.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	2	5	40.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organic Matter	EP004	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organochlorine Pesticides (Ultra-trace)	EP131A	2	9	22.22	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	3	19	15.79	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	5	40.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	3	19	15.79	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	3	19	15.79	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	2	5	40.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	2	5	40.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Total Soluble Salts	EA014	SOIL	In house: The concentration of Total Soluble Salts in a soil is calculated from the Electrical conductivity of a water extract. This method is compliant with NEPM (2013) Schedule B(3) (Method 104)
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
ASS Field Screening Analysis	* EA037	SOIL	In house: Referenced to Acid Sulfate Soils Laboratory Methods Guidelines, version 2.1 June 2004. As received samples are tested for pH field and pH fox and assessed for a reaction rating.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Settleability 10%	* EA151-10	SOIL	In house: Determination of the settling rate of sediment or sludge in 10% solids slurries in seawater
Settleability 20%	* EA151-20	SOIL	In house: Determination of the settling rate of sediment or sludge in 20% solids slurries in seawater
Soil Particle Density	* EA152	SOIL	Soil Particle Density by AS 1289.3.5.1-2006 : Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Chloride Soluble By Discrete Analyser	ED045G	SOIL	In house: Referenced to APHA 4500-Cl- E. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm. Analysis is performed on a 1:5 soil / water leachate.
Total Metals in Sediments by ICPMS	EG020-SD	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. Analyte list and LORs per NODG.
Total Mercury by FIMS (Low Level)	EG035T-LL	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automatically measured by infra-red detector.
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1 - 1997. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (2013) Schedule B(3).



Analytical Methods	Method	Matrix	Method Descriptions
TPH - Semivolatile Fraction	EP071-SD	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
TRH Volatiles/BTEX in Sediments	EP080-SD	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Organotin Analysis	EP090	SOIL	In house: Referenced to USEPA SW 846 - 8270D Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quantified against an established calibration curve.
Organochlorine Pesticides (Ultra-trace)	EP131A	SOIL	In house: Referenced to USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/μECD/μECD) This technique is compliant with NEPM (2013) Schedule B(3)
PAHs in Sediments by GCMS(SIM)	EP132B-SD	SOIL	In house: Referenced to USEPA 8270D GCMS Capillary column, SIM mode using large volume programmed temperature vaporisation injection.
Preparation Methods	Method	Matrix	Method Descriptions
Drying only	EN020D	SOIL	In house
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1 - 1997. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (2013) Schedule B(3) (Method 105)
Dry and Pulverise (up to 100g)	GEO30	SOIL	#
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids/ Sample Cleanup	ORG17A-UTP	SOIL	In house: Mechanical agitation (tumbler). 20g of sample, Na ₂ SO ₄ and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. Samples are extracted, concentrated (by KD) and exchanged into an appropriate solvent for GPC and florisil cleanup as required.
Tumbler Extraction of Solids for LVI (Non-concentrating)	ORG17D	SOIL	In house: 10g of sample, Na ₂ SO ₄ and surrogate are extracted with 50mL 1:1 DCM/Acetone by end over end tumbling. An aliquot is concentrated by nitrogen blowdown to a reduced volume for analysis if required.
Organotin Sample Preparation	ORG35	SOIL	In house: 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1823888**
Amendment : **3**

Client : **ADVISIAN PTY LTD** Laboratory : Environmental Division Brisbane
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Project : **301001.02018 - Port of Mackay** Page : **1 of 4**
Sediment Sampling

Order number : **----** Quote number : **EB2018ADVISI0003 (BN/185/18)**
C-O-C number : **----** QC Level : **NEPM 2013 B3 & ALS QC Standard**

Site : **----**
Sampler : **NICHOLAS BAINTON**

Dates

Date Samples Received : **03-Oct-2018 09:10** Issue Date : **21-Nov-2018**
Client Requested Due Date : **28-Nov-2018** Scheduled Reporting Date : **28-Nov-2018**

Delivery Details

Mode of Delivery : **Carrier** Security Seal : **Intact.**
No. of coolers/boxes : **8** Temperature : **<6.0°C - Ice present**
Receipt Detail : **MEDIUM ESKY** No. of samples received / analysed : **19 / 19**

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Please be advised, 1x glass jar for sample ""OP2_45 (1.0-1.5)" was broken in transit.**
- **25/10/2018: SRN has been resent to acknowledge Cr suite added to samples 9, 13-15, 19 and due date adjusted.**
- **2/11/2018: SRN has been resent to acknowledge Chloride added to samples, as per COC.**
- **21/11/2018: SRN has been resent to acknowledge samples 'OP2_42...' have been added to this workorder from EB1823470, as per email from Alex 20/11/2018.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **Particle Sizing analysis will be conducted by ALS Environmental, Newcastle, NATA accreditation no. 825, Site No. 1656.**
- **Specialty Organics analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**



Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EA150H Particle Size Analysis by Hydrometer. AS1289	SOIL - EA151-20 Settleability 20%	SOIL - EG020-SD Total Metals in Sediments by ICPMS (NODG)	SOIL - EG035T-LL Total Mercury by FIMS - Low Level (SOLID)	SOIL - EP003 Total Organic Carbon (TOC) in Soil	SOIL - EP090 (solids) Organotins
EB1823888-004	28-Sep-2018 00:00	OP2_44 (0-0.5)	✓	✓	✓	✓	✓	✓	✓
EB1823888-005	28-Sep-2018 00:00	OP2_44 (0.5-1.0)	✓	✓	✓	✓	✓	✓	✓
EB1823888-006	28-Sep-2018 00:00	OP2-45 (0-0.5)	✓	✓	✓	✓	✓	✓	✓
EB1823888-007	28-Sep-2018 00:00	OP2-45 (0.5-1.0)	✓	✓	✓	✓	✓	✓	✓
EB1823888-008	28-Sep-2018 00:00	OP2-45 (1.0-1.5)	✓	✓	✓	✓	✓	✓	✓
EB1823888-009	28-Sep-2018 00:00	OP2_32 (0-0.5)	✓			✓	✓	✓	✓
EB1823888-010	28-Sep-2018 00:00	OP2_38 (0-0.5) T1	✓	✓	✓	✓	✓	✓	✓
EB1823888-011	28-Sep-2018 00:00	OP2_38 (0-0.5) T2	✓	✓	✓	✓	✓	✓	✓
EB1823888-012	28-Sep-2018 00:00	OP2_38 (0-0.5) T3	✓	✓	✓	✓	✓	✓	✓
EB1823888-013	28-Sep-2018 00:00	OP2_36 (0-0.5)	✓			✓	✓	✓	✓
EB1823888-014	28-Sep-2018 00:00	OP2_36 (0.5-1.0)	✓			✓	✓	✓	✓
EB1823888-015	28-Sep-2018 00:00	OP2_36 (1.0-1.5)	✓			✓	✓	✓	✓
EB1823888-016	28-Sep-2018 00:00	OP2_33 (0-0.5)	✓			✓	✓	✓	✓
EB1823888-017	28-Sep-2018 00:00	D7	✓			✓	✓	✓	✓
EB1823888-018	28-Sep-2018 00:00	OP2_21 (0-0.5)	✓	✓	✓	✓	✓	✓	✓
EB1823888-019	26-Sep-2018 00:00	OP2_18 (0-0.5)	✓			✓	✓	✓	✓
EB1823888-020	21-Nov-2018 00:00	OP2_42 / 0.0-0.5	✓	✓		✓	✓	✓	✓
EB1823888-021	21-Nov-2018 00:00	OP2_42 / 0.5-1.0	✓	✓		✓	✓	✓	✓
EB1823888-022	21-Nov-2018 00:00	OP2_42 / 1.0-1.5	✓	✓		✓	✓	✓	✓

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA010 (solids): Electrical Conductivity (1:5)	SOIL - EA014 Total Soluble Salts	SOIL - EA033 Chromium Suite for Acid Sulphate Soils	SOIL - EA037 ASS Field Screening Analysis	SOIL - EA151-10 Settleability 10%	SOIL - EA152 Soil Particle Density for Hydrometer Analysis	SOIL - EP004 Organic Matter in Soil (Walkley Black)
EB1823888-004	28-Sep-2018 00:00	OP2_44 (0-0.5)					✓	✓	
EB1823888-005	28-Sep-2018 00:00	OP2_44 (0.5-1.0)					✓	✓	
EB1823888-006	28-Sep-2018 00:00	OP2-45 (0-0.5)					✓	✓	
EB1823888-007	28-Sep-2018 00:00	OP2-45 (0.5-1.0)					✓	✓	
EB1823888-008	28-Sep-2018 00:00	OP2-45 (1.0-1.5)					✓	✓	



			SOIL - EA010 (solids): Electrical Conductivity (1:5)	SOIL - EA014 Total Soluble Salts	SOIL - EA033 Chromium Suite for Acid Sulphate Soils	SOIL - EA037 ASS Field Screening Analysis	SOIL - EA151-10 Settleability 10%	SOIL - EA152 Soil Particle Density for Hydrometer Analysis	SOIL - EP004 Organic Matter in Soil (Walkley Black)
EB1823888-009	28-Sep-2018 00:00	OP2_32 (0-0.5)	✓	✓	✓	✓			✓
EB1823888-010	28-Sep-2018 00:00	OP2_38 (0-0.5) T1					✓	✓	
EB1823888-011	28-Sep-2018 00:00	OP2_38 (0-0.5) T2					✓	✓	
EB1823888-012	28-Sep-2018 00:00	OP2_38 (0-0.5) T3					✓	✓	
EB1823888-013	28-Sep-2018 00:00	OP2_36 (0-0.5)	✓	✓	✓	✓			✓
EB1823888-014	28-Sep-2018 00:00	OP2_36 (0.5-1.0)	✓	✓	✓	✓			✓
EB1823888-015	28-Sep-2018 00:00	OP2_36 (1.0-1.5)	✓	✓	✓	✓			✓
EB1823888-018	28-Sep-2018 00:00	OP2_21 (0-0.5)					✓	✓	
EB1823888-019	26-Sep-2018 00:00	OP2_18 (0-0.5)	✓	✓	✓	✓			✓
EB1823888-020	21-Nov-2018 00:00	OP2_42 / 0.0-0.5						✓	
EB1823888-021	21-Nov-2018 00:00	OP2_42 / 0.5-1.0						✓	
EB1823888-022	21-Nov-2018 00:00	OP2_42 / 1.0-1.5						✓	

Matrix: **SOIL**

Laboratory sample ID Client sampling date / time Client sample ID

			SOIL - ED045G (solids) Chloride Soluble by Discrete Analyser	SOIL - EP071 - SD TRH ultra trace in sediments	SOIL - EP080-SD TRH(V)/BTEXN in Sediments	SOIL - EP131A OC Pesticides (Ultratrace)	SOIL - EP132B-SD Ultra-trace PAHs in Sediments
EB1823888-009	28-Sep-2018 00:00	OP2_32 (0-0.5)	✓				
EB1823888-013	28-Sep-2018 00:00	OP2_36 (0-0.5)	✓				
EB1823888-014	28-Sep-2018 00:00	OP2_36 (0.5-1.0)	✓				
EB1823888-015	28-Sep-2018 00:00	OP2_36 (1.0-1.5)	✓				
EB1823888-016	28-Sep-2018 00:00	OP2_33 (0-0.5)		✓	✓	✓	✓
EB1823888-017	28-Sep-2018 00:00	D7		✓	✓	✓	✓
EB1823888-019	26-Sep-2018 00:00	OP2_18 (0-0.5)	✓				
EB1823888-020	21-Nov-2018 00:00	OP2_42 / 0.0-0.5		✓	✓	✓	✓
EB1823888-021	21-Nov-2018 00:00	OP2_42 / 0.5-1.0		✓	✓	✓	✓
EB1823888-022	21-Nov-2018 00:00	OP2_42 / 1.0-1.5		✓	✓	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **SOIL**

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

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA010: Electrical Conductivity (1:5)							



OP2_18 (0-0.5)	Soil Glass Jar - Unpreserved	03-Oct-2018	06-Nov-2018	03-Oct-2018	✓	04-Oct-2018	✗
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Requested Deliverables

ALEX KOCHNIEFF

- *AU Certificate of Analysis - NATA (COA) Email alex.kochnieff@advisian.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email alex.kochnieff@advisian.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email alex.kochnieff@advisian.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email alex.kochnieff@advisian.com
- Chain of Custody (CoC) (COC) Email alex.kochnieff@advisian.com
- EDI Format - ENMRG (ENMRG) Email alex.kochnieff@advisian.com
- EDI Format - XTab (XTAB) Email alex.kochnieff@advisian.com

BILL BOYLSON

- *AU Certificate of Analysis - NATA (COA) Email bill.boylson@advisian.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email bill.boylson@advisian.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email bill.boylson@advisian.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email bill.boylson@advisian.com
- A4 - AU Tax Invoice (INV) Email bill.boylson@advisian.com
- Attachment - Report (SUBCO) Email bill.boylson@advisian.com
- Chain of Custody (CoC) (COC) Email bill.boylson@advisian.com
- EDI Format - ENMRG (ENMRG) Email bill.boylson@advisian.com
- EDI Format - XTab (XTAB) Email bill.boylson@advisian.com

NICHOLAS BAINTON

- *AU Certificate of Analysis - NATA (COA) Email nicholas.bainton@advisian.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email nicholas.bainton@advisian.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email nicholas.bainton@advisian.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email nicholas.bainton@advisian.com
- Attachment - Report (SUBCO) Email nicholas.bainton@advisian.com
- Chain of Custody (CoC) (COC) Email nicholas.bainton@advisian.com
- EDI Format - ENMRG (ENMRG) Email nicholas.bainton@advisian.com
- EDI Format - XTab (XTAB) Email nicholas.bainton@advisian.com



CHAIN OF CUSTODY

ALS Laboratory please tick

1800 55 1700... 1800 55 1700... 1800 55 1700...

1800 55 1700... 1800 55 1700... 1800 55 1700...

1800 55 1700... 1800 55 1700... 1800 55 1700...

1800 55 1700... 1800 55 1700... 1800 55 1700...

Client: Advision Pty Ltd, Office: Lvl 31, 12 Creek Street, Brisbane 4000, Project: Port of Mackay Sediment Sampling, Order Number: 301001.02018, Project Manager: Bill Boylson, Sampler: Nicholas Bailton, Contact Ph: 0437008129, Relinquished By: Nicholas Bailton, Date/Time: 28.09.18 @ 16:15.

Environmental Division Brisbane Work Order Reference EB1823888



Telephone : + 61-7-3243 7222

Table with columns: ALS USE ONLY, SAMPLE DETAILS (MATRIX, DATE/TIME), CONTAINER INFORMATION (TYPE & PRESERVATIVE, TOTAL BOTTLES), ANALYSIS REQUIRED (including SUITES), and Comments on likely container labels. Includes handwritten sample IDs like SNR 1-19.

Water Container Codes: F = Unreserved Plastic, N = Nitrite Preserved Plastic, ORC = Nitric Preserved ORC, SH = Sodium Hydroxide Preserved, S = Sodium Hydroxide Preserved Plastic, AF = Amber Glass Unreserved, AP = Air-tight Unreserved Plastic, V = VOA Vial Non-Preserved, VB = VOA Vial Sulfuric Preserved, VS = VOA Vial Sulfuric Preserved, AV = Air-tight Unreserved Vial SG = Sulfuric Preserved Amber Glass, H = HCl Preserved Plastic, PS = HCl Preserved Specimen Bottle, SP = Sulfuric Preserved Plastic, F = Formic Acid Preserved Plastic, C = EDTA Preserved Bottle, B = Unreserved Bag, L1 = Lysol's iodine Preserved Bottle, ST1 = Strain Sodium Chloride Preserved Bottle

CERTIFICATE OF ANALYSIS

Work Order : EB1826955 Client : ADVISIAN PTY LTD Contact : ALEX KOCHNIEFF Address : LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000 Telephone : ---- Project : 301001.02018 - Port of Mackay Sediment Sampling Order number : ---- C-O-C number : ---- Sampler : NICHOLAS BAINTON Site : ---- Quote number : EN/222 No. of samples received : 3 No. of samples analysed : 3	Page : 1 of 5 Laboratory : Environmental Division Brisbane Contact : Customer Services EB Address : 2 Byth Street Stafford QLD Australia 4053 Telephone : +61-7-3243 7222 Date Samples Received : 07-Nov-2018 09:24 Date Analysis Commenced : 07-Nov-2018 Issue Date : 12-Nov-2018 13:59
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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
- Surrogate Control Limits

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 Inorganics, Stafford, QLD
Sarah Ashworth	Laboratory Manager - Brisbane	Brisbane Organics, Stafford, QLD



General Comments

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

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

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

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

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

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

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

- EG005-SDH (1M Extractable Metals) Sample EB1826955-001(OP2_18 (0-0.5)) shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- EN68: This analysis in accordance with National Ocean Disposal Guidelines, Commonwealth of Australia, 2002 - (modified). Results reported are those determined on a 1:4 sediment/seawater elutriate without blank correction.



Analytical Results

Sub-Matrix: ELUTRIATE (Matrix: WATER)				Client sample ID	OP2_18 (0-0.5)	OP2_44 (0.5-1.0)	BLANK	----	----
Client sampling date / time				26-Sep-2018 00:00	28-Sep-2018 00:00	27-Sep-2018 00:00	----	----	
Compound	CAS Number	LOR	Unit	EB1826955-001	EB1826955-002	EB1826955-003	-----	-----	
				Result	Result	Result	----	----	
EG093T: Total Metals in Saline Water by ORC-ICPMS									
Zinc	7440-66-6	5	µg/L	<5	----	<5	----	----	
EN68: Seawater Elutriate Testing Procedure									
Seawater Sampling Date	----	-	-	----	----	8/11/2018	----	----	
EP090: Organotin Compounds (Soluble)									
Tributyltin	56573-85-4	2	ngSn/L	----	125	<2	----	----	
EP090S: Organotin Surrogate									
Tripopyltin	----	5	%	----	76.2	98.7	----	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	OP2_18 (0-0.5)	OP2_44 (0.5-1.0)	----	----	----
Client sampling date / time			26-Sep-2018 00:00	28-Sep-2018 00:00	----	----	----	
Compound	CAS Number	LOR	Unit	EB1826955-001	EB1826955-002	-----	-----	-----
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	44.2	----	----	----	----
EG005-SDH: 1M HCl-Extractable Metals by ICPAES								
Zinc	7440-66-6	1.0	mg/kg	86.2	----	----	----	----
EN68: Seawater Elutriate Testing Procedure								
Seawater Sampling Date	----	-	-	8/11/2018	8/11/2018	----	----	----



Surrogate Control Limits

Sub-Matrix: ELUTRIATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP090S: Organotin Surrogate			
Tripopyltin	----	24	116

QUALITY CONTROL REPORT

Work Order	: EB1826955	Page	: 1 of 3
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: ALEX KOCHNIEFF	Contact	: Customer Services EB
Address	: LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Date Samples Received	: 07-Nov-2018
Order number	:	Date Analysis Commenced	: 07-Nov-2018
C-O-C number	: ----	Issue Date	: 12-Nov-2018
Sampler	: NICHOLAS BAINTON		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 3		
No. of samples analysed	: 3		



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 Quality Control Report contains the following information:

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

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 Inorganics, Stafford, QLD
Sarah Ashworth	Laboratory Manager - Brisbane	Brisbane Organics, Stafford, QLD



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2024376)									
EB1826955-001	OP2_18 (0-0.5)	EA055: Moisture Content	----	0.1	%	44.2	43.6	1.46	0% - 20%
EG005-SDH: 1M HCl-Extractable Metals by ICPAES (QC Lot: 2024375)									
EB1826955-001	OP2_18 (0-0.5)	EG005-SDH: Zinc	7440-66-6	1	mg/kg	86.2	# 43.8	65.1	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG093T: Total Metals in Saline Water by ORC-ICPMS (QC Lot: 2027412)									
EB1826955-001	OP2_18 (0-0.5)	EG093A-T: Zinc	7440-66-6	5	µg/L	<5	<5	0.00	No Limit



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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
EG005-SDH: 1M HCl-Extractable Metals by ICPAES (QCLot: 2024375)								
EG005-SDH: Zinc	7440-66-6	1	mg/kg	<1.0	64 mg/kg	70.4	70	117
EN68: Seawater Elutriate Testing Procedure (QCLot: 2025503)								
EN68a: Seawater Sampling Date	----	----	-	8/11/2018	----	----	----	----

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
EG093T: Total Metals in Saline Water by ORC-ICPMS (QCLot: 2027412)								
EG093A-T: Zinc	7440-66-6	5	µg/L	<5	20 µg/L	98.7	81	124
EP090: Organotin Compounds (Soluble) (QCLot: 2028337)								
EP090S: Tributyltin	56573-85-4	2	ngSn/L	<2	147 ngSn/L	95.8	20	125

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%) MS	Recovery Limits (%) Low High	
EG093T: Total Metals in Saline Water by ORC-ICPMS (QCLot: 2027412)							
EB1826955-003	BLANK	EG093A-T: Zinc	7440-66-6	100 µg/L	104	70	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EB1826955	Page	: 1 of 6
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: ALEX KOCHNIEFF	Telephone	: +61-7-3243 7222
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Date Samples Received	: 07-Nov-2018
Site	: ----	Issue Date	: 12-Nov-2018
Sampler	: NICHOLAS BAINTON	No. of samples received	: 3
Order number	:	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- Duplicate outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005-SDH: 1M HCl-Extractable Metals by ICPAES	EB1826955--001	OP2_18 (0-0.5)	Zinc	7440-66-6	65.1 %	0% - 20%	RPD exceeds LOR based limits

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	Extraction / Preparation			Analysis			
	Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved OP2_18 (0-0.5)		----	----	----	07-Nov-2018	10-Oct-2018	28
EN68: Seawater Elutriate Testing Procedure							
Non-Volatile Leach: 14 day HT(e.g. SV organics) BLANK		08-Nov-2018	11-Oct-2018	28	----	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) OP2_44 (0.5-1.0)		08-Nov-2018	12-Oct-2018	27	----	----	----

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
1M HCl Extractable Metals	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Organotin Compounds (Soluble)	0	3	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Organotin Compounds (Soluble)	0	3	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

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



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) OP2_18 (0-0.5)	26-Sep-2018	----	----	----	07-Nov-2018	10-Oct-2018	*
EG005-SDH: 1M HCl-Extractable Metals by ICPAES							
Soil Glass Jar - Unpreserved (EG005-SDH) OP2_18 (0-0.5)	26-Sep-2018	08-Nov-2018	25-Mar-2019	✓	08-Nov-2018	25-Mar-2019	✓
EN68: Seawater Elutriate Testing Procedure							
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN68a) BLANK	27-Sep-2018	08-Nov-2018	11-Oct-2018	*	----	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN68a) OP2_44 (0.5-1.0)	28-Sep-2018	08-Nov-2018	12-Oct-2018	*	----	----	----
Non-Volatile Leach: 180 day HT (e.g. PFAS, metals ex.Hg) (EN68a) OP2_18 (0-0.5)	26-Sep-2018	08-Nov-2018	25-Mar-2019	✓	----	----	----

Matrix: **WATER** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG093T: Total Metals in Saline Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG093A-T) OP2_18 (0-0.5), BLANK	08-Nov-2018	09-Nov-2018	07-May-2019	✓	09-Nov-2018	07-May-2019	✓
EP090: Organotin Compounds (Soluble)							
Amber Glass Bottle - Unpreserved (EP090S) OP2_44 (0.5-1.0), BLANK	08-Nov-2018	09-Nov-2018	15-Nov-2018	✓	09-Nov-2018	19-Dec-2018	✓



Quality Control Parameter Frequency Compliance

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

Matrix: SOIL

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Analytical Methods							
Laboratory Duplicates (DUP)							
1M HCl Extractable Metals	EG005-SDH	1	1	100.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	1	100.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
1M HCl Extractable Metals	EG005-SDH	1	1	100.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
1M HCl Extractable Metals	EG005-SDH	1	1	100.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Seawater Elutriate Testing Procedure	EN68a	1	3	33.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
1M HCl Extractable Metals	EG005-SDH	0	1	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard

Matrix: WATER

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Analytical Methods							
Laboratory Duplicates (DUP)							
Organotin Compounds (Soluble)	EP090S	0	3	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
Total Metals in Saline Water Suite A by ORC-ICPMS	EG093A-T	1	2	50.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Organotin Compounds (Soluble)	EP090S	1	3	33.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Saline Water Suite A by ORC-ICPMS	EG093A-T	1	2	50.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Organotin Compounds (Soluble)	EP090S	1	3	33.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Saline Water Suite A by ORC-ICPMS	EG093A-T	1	2	50.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organotin Compounds (Soluble)	EP090S	0	3	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
Total Metals in Saline Water Suite A by ORC-ICPMS	EG093A-T	1	2	50.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
1M HCl Extractable Metals	EG005-SDH	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined via ICPAES following weak acid extraction. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3). LORs per NAGD. ALS is not NATA accredited for the analysis of Barium, Boron, Molybdenum and Strontium by this method.
Total Metals in Saline Water Suite A by ORC-ICPMS	EG093A-T	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Organotin Compounds (Soluble)	EP090S	SOIL	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by GC/MS coupled with high volume injection and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Metals in Saline Water Suite A by ORC-ICPMS	EG093A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Organotin Compounds (Soluble)	EP090S	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by GC/MS coupled with high volume injection and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals - ORC	EN25-ORC	SOIL	In house: Referenced to USEPA SW846-3005. This is an Ultrapure Nitric acid digestion procedure used to prepare surface and ground water samples for analysis by ORC- ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Seawater Elutriate Testing Procedure	EN68a	SOIL	USEPA Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Guide, 1991, EPA-503/8-91/001, USEPA and US Army Corps of Engineers. ANZECC Interim Ocean Disposal Guidelines, December, 1998 This Procedure outlines the preparation of leachate designed to simulate release of contaminants from sediment during the disposal of dredged material. Release can occur by physical processes or a variety of chemical changes such as oxidation of metal sulphides and release of contaminants adsorbed to particles or organic matter.
1M HCl Extraction for Metals in Sediments (1 hour)	EN71	SOIL	In house: Referenced to In house, Allen (1993). 1g of sample is leached at room temperature for 1 hour in 10% hydrochloric acid. The resultant extract is filtered and bulked for analysis of extracted metals.



<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Organotin Sample Preparation	ORG34	SOIL	In house. A specified volume of sample is spiked with surrogate, acidified and vacuum filtered. Reagents and solvent are added and the mixture tumbled. The butyltin compounds is derivitised, extracted and the substitution reaction completed. The extract is transferred to a separatory funnel and further extracted two times with petroleum ether. The resultant extracts are combined and concentrated for analysis.
Digestion for Total Recoverable Metals - ORC	EN25-ORC	WATER	In house: Referenced to USEPA SW846-3005. This is an Ultrapure Nitric acid digestion procedure used to prepare surface and ground water samples for analysis by ORC- ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Seawater Elutriate Testing Procedure	EN68a	WATER	USEPA Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Guide, 1991, EPA-503/8-91/001, USEPA and US Army Corps of Engineers. ANZECC Interim Ocean Disposal Guidelines, December, 1998 This Procedure outlines the preparation of leachate designed to simulate release of contaminants from sediment during the disposal of dredged material. Release can occur by physical processes or a variety of chemical changes such as oxidation of metal sulphides and release of contaminants adsorbed to particles or organic matter.
Organotin Sample Preparation	ORG34	WATER	In house. A specified volume of sample is spiked with surrogate, acidified and vacuum filtered. Reagents and solvent are added and the mixture tumbled. The butyltin compounds is derivitised, extracted and the substitution reaction completed. The extract is transferred to a separatory funnel and further extracted two times with petroleum ether. The resultant extracts are combined and concentrated for analysis.



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EB1826955

Client : ADVISIAN PTY LTD
Contact : ALEX KOCHNIEFF
Address : LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053
E-mail : alex.kochnieff@advisian.com
E-mail : ALSEnviro.Brisbane@alsglobal.com
Telephone : ----
Telephone : +61-7-3243 7222
Facsimile : ----
Facsimile : +61-7-3243 7218
Project : 301001.02018 - Port of Mackay Sediment Sampling
Page : 1 of 3
Order number :
Quote number : EB2018ADVISI0002 (EN/222)
C-O-C number : ----
QC Level : NEPM 2013 B3 & ALS QC Standard
Site : ----
Sampler : NICHOLAS BAINTON

Dates

Date Samples Received : 07-Nov-2018 09:24
Issue Date : 07-Nov-2018
Client Requested Due Date : 09-Nov-2018
Scheduled Reporting Date : 12-Nov-2018

Delivery Details

Mode of Delivery : Samples On Hand
Security Seal : Not Available
No. of coolers/boxes : ----
Temperature : CHILLED
Receipt Detail : RE-BATCH
No. of samples received / analysed : 3 / 3

General Comments

- This report contains the following information:
- Sample Container(s)/Preservation Non-Compliances
- Summary of Sample(s) and Requested Analysis
- Proactive Holding Time Report
- Requested Deliverables
The soil samples in this work order have been re-batched from EB1823888, and the elutriate water from EB1823470.
A 10% surcharge applies for results returned within 3 days.
Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
Please direct any turn around / technical queries to the laboratory contact designated above.
Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.



Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-T03 Moisture Content	SOIL - EG005-SDH HM HCl Extractable Metals	SOIL - EG093-T Total Metals by ORC - Ultra Trace in Saline	SOIL - EN68-1 Preparation of Elutriates for a single analysis	SOIL - EP090S Organotins (TBT) Brisbane
EB1826955-001	26-Sep-2018 00:00	OP2_18 (0-0.5)	✓	✓	✓	✓	
EB1826955-002	28-Sep-2018 00:00	OP2_44 (0.5-1.0)				✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG093-T Total Metals by ORC - Ultra Trace in Saline	WATER - EP090S Organotins (TBT) Brisbane
EB1826955-003	27-Sep-2018 00:00	BLANK	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **SOIL**

Evaluation: ✘ = Holding time breach ; ✔ = Within holding time.

Method	Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
					Date	Evaluation	Date	Evaluation
EA055: Moisture Content								
	OP2_18 (0-0.5)	Soil Glass Jar - Unpreserved	----	10-Oct-2018	07-Nov-2018	✘	----	----
EN68a: Seawater Elutriate Testing Procedure								
	OP2_44 (0.5-1.0)	Non-Volatile Leach: 14 day HT(€	12-Oct-2018	----	07-Nov-2018	✘	----	----

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✔ = Within holding time.

Method	Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
					Date	Evaluation	Date	Evaluation
EP090S: Organotin Compounds (Soluble)								
	BLANK	Amber Glass Bottle - Unpreserved	04-Oct-2018	13-Nov-2018	07-Nov-2018	✘	----	----

Kylie Codd

From: Kochnieff, Alex (Brisbane) [mailto:ALEX.KOCHNIEFF@advisian.com]

Sent: Wednesday, 7 November 2018 9:24 AM

To: Caroline Hill <caroline.hill@ALSGlobal.com>

Subject: RE: RESULTS & EDD for ALS Workorder : EB1823888 | Your Reference: 301001.02018 - Port of Mackay Sediment Sampling

Good morning Caroline.

Can you please proceed with the testing below on a 2 day turnaround time:

- ① • Sample OP2_18 (0-0.5): Zinc DAE (EG005-SHD) + Zinc Elutriate analysis (EN68)
- ② • Sample OP2_44 (0.5-1.0): TBT elutriate analysis (EN68)

Can you also provide a cost for this?

Kind regards,


Alex Kochnieff

Senior Environmental Engineer

Level 31, 12 Creek St | Brisbane City, QLD 4000

P +61 7 3319 3940 | **M** +61 468 660 301

E alex.kochnieff@advisian.com

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Environmental Division
Brisbane

Work Order Reference

EB1826955



Telephone : + 61-7-3243 7322

CERTIFICATE OF ANALYSIS

Work Order : **EB1828216**
Client : **ADVISIAN PTY LTD**
Contact : **ALEX KOCHNIEFF**
Address : **LEVEL 3 60 ALBERT STREET**
BRISBANE QLD, AUSTRALIA 4000
Telephone : ----
Project : ----
Order number :
C-O-C number : ----
Sampler : ----
Site : ----
Quote number : **BN/185/18**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 6
Laboratory : Environmental Division Brisbane
Contact : Caroline Hill
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61 7 3552 8662
Date Samples Received : 20-Nov-2018 15:06
Date Analysis Commenced : 21-Nov-2018
Issue Date : 30-Nov-2018 14:19



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
- Surrogate Control Limits

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>
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Senior Organic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Senior Organic Chemist	Brisbane Organics, Stafford, QLD
Minh Wills	2IC Organic Chemist	Brisbane Organics, Stafford, QLD



General Comments

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

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

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

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

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

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

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

- EN68: This analysis in accordance with National Ocean Disposal Guidelines, Commonwealth of Australia, 2002 - (modified). Results reported are those determined on a 1:4 sediment/seawater elutriate without blank correction.



Analytical Results

Sub-Matrix: ELUTRIATE (Matrix: WATER)				Client sample ID	OP2_42/0.0-0.5 A	OP2_36 (0.5-1.0) A	ELUTRIATE BLANK	ELUTRIATE BLANK 2	----
Client sampling date / time					27-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit		EB1828216-001	EB1828216-004	EB1828216-007	EB1828216-008	-----
					Result	Result	Result	Result	----
EP090: Organotin Compounds (Soluble)									
Tributyltin	56573-85-4	2	ngSn/L		<2	<2	<2	<2	----
EP090S: Organotin Surrogate									
Tripropyltin	----	5	%		68.4	62.3	80.7	121	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_42/0.0-0.5 A	OP2_42/0.0-0.5 B	OP2_42/0.0-0.5 C	OP2_36 (0.5-1.0) A	OP2_36 (0.5-1.0) B
Client sampling date / time					27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	EB1828216-001	EB1828216-002	EB1828216-003	EB1828216-004	EB1828216-005	
				Result	Result	Result	Result	Result	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%	23.8	23.8	23.8	38.7	38.7	
EN68: Seawater Elutriate Testing Procedure									
Seawater Sampling Date	----	-	-	29/11/2018	----	----	21/11/2018	----	
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg	2.5	5.3	2.9	1.3	1.2	
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%	104	127	113	98.8	93.3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_36 (0.5-1.0) C	ELUTRIATE BLANK	ELUTRIATE BLANK 2	----	----
Client sampling date / time					28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1828216-006	EB1828216-007	EB1828216-008	-----	-----
					Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		38.7	----	----	----	----
EN68: Seawater Elutriate Testing Procedure									
Seawater Sampling Date	----	-	-		----	21/11/2018	29/11/2018	----	----
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg		1.3	----	----	----	----
EP090S: Organotin Surrogate									
Tripopyltin	----	0.5	%		98.5	----	----	----	----



Surrogate Control Limits

Sub-Matrix: ELUTRIATE		Recovery Limits (%)	
<i>Compound</i>	<i>CAS Number</i>	<i>Low</i>	<i>High</i>
EP090S: Organotin Surrogate			
Tripopyltin	----	24	116

Sub-Matrix: SOIL		Recovery Limits (%)	
<i>Compound</i>	<i>CAS Number</i>	<i>Low</i>	<i>High</i>
EP090S: Organotin Surrogate			
Tripopyltin	----	35	130

QUALITY CONTROL REPORT

Work Order	: EB1828216	Page	: 1 of 3
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: ALEX KOCHNIEFF	Contact	: Caroline Hill
Address	: LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8662
Project	: ----	Date Samples Received	: 20-Nov-2018
Order number	: ----	Date Analysis Commenced	: 21-Nov-2018
C-O-C number	: ----	Issue Date	: 30-Nov-2018
Sampler	: ----		
Site	: ----		
Quote number	: BN/185/18		
No. of samples received	: 8		
No. of samples analysed	: 8		



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 Quality Control Report contains the following information:

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

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>
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Senior Organic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Senior Organic Chemist	Brisbane Organics, Stafford, QLD
Minh Wills	2IC Organic Chemist	Brisbane Organics, Stafford, QLD



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2049453)									
EB1828216-001	OP2_42/0.0-0.5 A	EA055: Moisture Content	----	0.1	%	23.8	23.6	0.813	0% - 20%
EP090: Organotin Compounds (QC Lot: 2049452)									
EB1828216-005	OP2_36 (0.5-1.0) B	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	1.2	1.1	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP090: Organotin Compounds (Soluble) (QC Lot: 2056410)									
EP1813569-001	Anonymous	EP090S: Tributyltin	56573-85-4	2	ngSn/L	<2	<2	0.00	No Limit



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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)
Method: Compound	CAS Number	LOR	Unit			LCS	Low	High
EN68: Seawater Elutriate Testing Procedure (QCLot: 2048491)								
EN68a: Seawater Sampling Date	----	----	-	21/11/2018	----	----	----	----
EN68: Seawater Elutriate Testing Procedure (QCLot: 2064419)								
EN68a: Seawater Sampling Date	----	----	-	29/11/2018	----	----	----	----
EP090: Organotin Compounds (QCLot: 2049452)								
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	108	52	139

Sub-Matrix: **WATER**

				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)
Method: Compound	CAS Number	LOR	Unit			LCS	Low	High
EP090: Organotin Compounds (Soluble) (QCLot: 2056410)								
EP090S: Tributyltin	56573-85-4	2	ngSn/L	<2	147 ngSn/L	108	20	125
EP090: Organotin Compounds (Soluble) (QCLot: 2066595)								
EP090S: Tributyltin	56573-85-4	2	ngSn/L	<2	147 ngSn/L	114	20	125

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number			Low	High
EP090: Organotin Compounds (QCLot: 2049452)							
EB1828216-006	OP2_36 (0.5-1.0) C	EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	88.4	20	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EB1828216	Page	: 1 of 5
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: ALEX KOCHNIEFF	Telephone	: +61 7 3552 8662
Project	: ----	Date Samples Received	: 20-Nov-2018
Site	: ----	Issue Date	: 30-Nov-2018
Sampler	: ----	No. of samples received	: 8
Order number	:	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**



Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP090S: Organotin Surrogate	EB1828216-008	ELUTRIATE BLANK 2	Tripropyltin	----	121 %	24-116 %	Recovery greater than upper data quality objective

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved							
OP2_42/0.0-0.5 - A, OP2_42/0.0-0.5 - C	OP2_42/0.0-0.5 - B,	----	----	----	21-Nov-2018	11-Oct-2018	41
Soil Glass Jar - Unpreserved							
OP2_36 (0.5-1.0) - A, OP2_36 (0.5-1.0) - C	OP2_36 (0.5-1.0) - B,	----	----	----	21-Nov-2018	12-Oct-2018	40
EN68: Seawater Elutriate Testing Procedure							
Non-Volatile Leach: 14 day HT(e.g. SV organics)							
OP2_42/0.0-0.5 - A		29-Nov-2018	11-Oct-2018	49	----	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics)							
OP2_36 (0.5-1.0) - A,	ELUTRIATE BLANK	21-Nov-2018	12-Oct-2018	40	----	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics)							
ELUTRIATE BLANK 2		29-Nov-2018	12-Oct-2018	48	----	----	----
EP090: Organotin Compounds							
Soil Glass Jar - Unpreserved							
OP2_42/0.0-0.5 - A, OP2_42/0.0-0.5 - C	OP2_42/0.0-0.5 - B,	23-Nov-2018	11-Oct-2018	43	----	----	----
Soil Glass Jar - Unpreserved							
OP2_36 (0.5-1.0) - A, OP2_36 (0.5-1.0) - C	OP2_36 (0.5-1.0) - B,	23-Nov-2018	12-Oct-2018	42	----	----	----

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
Organotin Compounds (Soluble)	0	8	0.00	5.00	NEPM 2013 B3 & ALS QC Standard



Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) OP2_42/0.0-0.5 - A, OP2_42/0.0-0.5 - C	OP2_42/0.0-0.5 - B, 27-Sep-2018	----	----	----	21-Nov-2018	11-Oct-2018	*
Soil Glass Jar - Unpreserved (EA055) OP2_36 (0.5-1.0) - A, OP2_36 (0.5-1.0) - C	OP2_36 (0.5-1.0) - B, 28-Sep-2018	----	----	----	21-Nov-2018	12-Oct-2018	*
EN68: Seawater Elutriate Testing Procedure							
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN68a) OP2_42/0.0-0.5 - A	27-Sep-2018	29-Nov-2018	11-Oct-2018	*	----	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN68a) OP2_36 (0.5-1.0) - A,	ELUTRIATE BLANK 28-Sep-2018	21-Nov-2018	12-Oct-2018	*	----	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN68a) ELUTRIATE BLANK 2	28-Sep-2018	29-Nov-2018	12-Oct-2018	*	----	----	----
EP090: Organotin Compounds							
Soil Glass Jar - Unpreserved (EP090) OP2_42/0.0-0.5 - A, OP2_42/0.0-0.5 - C	OP2_42/0.0-0.5 - B, 27-Sep-2018	23-Nov-2018	11-Oct-2018	*	26-Nov-2018	02-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP090) OP2_36 (0.5-1.0) - A, OP2_36 (0.5-1.0) - C	OP2_36 (0.5-1.0) - B, 28-Sep-2018	23-Nov-2018	12-Oct-2018	*	26-Nov-2018	02-Jan-2019	✓

Matrix: **WATER**

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP090: Organotin Compounds (Soluble)							
Amber Glass Bottle - Unpreserved (EP090S) OP2_36 (0.5-1.0) - A,	ELUTRIATE BLANK 21-Nov-2018	26-Nov-2018	28-Nov-2018	✓	26-Nov-2018	05-Jan-2019	✓
Amber Glass Bottle - Unpreserved (EP090S) OP2_42/0.0-0.5 - A,	ELUTRIATE BLANK 2 29-Nov-2018	30-Nov-2018	06-Dec-2018	✓	30-Nov-2018	09-Jan-2019	✓



Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	1	6	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	6	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Organotin Analysis	EP090	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Organotin Analysis	EP090	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Seawater Elutriate Testing Procedure	EN68a	2	4	50.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organotin Analysis	EP090	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Organotin Compounds (Soluble)	EP090S	1	8	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Organotin Compounds (Soluble)	EP090S	2	8	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Organotin Compounds (Soluble)	EP090S	2	8	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organotin Compounds (Soluble)	EP090S	0	8	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Organotin Analysis	EP090	SOIL	In house: Referenced to USEPA SW 846 - 8270D Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quantified against an established calibration curve.
Organotin Compounds (Soluble)	EP090S	SOIL	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by GC/MS coupled with high volume injection and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Seawater Elutriate Testing Procedure	EN68a	SOIL	USEPA Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Guide, 1991, EPA-503/8-91/001, USEPA and US Army Corps of Engineers. ANZECC Interim Ocean Disposal Guidelines, December, 1998 This Procedure outlines the preparation of leachate designed to simulate release of contaminants from sediment during the disposal of dredged material. Release can occur by physical processes or a variety of chemical changes such as oxidation of metal sulphides and release of contaminants adsorbed to particles or organic matter.
Organotin Sample Preparation	ORG34	SOIL	In house. A specified volume of sample is spiked with surrogate, acidified and vacuum filtered. Reagents and solvent are added and the mixture tumbled. The butyltin compounds is derivatisated, extracted and the substitution reaction completed. The extract is transferred to a separatory funnel and further extracted two times with petroleum ether. The resultant extracts are combined and concentrated for analysis.
Organotin Sample Preparation	ORG35	SOIL	In house: 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatisated and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1828216**

Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: ALEX KOCHNIEFF	Contact	: Customer Services EB
Address	: LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: alex.kochnieff@advisian.com	E-mail	: ALSEnviro.Brisbane@alsglobal.com
Telephone	: ----	Telephone	: +61-7-3243 7222
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: ----	Page	: 1 of 3
Order number	:	Quote number	: EB2018ADVISI0002 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 20-Nov-2018 15:06	Issue Date	: 21-Nov-2018
Client Requested Due Date	: 27-Nov-2018	Scheduled Reporting Date	: 27-Nov-2018

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not intact.
No. of coolers/boxes	: ----	Temperature	: <6.0°C
Receipt Detail	: REBATCH	No. of samples received / analysed	: 7 / 7

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **This work order was created to rebatch Soil samples from work orders EB1823470-056 & EB1823888-014. The Elutriate water was rebatched from EB1826955.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**



Sample Container(s)/Preservation Non-Compliances

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

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

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EB1828216-004 : [28-Sep-2018] : OP2_36 (0.5-1.0) - A
EB1828216-005 : [28-Sep-2018] : OP2_36 (0.5-1.0) - B
EB1828216-006 : [28-Sep-2018] : OP2_36 (0.5-1.0) - C

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EN68-1 Preparation of Elutriates for a single analysis	SOIL - EP090 (solids) Organotins	SOIL - EP090S Organotins (TBT) Brisbane
EB1828216-001	27-Sep-2018 00:00	OP2_42/0.0-0.5 A	✓	✓	✓	✓
EB1828216-002	27-Sep-2018 00:00	OP2_42/0.0-0.5 B	✓		✓	
EB1828216-003	27-Sep-2018 00:00	OP2_42/0.0-0.5 C	✓		✓	
EB1828216-004	28-Sep-2018 00:00	OP2_36 (0.5-1.0) A	✓	✓	✓	✓
EB1828216-005	28-Sep-2018 00:00	OP2_36 (0.5-1.0) B	✓		✓	
EB1828216-006	28-Sep-2018 00:00	OP2_36 (0.5-1.0) C	✓		✓	
EB1828216-007	28-Sep-2018 00:00	ELUTRIATE BLANK		✓		✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **SOIL**

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

Method	Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
					Date	Evaluation	Date	Evaluation
EA055: Moisture Content								
OP2_36 (0.5-1.0)		Soil Glass Jar - Unpreserved	----	12-Oct-2018	20-Nov-2018	✗	----	----
OP2_36 (0.5-1.0)		Soil Glass Jar - Unpreserved	----	12-Oct-2018	20-Nov-2018	✗	----	----
OP2_36 (0.5-1.0)		Soil Glass Jar - Unpreserved	----	12-Oct-2018	20-Nov-2018	✗	----	----
OP2_42/0.0-0.5		Soil Glass Jar - Unpreserved	----	11-Oct-2018	20-Nov-2018	✗	----	----
OP2_42/0.0-0.5		Soil Glass Jar - Unpreserved	----	11-Oct-2018	20-Nov-2018	✗	----	----
OP2_42/0.0-0.5		Soil Glass Jar - Unpreserved	----	11-Oct-2018	20-Nov-2018	✗	----	----
EN68a: Seawater Elutriate Testing Procedure								
ELUTRIATE BLANK		Non-Volatile Leach: 14 day HT(ε	12-Oct-2018	----	20-Nov-2018	✗	----	----
OP2_36 (0.5-1.0)		Non-Volatile Leach: 14 day HT(ε	12-Oct-2018	----	20-Nov-2018	✗	----	----
OP2_42/0.0-0.5		Non-Volatile Leach: 14 day HT(ε	11-Oct-2018	----	20-Nov-2018	✗	----	----
EP090: Organotin Analysis								
OP2_36 (0.5-1.0)		Soil Glass Jar - Unpreserved	12-Oct-2018	21-Nov-2018	20-Nov-2018	✗	----	----
OP2_36 (0.5-1.0)		Soil Glass Jar - Unpreserved	12-Oct-2018	21-Nov-2018	20-Nov-2018	✗	----	----
OP2_36 (0.5-1.0)		Soil Glass Jar - Unpreserved	12-Oct-2018	21-Nov-2018	20-Nov-2018	✗	----	----
OP2_42/0.0-0.5		Soil Glass Jar - Unpreserved	11-Oct-2018	20-Nov-2018	20-Nov-2018	✗	----	----
OP2_42/0.0-0.5		Soil Glass Jar - Unpreserved	11-Oct-2018	20-Nov-2018	20-Nov-2018	✗	----	----
OP2_42/0.0-0.5		Soil Glass Jar - Unpreserved	11-Oct-2018	20-Nov-2018	20-Nov-2018	✗	----	----

Yogendra Khadka
Client Services Officer, Environmental
Brisbane



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2 Byth Street (cnr Shand & Byth Street)
Stafford QLD 4053 AUSTRALIA



[MANAGING PROJECTS OVER THE CHRISTMAS PERIOD - CLICK FOR MORE DETAILS](#)

From: Kochnieff, Alex (Brisbane) [<mailto:ALEX.KOCHNIEFF@advisian.com>]
Sent: Tuesday, 20 November 2018 15:06 PM
To: ALSEnviro Brisbane <ALSEnviro.Brisbane@alsglobal.com>
Subject: FW: EB1823470 - additional analysis

Hi there,

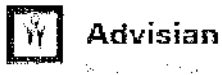
In Caroline's absence could you please action my request below?

Kind regards,

Alex Kochnieff
Senior Environmental Engineer

Level 31, 12 Creek St | Brisbane City, QLD 4000
P +61 7 3319 3940 | **M** +61 468 660 301
E alex.kochnieff@advisian.com

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Environmental Division
Brisbane
Work Order Reference
EB1828216



Telephone : + 61-7-3243 7222

From: Kochnieff, Alex (Brisbane)
Sent: Tuesday, 20 November 2018 3:03 PM
To: 'caroline.hill@alsglobal.com' <caroline.hill@alsglobal.com>
Subject: EB1823470 - additional analysis

Hi Caroline,

Could you please arrange triplicate TBT analysis and elutriate analysis of sample OP2_42/0.0-0.5 (ALS ID EB1823470056).

If possible could you please arrange a 24 hr turnaround time?

Hope to hear from you soon.

Kind regards,

In summary -

Analysis required:

- Triplicate TBT analysis, i.e. three new TBT concentrations
- TBT in Elutriate water

Samples:

- EB1823470-056 - OP2_42/0.0-0.5 - Sydney
- EB1823888-014 - OP2_36 (0.5-1.0)

4533 - 4554
4626 - 4630

TAT Request:

- 24 - 48 hours

Please use Elutriate Water from EB1823470. Note that this has already been used on EB1826955.

Please let me know if there is any issue.

Regards,

Yogendra Khadka

Client Services Officer, Environmental
Brisbane



T +61 7 3243 7222 D +61 7 3552 8609
yogendra.khadka@alsglobal.com
2 Byth Street (cnr Shand & Byth Street)
Stafford QLD 4053 AUSTRALIA



MANAGING PROJECTS OVER THE CHRISTMAS PERIOD - CLICK FOR MORE DETAILS

From: Kochnieff, Alex (Brisbane) [<mailto:ALEX.KOCHNIEFF@advisian.com>]

Sent: Tuesday, 20 November 2018 16:22 PM

To: ALSEnviro Brisbane <ALSEnviro.Brisbane@alsglobal.com>

Cc: Caroline Hill <caroline.hill@ALSGlobal.com>

Subject: EB1823888 - Additional Analysis

Hello EnviroTeam,

Could I please request additional analysis for Advisian sample **OP2_36 (0.5-1.0)** (ALS ID EB1823888014).

Additional analysis includes:

- Triplicate TBT analysis, i.e. three new TBT concentrations
- TBT in Elutriate water

Could this be completed within 24-48hrs?

Please let me know if there are any queries or concerns.

Kind regards,

CERTIFICATE OF ANALYSIS

Work Order : **EB1828853**
Client : **ADVISIAN PTY LTD**
Contact : **MR BILL BOYLSON**
Address : **LEVEL 3 60 ALBERT STREET**
BRISBANE QLD, AUSTRALIA 4000

Telephone : **----**
Project : **301001.02018 - Port of Mackay Sediment Sampling**
Order number : **----**
C-O-C number : **----**
Sampler : **NICHOLAS BAINTON**
Site : **----**
Quote number : **BN/185/18**
No. of samples received : **15**
No. of samples analysed : **15**

Page : 1 of 5
Laboratory : Environmental Division Brisbane
Contact : Caroline Hill
Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8662
Date Samples Received : 22-Nov-2018 13:06
Date Analysis Commenced : 05-Dec-2018
Issue Date : 06-Dec-2018 10:27



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>
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW



General Comments

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

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

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

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

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

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

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

- EA150H: The matrix of samples fell outside the scope of the method. They contained extremely high dissolved salts which were unable to be removed from the sample without the loss of fine soil particles. Particle size results were calculated using an electrical conductivity correction consistent with the blank dispersant solution. Results should be scrutinised accordingly.
- EA151: ALS does not hold NATA accreditation for Settleability.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				SB_40	SB_50	SB_58	B1_07	B5_08
Client sampling date / time				24-Sep-2018 00:00	24-Sep-2018 00:00	24-Sep-2018 00:00	26-Sep-2018 00:00	26-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	EB1828853-001	EB1828853-002	EB1828853-003	EB1828853-004	EB1828853-005
				Result	Result	Result	Result	Result
EA150: Particle Sizing								
+75µm	----	1	%	12	92	25	28	24
+150µm	----	1	%	8	85	6	25	14
+300µm	----	1	%	5	56	2	21	10
+425µm	----	1	%	4	28	2	17	8
+600µm	----	1	%	3	8	1	12	6
+1180µm	----	1	%	1	<1	<1	5	2
+2.36mm	----	1	%	<1	<1	<1	1	<1
+4.75mm	----	1	%	<1	<1	<1	<1	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	40	4	36	46	43
Silt (2-60 µm)	----	1	%	43	1	30	24	29
Sand (0.06-2.00 mm)	----	1	%	16	95	34	27	27
Gravel (>2mm)	----	1	%	1	<1	<1	3	1
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
EA151: Settleability 10%								
∅ Underflow Density	----	0.01	g/cm3	1.12	1.54	1.21	1.15	1.19
∅ Underflow Solids	----	0.1	%	19.8	59.1	25.8	22.9	25.5
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	0.267	24.4	2.20	2.00	2.80
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.030	1.80	0.067	0.021	0.058
∅ Clarity	----	-	-	Clear	Clear	Clear	Clear	Clear
EA151: Settleability 20%								
∅ Underflow Density	----	0.01	g/cm3	1.13	1.49	1.18	1.18	1.15
∅ Underflow Solids	----	0.1	%	23.2	58.4	24.1	24.1	24.9
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	0.017	14.4	0.016	0.033	0.016
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.010	0.200	0.016	0.010	0.016
∅ Clarity	----	-	-	Clear	Clear	Clear	Clear	Clear
EA152: Soil Particle Density								
∅ Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.65	2.63	2.61	2.58	2.62



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				TB_05 (T1)	TB_12	TB_26	H-3	OP2_32 (0-0.5)
Client sampling date / time				25-Sep-2018 00:00	25-Sep-2018 00:00	25-Sep-2018 00:00	25-Sep-2018 00:00	28-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	EB1828853-006	EB1828853-007	EB1828853-008	EB1828853-009	EB1828853-010
				Result	Result	Result	Result	Result
EA150: Particle Sizing								
+75µm	----	1	%	21	2	3	54	42
+150µm	----	1	%	15	<1	1	25	30
+300µm	----	1	%	10	<1	<1	14	20
+425µm	----	1	%	7	<1	<1	6	16
+600µm	----	1	%	5	<1	<1	2	12
+1180µm	----	1	%	4	<1	<1	<1	5
+2.36mm	----	1	%	<1	<1	<1	<1	2
+4.75mm	----	1	%	<1	<1	<1	<1	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	40	46	44	26	31
Silt (2-60 µm)	----	1	%	34	42	52	14	19
Sand (0.06-2.00 mm)	----	1	%	24	12	4	60	47
Gravel (>2mm)	----	1	%	2	<1	<1	<1	3
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
EA151: Settleability 10%								
∅ Underflow Density	----	0.01	g/cm3	1.16	1.06	1.05	1.21	1.21
∅ Underflow Solids	----	0.1	%	26.1	20.0	20.2	30.6	31.7
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	2.80	0.267	0.267	1.80	3.80
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.075	0.036	0.032	0.083	0.067
∅ Clarity	----	-	-	Clear	Clear	Clear	Clear	Clear
EA151: Settleability 20%								
∅ Underflow Density	----	0.01	g/cm3	1.15	1.11	1.14	1.32	1.27
∅ Underflow Solids	----	0.1	%	24.1	22.9	21.5	36.1	37.5
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	0.017	0.009	0.017	1.00	2.60
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.002	0.009	0.004	0.025	0.033
∅ Clarity	----	-	-	Clear	Clear	Clear	Clear	Clear
EA152: Soil Particle Density								
∅ Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.55	2.55	2.41	2.52	2.62



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	OP2_36 (0-0.5)	OP2_36 (0.5-1.0)	OP2_36 (1.0-1.5)	OP2_33 (0-0.5)	OP2_18 (0-0.5)
Client sampling date / time				28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	28-Sep-2018 00:00	26-Sep-2018 00:00	
Compound	CAS Number	LOR	Unit	EB1828853-011	EB1828853-012	EB1828853-013	EB1828853-014	EB1828853-015	
				Result	Result	Result	Result	Result	
EA150: Particle Sizing									
+75µm	----	1	%	58	61	30	33	38	
+150µm	----	1	%	50	55	20	20	28	
+300µm	----	1	%	43	48	16	13	21	
+425µm	----	1	%	38	44	13	11	17	
+600µm	----	1	%	30	37	9	9	13	
+1180µm	----	1	%	15	20	2	4	7	
+2.36mm	----	1	%	5	10	<1	<1	3	
+4.75mm	----	1	%	2	8	<1	<1	2	
+9.5mm	----	1	%	<1	6	<1	<1	<1	
+19.0mm	----	1	%	<1	<1	<1	<1	<1	
+37.5mm	----	1	%	<1	<1	<1	<1	<1	
+75.0mm	----	1	%	<1	<1	<1	<1	<1	
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	24	24	34	29	34	
Silt (2-60 µm)	----	1	%	16	11	29	25	22	
Sand (0.06-2.00 mm)	----	1	%	52	52	36	44	40	
Gravel (>2mm)	----	1	%	8	13	1	2	4	
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1	
EA151: Settleability 10%									
∅ Underflow Density	----	0.01	g/cm3	1.21	1.27	1.18	----	1.18	
∅ Underflow Solids	----	0.1	%	35.2	40.3	31.4	----	30.2	
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	4.00	3.40	2.40	----	2.00	
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.067	0.050	0.067	----	0.075	
∅ Clarity	----	-	-	Clear	Clear	Clear	----	Clear	
EA151: Settleability 20%									
∅ Underflow Density	----	0.01	g/cm3	1.31	1.34	1.25	----	1.23	
∅ Underflow Solids	----	0.1	%	40.1	44.0	35.6	----	35.4	
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	3.00	2.80	0.400	----	0.600	
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.025	0.025	0.011	----	0.009	
∅ Clarity	----	-	-	Clear	Clear	Clear	----	Clear	
EA152: Soil Particle Density									
∅ Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.64	2.63	2.66	2.64	2.63	

Certificate of Analysis

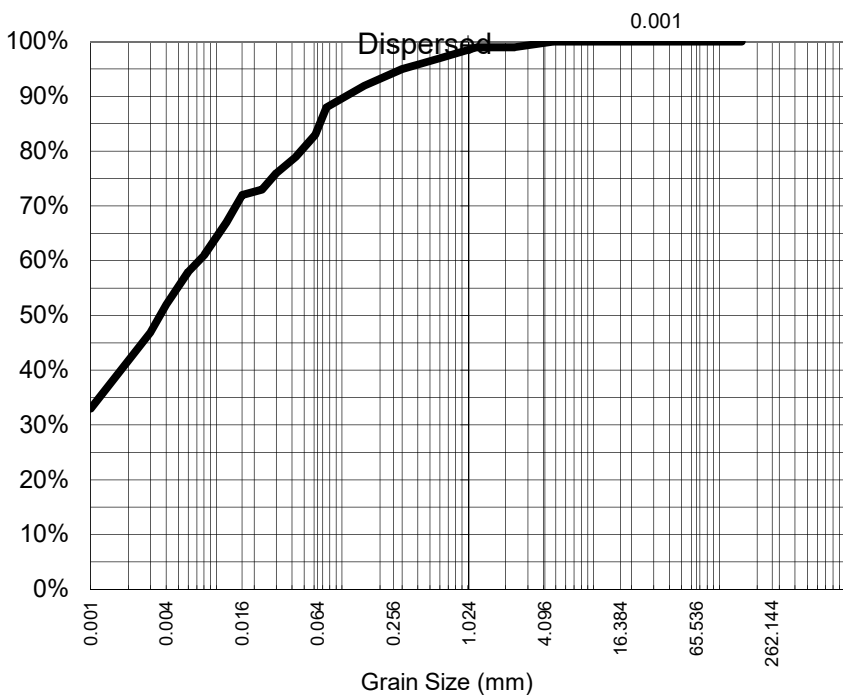
ALS Laboratory Group Pty Ltd
 5/585 Maitland Road
 Mayfield West, NSW 2304
 pH 02 4014 2500
 fax 02 4968 0349
 samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-001 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** SB_40
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	99%
0.600	97%
0.425	96%
0.300	95%
0.150	92%
0.075	88%
Particle Size (microns)	
43	79%
30	76%
23	73%
16	72%
12	67%
8	61%
6	58%
4	52%
1	33%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	<0.006
----------------------------	--------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.65

NATA Accreditation: 825 Site: Newcastle
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Dianne Blane
 Laboratory Coordinator
Authorised Signatory

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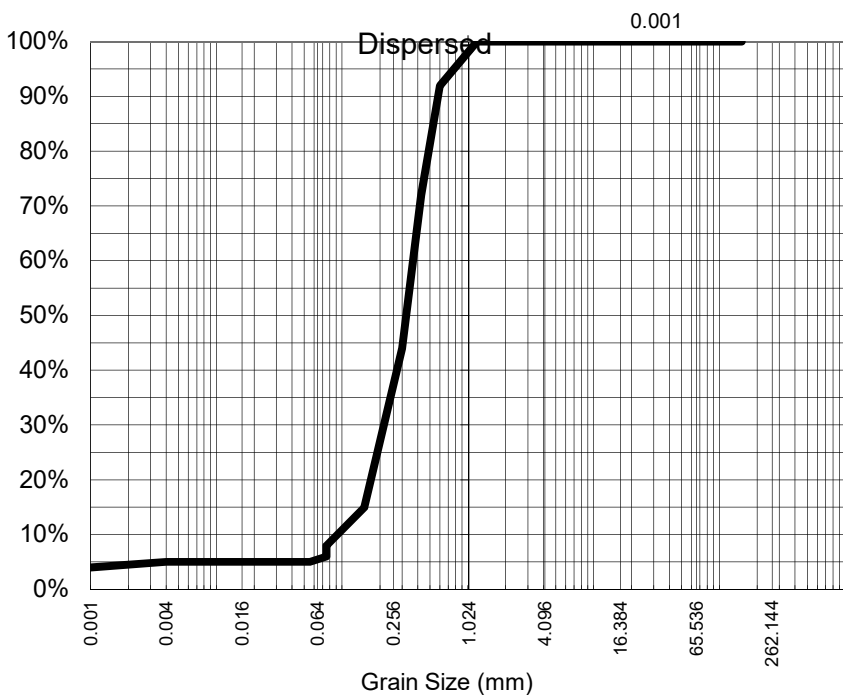
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 fax 02 4968 0349
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Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-002 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** SB_50
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
1.18	100%
0.600	92%
0.425	72%
0.300	44%
0.150	15%
0.075	8%
Particle Size (microns)	
55	5%
39	5%
27	5%
19	5%
14	5%
10	5%
7	5%
5	5%
1	4%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.327
----------------------------	-------

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

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly **Analysed:** 30-Nov-18
Loss on Pretreatment NA **Limit of Reporting:** 1%
Sample Description: SAND **Dispersion Method** Shaker
Test Method: AS1289.3.6.2/AS1289.3.6.3
Soil Particle Density (<2.36mm) 2.63

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 Laboratory Coordinator
Authorised Signatory

Certificate of Analysis

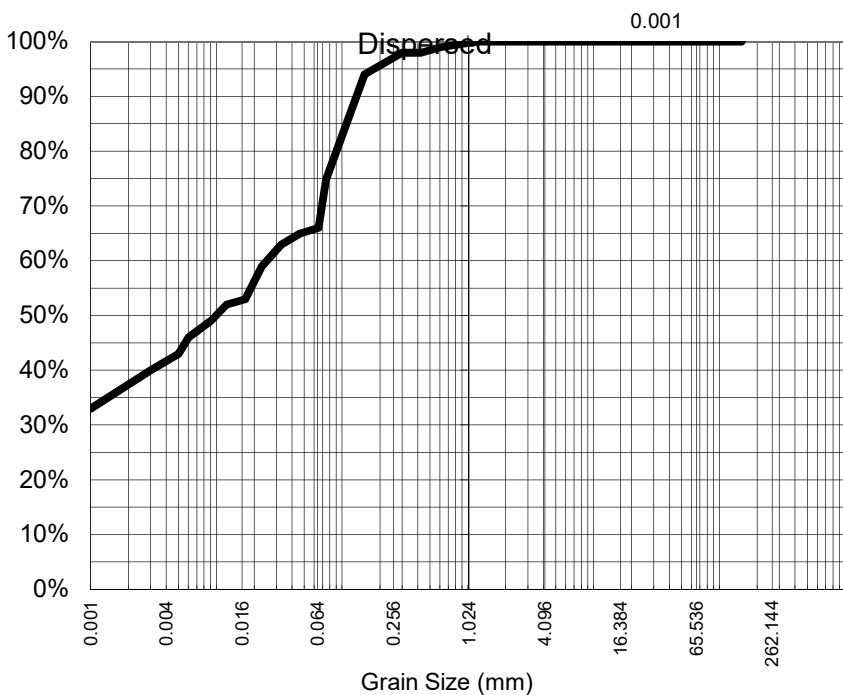
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 pH 02 4014 2500
 fax 02 4968 0349
 samples.newcastle@alsenviro.com

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Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-003 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** SB_58
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
1.18	100%
0.600	99%
0.425	98%
0.300	98%
0.150	94%
0.075	75%
Particle Size (microns)	
46	65%
33	63%
23	59%
17	53%
12	52%
9	49%
6	46%
5	43%
1	33%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.010
----------------------------	-------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.61

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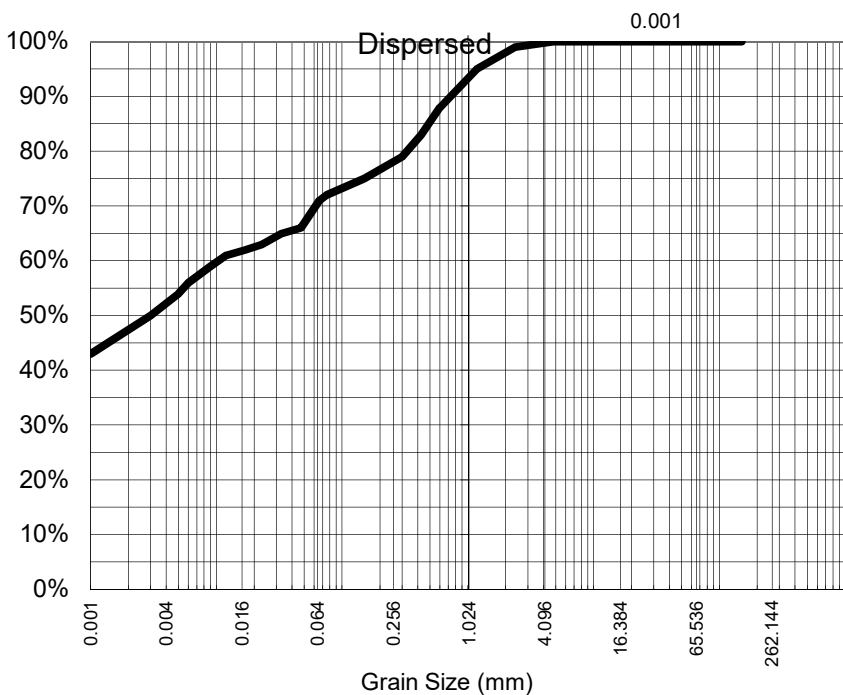
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 Mayfield West, NSW 2304
 pH 02 4014 2500
 fax 02 4968 0349
 samples.newcastle@alsenviro.com

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Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-004 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** B1_07
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	95%
0.600	88%
0.425	83%
0.300	79%
0.150	75%
0.075	72%
Particle Size (microns)	
47	66%
33	65%
23	63%
17	62%
12	61%
9	59%
6	56%
5	54%
1	43%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	<0.006
----------------------------	--------

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

Sample Comments:

Loss on Pretreatment NA

Sample Description: FINES, SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.58

Analysed: 30-Nov-18

Limit of Reporting: 1%

Dispersion Method Shaker

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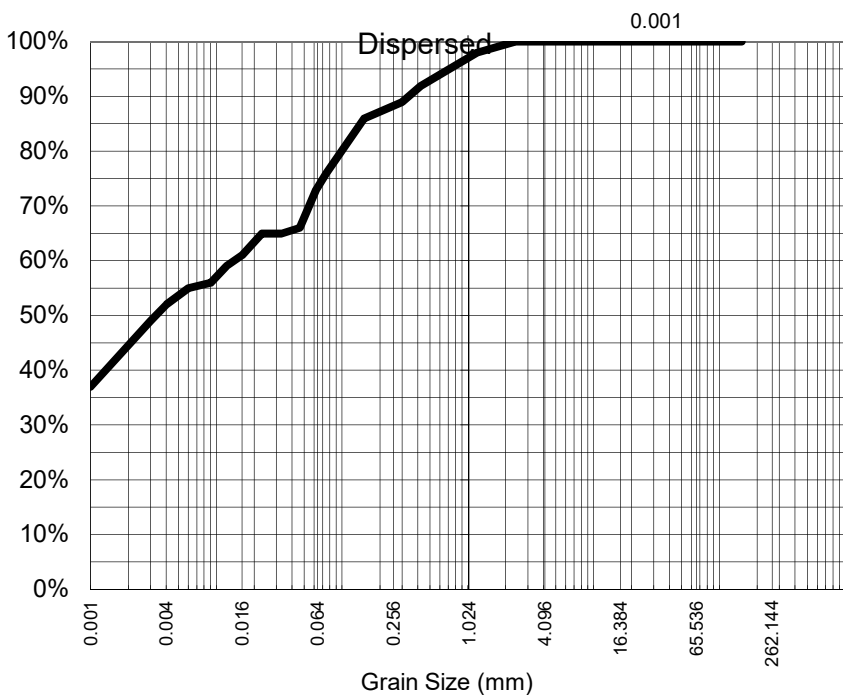
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 fax 02 4968 0349
 samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-005 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** B5_08
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	98%
0.600	94%
0.425	92%
0.300	89%
0.150	86%
0.075	76%
Particle Size (microns)	
46	66%
33	65%
23	65%
16	61%
12	59%
9	56%
6	55%
4	52%
1	37%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	<0.006
----------------------------	--------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.62

NATA Accreditation: 825 Site: Newcastle
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 Laboratory Coordinator
Authorised Signatory

Certificate of Analysis

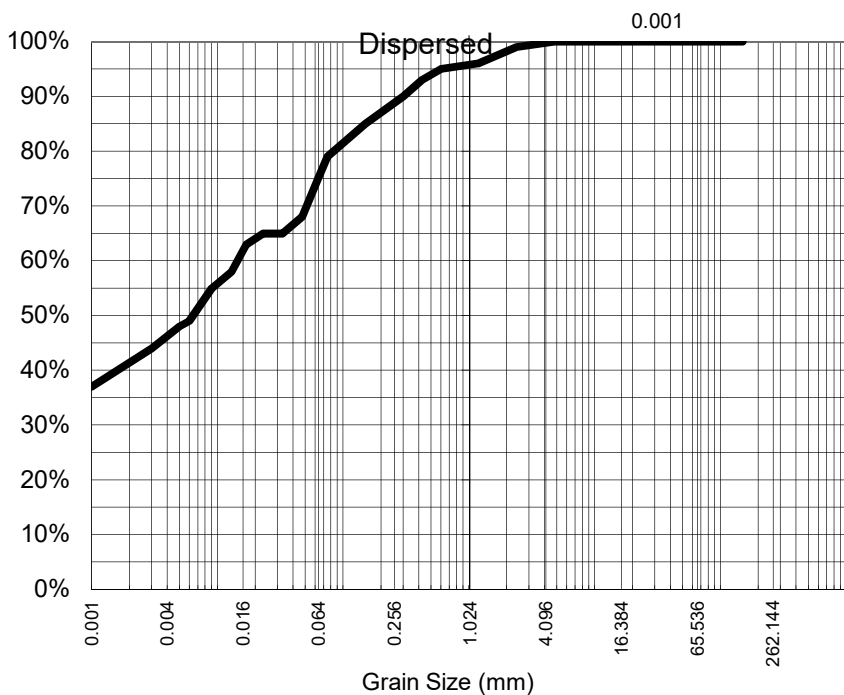
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-006 / PSD
60 ALBERT STREET
BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** TB_05 (T1)
Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	96%
0.600	95%
0.425	93%
0.300	90%
0.150	85%
0.075	79%
Particle Size (microns)	
47	68%
33	65%
23	65%
17	63%
13	58%
9	55%
6	49%
5	48%
1	37%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.007
----------------------------	-------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.55

NATA Accreditation: 825 Site: Newcastle
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D Blane

Dianne Blane
Laboratory Coordinator
Authorised Signatory

Certificate of Analysis

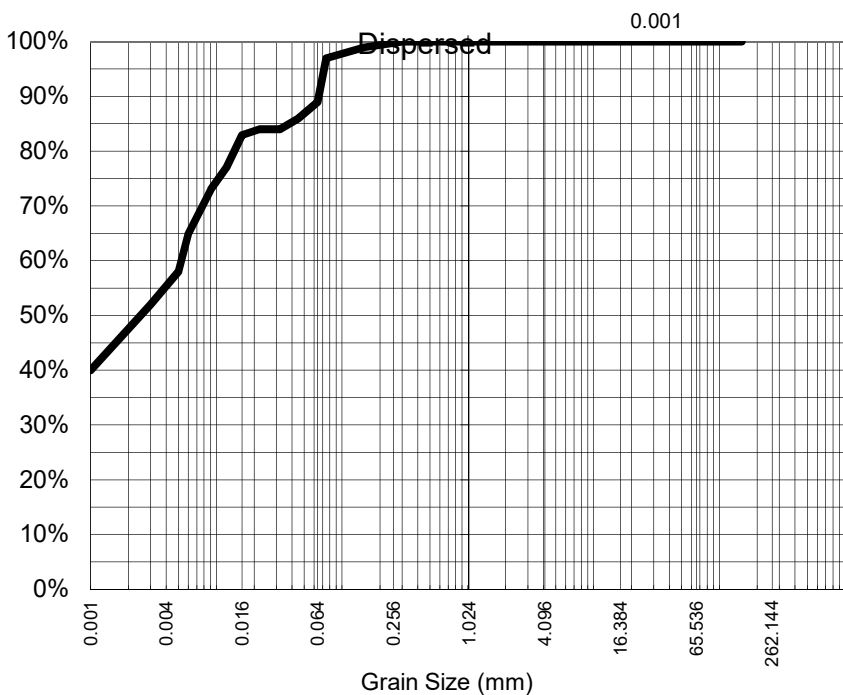
ALS Laboratory Group Pty Ltd
 5/585 Maitland Road
 Mayfield West, NSW 2304
 pH 02 4014 2500
 fax 02 4968 0349
 samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-007 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** TB_12
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
0.300	100%
0.150	99%
0.075	97%
Particle Size (microns)	
45	86%
32	84%
22	84%
16	83%
12	77%
9	73%
6	65%
5	58%
1	40%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	<0.006
----------------------------	--------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.55

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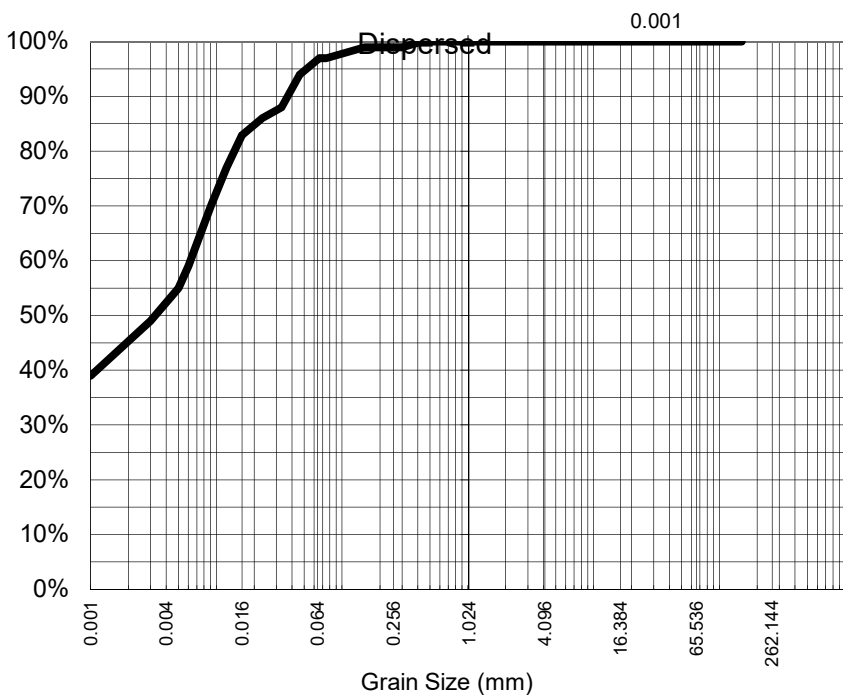
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CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-008 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** TB_26
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
0.425	100%
0.300	99%
0.150	99%
0.075	97%
Particle Size (microns)	
46	94%
33	88%
23	86%
16	83%
12	77%
9	70%
6	59%
5	55%
1	39%

Analysis Notes

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

Median Particle Size (mm)*	<0.006
----------------------------	--------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.41 (2.45)*

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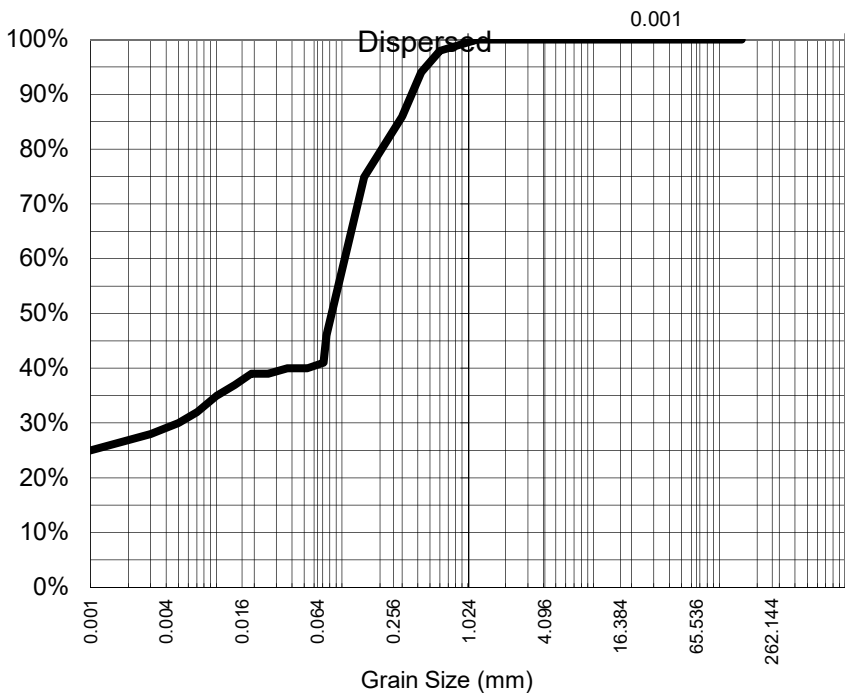
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CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-009 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** H-3
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
1.18	100%
0.600	98%
0.425	94%
0.300	86%
0.150	75%
0.075	46%
Particle Size (microns)	
53	40%
37	40%
26	39%
19	39%
14	37%
10	35%
7	32%
5	30%
1	25%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.085
----------------------------	-------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.52

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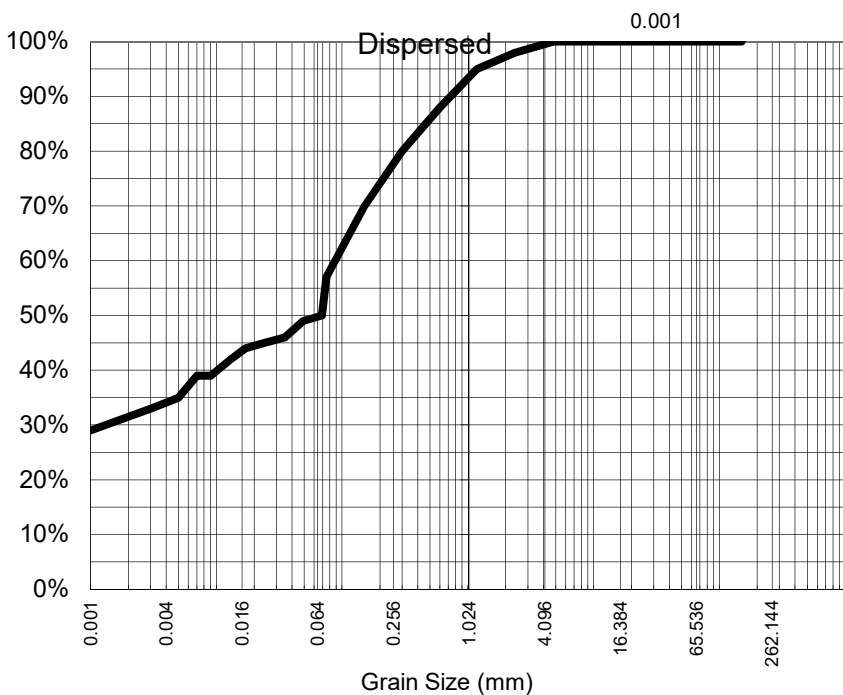
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CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-010 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** OP2_32 (0-0.5)
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	98%
1.18	95%
0.600	88%
0.425	84%
0.300	80%
0.150	70%
0.075	57%
Particle Size (microns)	
49	49%
35	46%
24	45%
17	44%
13	42%
9	39%
7	39%
5	35%
1	29%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.069
----------------------------	-------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.62

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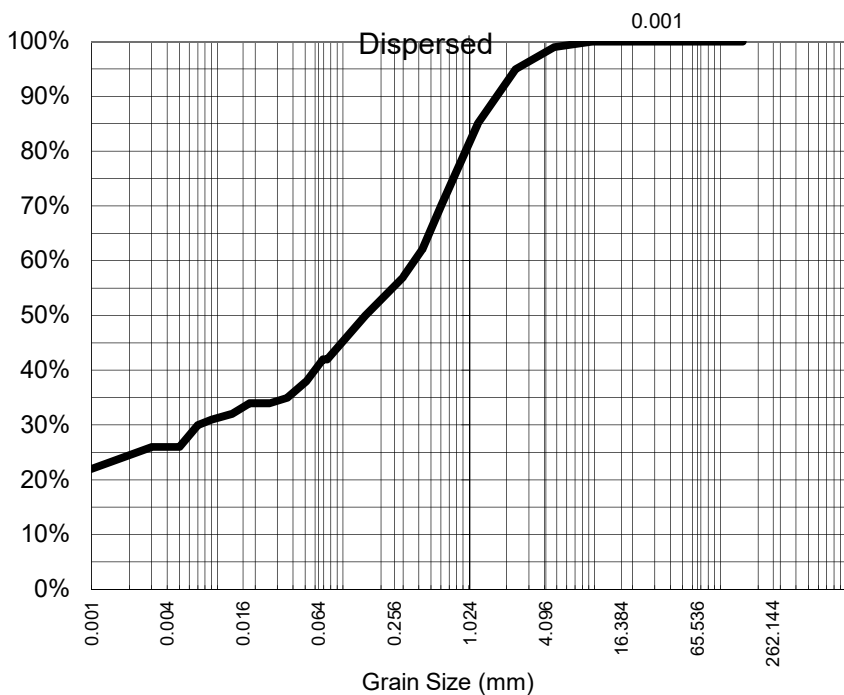
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CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-011 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** OP2_36 (0-0.5)
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	99%
2.36	95%
1.18	85%
0.600	70%
0.425	62%
0.300	57%
0.150	50%
0.075	42%
Particle Size (microns)	
51	38%
36	35%
26	34%
18	34%
13	32%
9	31%
7	30%
5	26%
1	22%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.150
----------------------------	-------

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

Sample Comments:

Loss on Pretreatment NA

Sample Description: FINES, SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.64

Analysed: 30-Nov-18

Limit of Reporting: 1%

Dispersion Method Shaker

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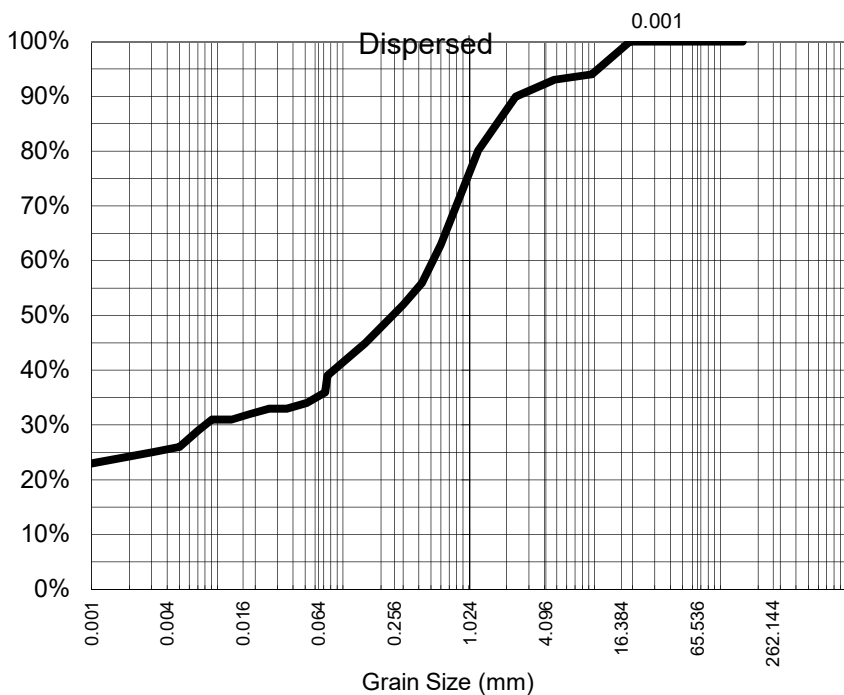
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 fax 02 4968 0349
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Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-012 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** OP2_36 (0.5-1.0)
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
19.0	100%
9.50	94%
4.75	93%
2.36	90%
1.18	80%
0.600	63%
0.425	56%
0.300	52%
0.150	45%
0.075	39%
Particle Size (microns)	
51	34%
36	33%
26	33%
18	32%
13	31%
9	31%
7	29%
5	26%
1	23%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.257
----------------------------	-------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.63

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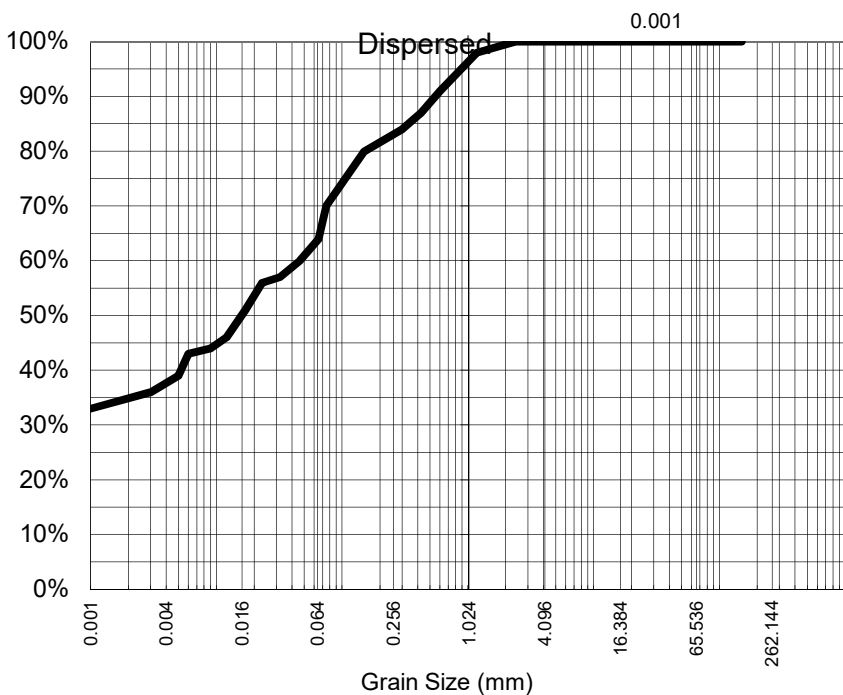
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CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-013 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** OP2_36 (1.0-1.5)
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	98%
0.600	91%
0.425	87%
0.300	84%
0.150	80%
0.075	70%
Particle Size (microns)	
46	60%
32	57%
23	56%
17	51%
12	46%
9	44%
6	43%
5	39%
1	33%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.016
----------------------------	-------

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

Sample Comments:

Analysed: 30-Nov-18

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.66

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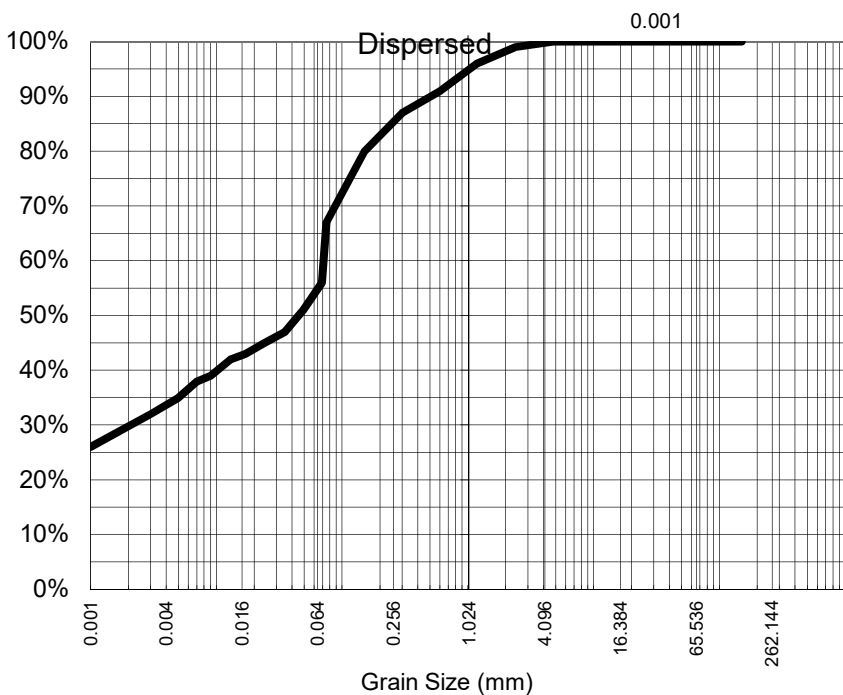
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 Mayfield West, NSW 2304
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ALS Environmental
Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-014 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** OP2_33 (0-0.5)
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	96%
0.600	91%
0.425	89%
0.300	87%
0.150	80%
0.075	67%
Particle Size (microns)	
49	51%
35	47%
24	45%
17	43%
13	42%
9	39%
7	38%
5	35%
1	26%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.046
----------------------------	-------

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

Sample Comments:

Loss on Pretreatment NA

Sample Description: FINES, SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.64

Analysed: 30-Nov-18

Limit of Reporting: 1%

Dispersion Method Shaker

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Certificate of Analysis

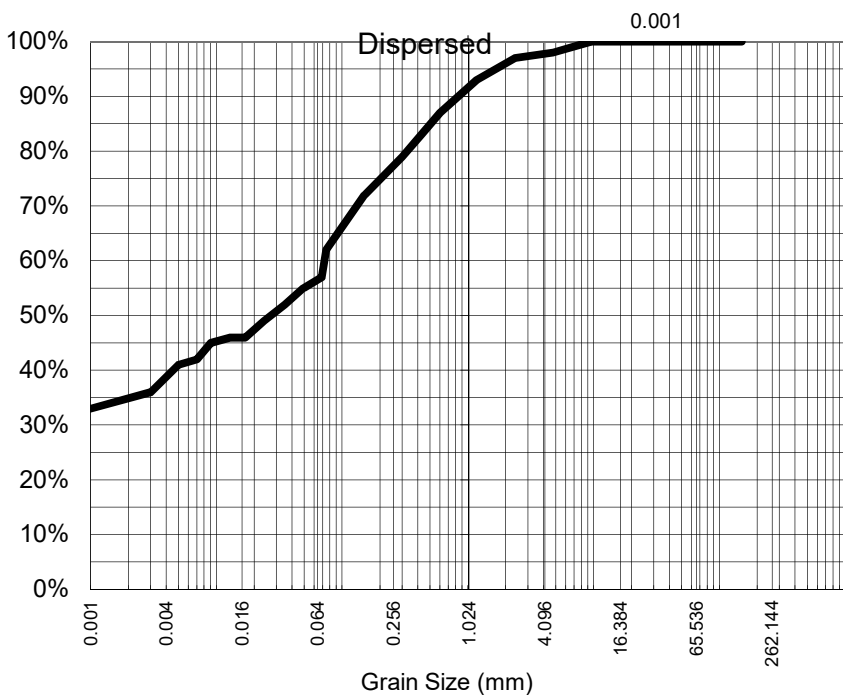
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 samples.newcastle@alsenviro.com

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Newcastle, NSW



CLIENT: Bill Boylson **DATE REPORTED:** 5-Dec-2018
COMPANY: ADVISIAN PTY LTD **DATE RECEIVED:** 22-Nov-2018
ADDRESS: LEVEL 3 **REPORT NO:** EB1828853-015 / PSD
 60 ALBERT STREET
 BRISBANE
PROJECT: 301001.02018 - Port Of Mackay **SAMPLE ID:** OP2_18 (0-0.5)
 Sediment Sampling

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	98%
2.36	97%
1.18	93%
0.600	87%
0.425	83%
0.300	79%
0.150	72%
0.075	62%
Particle Size (microns)	
49	55%
35	52%
24	49%
17	46%
13	46%
9	45%
7	42%
5	41%
1	33%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.028
----------------------------	-------

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

Sample Comments:

Loss on Pretreatment NA

Sample Description: FINES, SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.63

Analysed: 30-Nov-18

Limit of Reporting: 1%

Dispersion Method Shaker

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 Laboratory Coordinator
Authorised Signatory

QUALITY CONTROL REPORT

Work Order	: EB1828853	Page	: 1 of 3
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR BILL BOYLSON	Contact	: Caroline Hill
Address	: LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8662
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Date Samples Received	: 22-Nov-2018
Order number	:	Date Analysis Commenced	: 05-Dec-2018
C-O-C number	: ----	Issue Date	: 06-Dec-2018
Sampler	: NICHOLAS BAINTON		
Site	:		
Quote number	: BN/185/18		
No. of samples received	: 15		
No. of samples analysed	: 15		



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 Quality Control Report contains the following information:

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

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>
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

- **No Laboratory Duplicate (DUP) Results are required to be reported.**
-



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

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

- **No Method Blank (MB) or Laboratory Control Spike (LCS) Results are required to be reported.**

Matrix Spike (MS) Report

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

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**
-

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EB1828853	Page	: 1 of 6
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR BILL BOYLSON	Telephone	: +61 7 3552 8662
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Date Samples Received	: 22-Nov-2018
Site	:	Issue Date	: 06-Dec-2018
Sampler	: NICHOLAS BAINTON	No. of samples received	: 15
Order number	:	No. of samples analysed	: 15

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

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



Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA150: Particle Sizing								
Snap Lock Bag (EA150H) SB_40, SB_58	SB_50,	24-Sep-2018	----	----	----	05-Dec-2018	23-Mar-2019	✓
Snap Lock Bag (EA150H) TB_05 (T1), TB_26,	TB_12, H-3	25-Sep-2018	----	----	----	05-Dec-2018	24-Mar-2019	✓
Snap Lock Bag (EA150H) B1_07,	B5_08	26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Snap Lock Bag (EA150H) OP2_36 (0-0.5), OP2_36 (1.0-1.5),	OP2_36 (0.5-1.0), OP2_33 (0-0.5)	28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA150H) OP2_18 (0-0.5)		26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA150H) OP2_32 (0-0.5)		28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓
EA150: Soil Classification based on Particle Size								
Snap Lock Bag (EA150H) SB_40, SB_58	SB_50,	24-Sep-2018	----	----	----	05-Dec-2018	23-Mar-2019	✓
Snap Lock Bag (EA150H) TB_05 (T1), TB_26,	TB_12, H-3	25-Sep-2018	----	----	----	05-Dec-2018	24-Mar-2019	✓
Snap Lock Bag (EA150H) B1_07,	B5_08	26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Snap Lock Bag (EA150H) OP2_36 (0-0.5), OP2_36 (1.0-1.5),	OP2_36 (0.5-1.0), OP2_33 (0-0.5)	28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA150H) OP2_18 (0-0.5)		26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA150H) OP2_32 (0-0.5)		28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓



Matrix: SOIL

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA151: Settleability 10%								
Snap Lock Bag (EA151-10) SB_40, SB_58	SB_50,	24-Sep-2018	----	----	----	05-Dec-2018	23-Mar-2019	✓
Snap Lock Bag (EA151-10) TB_05 (T1), TB_26,	TB_12, H-3	25-Sep-2018	----	----	----	05-Dec-2018	24-Mar-2019	✓
Snap Lock Bag (EA151-10) B1_07,	B5_08	26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Snap Lock Bag (EA151-10) OP2_36 (0-0.5), OP2_36 (1.0-1.5)	OP2_36 (0.5-1.0),	28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA151-10) OP2_18 (0-0.5)		26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA151-10) OP2_32 (0-0.5)		28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓
EA151: Settleability 20%								
Snap Lock Bag (EA151-20) SB_40, SB_58	SB_50,	24-Sep-2018	----	----	----	05-Dec-2018	23-Mar-2019	✓
Snap Lock Bag (EA151-20) TB_05 (T1), TB_26,	TB_12, H-3	25-Sep-2018	----	----	----	05-Dec-2018	24-Mar-2019	✓
Snap Lock Bag (EA151-20) B1_07,	B5_08	26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Snap Lock Bag (EA151-20) OP2_36 (0-0.5), OP2_36 (1.0-1.5)	OP2_36 (0.5-1.0),	28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA151-20) OP2_18 (0-0.5)		26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA151-20) OP2_32 (0-0.5)		28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓



Matrix: **SOIL**

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA152: Soil Particle Density								
Snap Lock Bag (EA152) SB_40, SB_58	SB_50,	24-Sep-2018	----	----	----	05-Dec-2018	23-Mar-2019	✓
Snap Lock Bag (EA152) TB_05 (T1), TB_26,	TB_12, H-3	25-Sep-2018	----	----	----	05-Dec-2018	24-Mar-2019	✓
Snap Lock Bag (EA152) B1_07,	B5_08	26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Snap Lock Bag (EA152) OP2_36 (0-0.5), OP2_36 (1.0-1.5),	OP2_36 (0.5-1.0), OP2_33 (0-0.5)	28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA152) OP2_18 (0-0.5)		26-Sep-2018	----	----	----	05-Dec-2018	25-Mar-2019	✓
Soil Glass Jar - Unpreserved (EA152) OP2_32 (0-0.5)		28-Sep-2018	----	----	----	05-Dec-2018	27-Mar-2019	✓



Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**
-



Brief Method Summaries

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

<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Settleability 10%	* EA151-10	SOIL	In house: Determination of the settling rate of sediment or sludge in 10% solids slurries in seawater
Settleability 20%	* EA151-20	SOIL	In house: Determination of the settling rate of sediment or sludge in 20% solids slurries in seawater
Soil Particle Density	* EA152	SOIL	Soil Particle Density by AS 1289.3.5.1-2006 : Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1828853**

Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR BILL BOYLSON	Contact	: Caroline Hill
Address	: LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: bill.boylson@advisian.com	E-mail	: Caroline.Hill@Alsglobal.com
Telephone	: ----	Telephone	: +61 7 3552 8662
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Page	: 1 of 3
Order number	:	Quote number	: EB2018ADVISI0003 (BN/185/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: NICHOLAS BAINTON		

Dates

Date Samples Received	: 22-Nov-2018 13:06	Issue Date	: 26-Nov-2018
Client Requested Due Date	: 06-Dec-2018	Scheduled Reporting Date	: 06-Dec-2018

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: <6.0°C
Receipt Detail	: REBATCH	No. of samples received / analysed	: 15 / 15

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **This work order has been created to rebatch samples from EB1823470 & EB1823888.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **Analysis will be conducted by ALS Environmental, Newcastle, NATA accreditation no. 825, Site No. 1656.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**



Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA150H Particle Size Analysis by Hydrometer. AS1289	SOIL - EA151-10 Settling 10%	SOIL - EA151-20 Settling 20%	SOIL - EA152 Soil Particle Density for Hydrometer Analysis
EB1828853-001	24-Sep-2018 00:00	SB_40	✓	✓	✓	✓
EB1828853-002	24-Sep-2018 00:00	SB_50	✓	✓	✓	✓
EB1828853-003	24-Sep-2018 00:00	SB_58	✓	✓	✓	✓
EB1828853-004	26-Sep-2018 00:00	B1_07	✓	✓	✓	✓
EB1828853-005	26-Sep-2018 00:00	B5_08	✓	✓	✓	✓
EB1828853-006	25-Sep-2018 00:00	TB_05 (T1)	✓	✓	✓	✓
EB1828853-007	25-Sep-2018 00:00	TB_12	✓	✓	✓	✓
EB1828853-008	25-Sep-2018 00:00	TB_26	✓	✓	✓	✓
EB1828853-009	25-Sep-2018 00:00	H-3	✓	✓	✓	✓
EB1828853-010	28-Sep-2018 00:00	OP2_32 (0-0.5)	✓	✓	✓	✓
EB1828853-011	28-Sep-2018 00:00	OP2_36 (0-0.5)	✓	✓	✓	✓
EB1828853-012	28-Sep-2018 00:00	OP2_36 (0.5-1.0)	✓	✓	✓	✓
EB1828853-013	28-Sep-2018 00:00	OP2_36 (1.0-1.5)	✓	✓	✓	✓
EB1828853-014	28-Sep-2018 00:00	OP2_33 (0-0.5)	✓	✓	✓	✓
EB1828853-015	26-Sep-2018 00:00	OP2_18 (0-0.5)	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.



Requested Deliverables

ALEX KOCHNIEFF

- *AU Certificate of Analysis - NATA (COA)	Email	alex.kochnieff@advisian.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	alex.kochnieff@advisian.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	alex.kochnieff@advisian.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	alex.kochnieff@advisian.com
- Attachment - Report (SUBCO)	Email	alex.kochnieff@advisian.com
- Chain of Custody (CoC) (COC)	Email	alex.kochnieff@advisian.com
- EDI Format - ENMRG (ENMRG)	Email	alex.kochnieff@advisian.com
- EDI Format - XTab (XTAB)	Email	alex.kochnieff@advisian.com

BILL BOYLSON

- *AU Certificate of Analysis - NATA (COA)	Email	bill.boylson@advisian.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	bill.boylson@advisian.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	bill.boylson@advisian.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	bill.boylson@advisian.com
- A4 - AU Tax Invoice (INV)	Email	bill.boylson@advisian.com
- Attachment - Report (SUBCO)	Email	bill.boylson@advisian.com
- Chain of Custody (CoC) (COC)	Email	bill.boylson@advisian.com
- EDI Format - ENMRG (ENMRG)	Email	bill.boylson@advisian.com
- EDI Format - XTab (XTAB)	Email	bill.boylson@advisian.com

NICHOLAS BAINTON

- *AU Certificate of Analysis - NATA (COA)	Email	nicholas.bainton@advisian.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	nicholas.bainton@advisian.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	nicholas.bainton@advisian.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	nicholas.bainton@advisian.com
- Attachment - Report (SUBCO)	Email	nicholas.bainton@advisian.com
- Chain of Custody (CoC) (COC)	Email	nicholas.bainton@advisian.com
- EDI Format - ENMRG (ENMRG)	Email	nicholas.bainton@advisian.com
- EDI Format - XTab (XTAB)	Email	nicholas.bainton@advisian.com

STEPHEN NEALE

- *AU Certificate of Analysis - NATA (COA)	Email	stephen.neale@advisian.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	stephen.neale@advisian.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	stephen.neale@advisian.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	stephen.neale@advisian.com
- Attachment - Report (SUBCO)	Email	stephen.neale@advisian.com
- Chain of Custody (CoC) (COC)	Email	stephen.neale@advisian.com
- EDI Format - ENMRG (ENMRG)	Email	stephen.neale@advisian.com
- EDI Format - XTab (XTAB)	Email	stephen.neale@advisian.com

From: Kochnieff, Alex (Brisbane) [mailto:ALEX.KOCHNIEFF@advisian.com]
Sent: Thursday, 22 November 2018 1:06 PM
To: Caroline Hill <caroline.hill@ALSGlobal.com>
Subject: EB1823470, EB1823888

Good afternoon Caroline,

As discussed, we require additional PSD and settling rate analysis on the following samples:

Workorder	ALS sample #	Volume Remaining			Advisian Sample ID
		250mL Soil Jar	ASS Bag	Porewater Bag	Units LOR
1 EB1823470	5	1	1	-	SB_40
2 EB1823470	7	2	2	-	SB_50
3 EB1823470	9	2.5	1	-	SB_58
4 EB1823470	16	1	2	-	B1_07
5 EB1823470	19	1.5	1	-	B5_08
6 EB1823470	24	1.75	2	-	TB_05 (T1)
7 EB1823470	27	1.75	2	1	TB_12
8 EB1823470	29	2.75	3	1	TB_26
9 EB1823470	35	0.5	-	-	REF_03
10 EB1823470	39	3.5	2	-	H-3
10 EB1823888	9	2-3	Maybe 1	Unknown	OP2_32 (0-0.5)
11 EB1823888	13	2-3	Maybe 2	Unknown	OP2_36 (0-0.5)
12 EB1823888	14	2-3	Maybe 2	Unknown	OP2_36 (0.5-1.0)
13 EB1823888	15	2-3	Maybe 2	Unknown	OP2_36 (1.0-1.5)
14 EB1823888	16	2	1	Unknown	OP2_33 (0-0.5)
15 EB1823888	19	3	Maybe 1	Unknown	OP2_18 (0-0.5)

Please let me know if this is possible.

Kind regards,

Alex Kochnieff
 Senior Environmental Engineer

Level 31, 12 Creek St | Brisbane City, QLD 4000
 P +61 7 3319 3940 | M +61 468 660 301
 E alex.kochnieff@advisian.com

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 **Advisian**

Environmental Division
 Brisbane
 Work Order Reference
EB1828853



Telephone : +61-7-3243 7222

CERTIFICATE OF ANALYSIS

Work Order : EB1828261 Client : ADVISIAN PTY LTD Contact : ALEX KOCHNIEFF Address : LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000 Telephone : ---- Project : 301001.02018 - Port of Mackay Sediment Sampling Order number : ---- C-O-C number : ---- Sampler : ---- Site : ---- Quote number : BN/185/18 No. of samples received : 4 No. of samples analysed : 4	Page : 1 of 7 Laboratory : Environmental Division Brisbane Contact : Caroline Hill Address : 2 Byth Street Stafford QLD Australia 4053 Telephone : +61 7 3552 8662 Date Samples Received : 21-Nov-2018 14:24 Date Analysis Commenced : 04-Oct-2018 Issue Date : 29-Nov-2018 14:43
---	--



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
- Surrogate Control Limits

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
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

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

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

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

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

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

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

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

- **Specialty Organics analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- EP132B-SD : Poor duplicate precision due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EP132B-SD : Poor matrix spike recovery due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EA151: ALS does not hold NATA accreditation for Settleability.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID			NA_01	NA_02	NA_03	NA_04	----
		Client sampling date / time			27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit	EB1828261-040	EB1828261-041	EB1828261-042	EB1828261-043	-----	
				Result	Result	Result	Result	----	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%	18.5	21.4	14.2	14.9	----	
EA150: Particle Sizing									
+75µm	----	1	%	92	----	94	99	----	
+150µm	----	1	%	85	----	93	97	----	
+300µm	----	1	%	53	----	84	86	----	
+425µm	----	1	%	44	----	75	81	----	
+600µm	----	1	%	37	----	57	70	----	
+1180µm	----	1	%	28	----	24	35	----	
+2.36mm	----	1	%	18	----	6	15	----	
+4.75mm	----	1	%	8	----	2	9	----	
+9.5mm	----	1	%	<1	----	<1	<1	----	
+19.0mm	----	1	%	<1	----	<1	<1	----	
+37.5mm	----	1	%	<1	----	<1	<1	----	
+75.0mm	----	1	%	<1	----	<1	<1	----	
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	6	----	2	<1	----	
Silt (2-60 µm)	----	1	%	2	----	2	1	----	
Sand (0.06-2.00 mm)	----	1	%	71	----	84	78	----	
Gravel (>2mm)	----	1	%	21	----	12	21	----	
Cobbles (>6cm)	----	1	%	<1	----	<1	<1	----	
EA151: Settleability 10%									
∅ Underflow Density	----	0.01	g/cm3	1.69	----	1.69	1.83	----	
∅ Underflow Solids	----	0.1	%	59.3	----	74.0	78.0	----	
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	26.0	----	58.2	57.8	----	
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.600	----	58.2	57.8	----	
∅ Clarity	----	-	-	Clear	----	Clear	Clear	----	
EA151: Settleability 20%									
∅ Underflow Density	----	0.01	g/cm3	1.57	----	1.66	2.03	----	
∅ Underflow Solids	----	0.1	%	57.9	----	75.4	82.2	----	
∅ Settling Rate @ 50% of Settlement	----	0.001	mm/min	11.4	----	24.6	25.4	----	
∅ Settling Rate @ 90% of Settlement	----	0.001	mm/min	0.067	----	24.6	25.4	----	
∅ Clarity	----	-	-	Clear	----	Clear	Clear	----	
EA152: Soil Particle Density									
∅ Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.61	----	2.68	2.67	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	NA_01	NA_02	NA_03	NA_04	----
Client sampling date / time					27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit		EB1828261-040	EB1828261-041	EB1828261-042	EB1828261-043	-----
				Result	Result	Result	Result	Result	----
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg	4.88	7.20	9.04	11.5	----	----
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----	----
Chromium	7440-47-3	1.0	mg/kg	6.0	4.0	3.0	4.0	----	----
Copper	7440-50-8	1.0	mg/kg	2.4	1.8	1.4	1.5	----	----
Lead	7439-92-1	1.0	mg/kg	3.5	3.1	2.4	3.2	----	----
Nickel	7440-02-0	1.0	mg/kg	2.8	2.0	1.4	1.9	----	----
Zinc	7440-66-6	1.0	mg/kg	8.9	6.1	4.8	5.8	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	0.28	0.29	0.25	0.18	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg	<3	8	<3	<3	----	----
>C16 - C34 Fraction	----	3	mg/kg	6	41	6	6	----	----
>C34 - C40 Fraction	----	5	mg/kg	<5	13	5	6	----	----
>C10 - C40 Fraction (sum)	----	3	mg/kg	6	62	11	12	----	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg	<3	8	<3	<3	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg	<3	<3	<3	<3	----	----
C10 - C14 Fraction	----	3	mg/kg	<3	8	<3	<3	----	----
C15 - C28 Fraction	----	3	mg/kg	4	29	3	4	----	----
C29 - C36 Fraction	----	5	mg/kg	<5	18	<5	5	----	----
^ C10 - C36 Fraction (sum)	----	3	mg/kg	4	55	3	9	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg	<3	<3	<3	<3	----	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg	<3.0	<3.0	<3.0	<3.0	----	----
EP080-SD: BTEXN									
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----	----
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----	----
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	NA_01	NA_02	NA_03	NA_04	----
Client sampling date / time					27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit		EB1828261-040	EB1828261-041	EB1828261-042	EB1828261-043	-----
					Result	Result	Result	Result	----
EP080-SD: BTEXN - Continued									
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Naphthalene	91-20-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	----
Dibutyltin	1002-53-5	1	µgSn/kg		<1	<1	<1	<1	----
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	<0.5	<0.5	<0.5	----
EP131A: Organochlorine Pesticides									
Aldrin	309-00-2	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
alpha-BHC	319-84-6	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
beta-BHC	319-85-7	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
delta-BHC	319-86-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
4,4`-DDD	72-54-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
4,4`-DDE	72-55-9	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
4,4`-DDT	50-29-3	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
Dieldrin	60-57-1	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
alpha-Endosulfan	959-98-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
beta-Endosulfan	33213-65-9	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
Endosulfan sulfate	1031-07-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
^ Endosulfan (sum)	115-29-7	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
Endrin	72-20-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
Endrin aldehyde	7421-93-4	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
Endrin ketone	53494-70-5	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
Heptachlor	76-44-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
Heptachlor epoxide	1024-57-3	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
gamma-BHC	58-89-9	0.25	µg/kg		<0.25	<0.25	<0.25	<0.25	----
Methoxychlor	72-43-5	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
cis-Chlordane	5103-71-9	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
trans-Chlordane	5103-74-2	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
^ Total Chlordane (sum)	----	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	NA_01	NA_02	NA_03	NA_04	----
Client sampling date / time					27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	27-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit		EB1828261-040	EB1828261-041	EB1828261-042	EB1828261-043	-----
					Result	Result	Result	Result	----
EP131A: Organochlorine Pesticides - Continued									
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg	<5	<5	<5	<5	<5	----
2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	<5	<5	<5	----
Acenaphthylene	208-96-8	4	µg/kg	<4	<4	<4	<4	<4	----
Acenaphthene	83-32-9	4	µg/kg	<4	<4	<4	<4	<4	----
Fluorene	86-73-7	4	µg/kg	<4	<4	<4	<4	<4	----
Phenanthrene	85-01-8	4	µg/kg	<4	<4	<4	<4	<4	----
Anthracene	120-12-7	4	µg/kg	<4	<4	<4	<4	<4	----
Fluoranthene	206-44-0	4	µg/kg	<4	<4	<4	<4	<4	----
Pyrene	129-00-0	4	µg/kg	<4	<4	<4	<4	<4	----
Benz(a)anthracene	56-55-3	4	µg/kg	<4	<4	<4	<4	<4	----
Chrysene	218-01-9	4	µg/kg	<4	<4	<4	<4	<4	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	<4	<4	<4	<4	<4	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	<4	<4	<4	----
Benzo(e)pyrene	192-97-2	4	µg/kg	<4	<4	<4	<4	<4	----
Benzo(a)pyrene	50-32-8	4	µg/kg	<4	<4	<4	<4	<4	----
Perylene	198-55-0	4	µg/kg	<4	<4	<4	<4	<4	----
Benzo(g,h,i)perylene	191-24-2	4	µg/kg	<4	<4	<4	<4	<4	----
Dibenz(a,h)anthracene	53-70-3	4	µg/kg	<4	<4	<4	<4	<4	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	<4	<4	<4	<4	----
Coronene	191-07-1	5	µg/kg	<5	<5	<5	<5	<5	----
^ Sum of PAHs	----	4	µg/kg	<4	<4	<4	<4	<4	----
EP080-SD: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	93.1	89.2	100	97.2	97.2	----
Toluene-D8	2037-26-5	0.2	%	92.7	85.7	95.7	94.4	94.4	----
4-Bromofluorobenzene	460-00-4	0.2	%	94.8	88.2	97.5	96.2	96.2	----
EP090S: Organotin Surrogate									
Tripopyltin	----	0.5	%	88.2	80.6	78.4	140	140	----
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%	83.4	95.6	93.2	86.6	86.6	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%	110	83.1	71.6	106	106	----
Anthracene-d10	1719-06-8	10	%	99.2	122	74.9	114	114	----
4-Terphenyl-d14	1718-51-0	10	%	81.7	110	88.8	99.3	99.3	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080-SD: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	51	145
Toluene-D8	2037-26-5	42	144
4-Bromofluorobenzene	460-00-4	58	142
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	119
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	55	135
Anthracene-d10	1719-06-8	70	136
4-Terphenyl-d14	1718-51-0	57	127

QUALITY CONTROL REPORT

Work Order	: EB1828261	Page	: 1 of 6
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: ALEX KOCHNIEFF	Contact	: Caroline Hill
Address	: LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8662
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Date Samples Received	: 21-Nov-2018
Order number	: ----	Date Analysis Commenced	: 04-Oct-2018
C-O-C number	: ----	Issue Date	: 29-Nov-2018
Sampler	: ----		
Site	:		
Quote number	: BN/185/18		
No. of samples received	: 4		
No. of samples analysed	: 4		



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 Quality Control Report contains the following information:

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

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
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2049626)									
EB1828261-040	NA_01	EA055: Moisture Content	----	0.1	%	18.5	18.5	0.00	0% - 20%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 2056763)									
EB1828261-040	NA_01	EP003: Total Organic Carbon	----	0.02	%	0.28	0.28	0.00	0% - 50%
EP131A: Organochlorine Pesticides (QC Lot: 2063016)									
EB1828261-042	NA_03	EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	0.00	No Limit
		EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: 4,4'-DDD	72-54-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: 4,4'-DDE	72-55-9	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: 4,4'-DDT	50-29-3	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	<0.50	0.00	No Limit

Page : 3 of 6
 Work Order : EB1828261
 Client : ADVISIAN PTY LTD
 Project : 301001.02018 - Port of Mackay Sediment Sampling



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP131A: Organochlorine Pesticides (QC Lot: 2063016) - continued									
EB1828261-042	NA_03	EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	<0.50	0.00	No Limit
		EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	<0.50	0.00	No Limit



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

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

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 2049620)									
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.0555 mg/kg	130	70	130	
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 2049621)									
EG020-SD: Arsenic	7440-38-2	1	mg/kg	<1.00	116 mg/kg	93.2	80	124	
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	0.8 mg/kg	97.6	87	122	
EG020-SD: Chromium	7440-47-3	1	mg/kg	<1.0	20.5 mg/kg	91.6	79	129	
EG020-SD: Copper	7440-50-8	1	mg/kg	<1.0	52.9 mg/kg	87.5	85	118	
EG020-SD: Lead	7439-92-1	1	mg/kg	<1.0	53.4 mg/kg	104	86	119	
EG020-SD: Nickel	7440-02-0	1	mg/kg	<1.0	14.7 mg/kg	92.1	77	123	
EG020-SD: Zinc	7440-66-6	1	mg/kg	<1.0	112 mg/kg	106	71	127	
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 2056763)									
EP003: Total Organic Carbon	----	0.02	%	<0.02	0.11 %	100	70	130	
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 2049622)									
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	16 mg/kg	100	66	120	
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 2049624)									
EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	157 mg/kg	108	43	126	
EP071-SD: C15 - C28 Fraction	----	3	mg/kg	<3	245 mg/kg	117	66	140	
EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	----	----	----	----	
EP071-SD: C10 - C36 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----	
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 2049622)									
EP080-SD: C6 - C10 Fraction	C6_C10	3	mg/kg	<3	18.5 mg/kg	101	66	119	
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 2049624)									
EP071-SD: >C10 - C16 Fraction	----	3	mg/kg	<3	227 mg/kg	111	40	134	
EP071-SD: >C16 - C34 Fraction	----	3	mg/kg	<3	162 mg/kg	119	66	136	
EP071-SD: >C34 - C40 Fraction	----	5	mg/kg	<5	----	----	----	----	
EP071-SD: >C10 - C40 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----	
EP080-SD: BTEXN (QCLot: 2049622)									
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	95.2	73	105	
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	1 mg/kg	94.5	73	105	
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	1 mg/kg	95.5	67	104	
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	2 mg/kg	97.2	66	106	
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	1 mg/kg	95.3	68	105	
EP080-SD: Total Xylenes	----	0.2	mg/kg	<0.2	----	----	----	----	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike	Spike Recovery (%)		Recovery Limits (%)	
					Concentration	LCS	Low	High	
EP080-SD: BTEXN (QCLot: 2049622) - continued									
EP080-SD: Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----	
EP080-SD: Naphthalene	91-20-3	0.2	mg/kg	<0.2	1 mg/kg	88.5	72	115	
EP090: Organotin Compounds (QCLot: 2049623)									
EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	1.25 µgSn/kg	85.5	36	128	
EP090: Dibutyltin	1002-53-5	1	µgSn/kg	<1	1.25 µgSn/kg	91.1	42	132	
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	62.3	52	139	
EP131A: Organochlorine Pesticides (QCLot: 2063016)									
EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	5 µg/kg	49.5	38	139	
EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	5 µg/kg	53.2	18	136	
EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	5 µg/kg	59.9	31	131	
EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	5 µg/kg	64.6	37	140	
EP131A: 4,4'-DDD	72-54-8	0.5	µg/kg	<0.50	5 µg/kg	63.4	26	141	
EP131A: 4,4'-DDE	72-55-9	0.5	µg/kg	<0.50	5 µg/kg	47.2	35	129	
EP131A: 4,4'-DDT	50-29-3	0.5	µg/kg	<0.50	5 µg/kg	75.0	23	138	
EP131A: Sum of DDD + DDE + DDT	72-54-8/72-5-9/50-2	0.5	µg/kg	<0.50	----	----	----	----	
EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	5 µg/kg	55.6	30	140	
EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	5 µg/kg	50.8	38	140	
EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	5 µg/kg	45.4	32	152	
EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	5 µg/kg	59.6	36	155	
EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	----	----	----	----	
EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	5 µg/kg	70.1	26	158	
EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	5 µg/kg	39.3	20	118	
EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	5 µg/kg	45.2	13	135	
EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	5 µg/kg	57.7	39	155	
EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	5 µg/kg	42.1	34	148	
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	5 µg/kg	38.5	26	152	
EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	5 µg/kg	36.7	31	137	
EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	5 µg/kg	84.5	36	152	
EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	5 µg/kg	84.7	36	142	
EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	5 µg/kg	40.7	30	138	
EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.25	----	----	----	----	
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 2063013)									
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	93.4	63	129	
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	25 µg/kg	90.0	64	128	
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	93.8	65	129	
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	86.5	68	132	
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	87.0	68	124	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
					25 µg/kg	LCS	Low	High	
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 2063013) - continued									
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	88.2	64	134	
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	88.8	65	131	
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	85.5	64	130	
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	83.4	67	133	
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	91.1	62	130	
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	89.1	65	133	
EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	<4	25 µg/kg	90.8	68	120	
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	82.4	61	133	
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	25 µg/kg	83.3	63	127	
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	88.6	66	118	
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	25 µg/kg	88.3	69	119	
EP132B-SD: Benzo(g,h,i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	89.1	66	120	
EP132B-SD: Dibenz(a,h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	89.3	64	122	
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	88.4	64	120	
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	25 µg/kg	91.9	68	136	
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----	

Matrix Spike (MS) Report

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

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EB1828261	Page	: 1 of 8
Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: ALEX KOCHNIEFF	Telephone	: +61 7 3552 8662
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Date Samples Received	: 21-Nov-2018
Site	:	Issue Date	: 29-Nov-2018
Sampler	: ----	No. of samples received	: 4
Order number	: ----	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP090S: Organotin Surrogate	EB1828261-043	NA_04	Tripropyltin	----	140 %	35-130 %	Recovery greater than upper data quality objective

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	Extraction / Preparation			Analysis			
	Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved							
NA_01, NA_03,	NA_02, NA_04	----	----	----	21-Nov-2018	11-Oct-2018	41
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved							
NA_01, NA_03,	NA_02, NA_04	28-Nov-2018	25-Oct-2018	34	28-Nov-2018	25-Oct-2018	34
EP003: Total Organic Carbon (TOC) in Soil							
Pulp Bag							
NA_01, NA_03,	NA_02, NA_04	26-Nov-2018	25-Oct-2018	32	26-Nov-2018	25-Oct-2018	32
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved							
NA_01, NA_03,	NA_02, NA_04	11-Oct-2018	11-Oct-2018	0	15-Oct-2018	20-Nov-2018	-36
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved							
NA_01, NA_03,	NA_02, NA_04	04-Oct-2018	11-Oct-2018	-7	26-Nov-2018	11-Oct-2018	46
Soil Glass Jar - Unpreserved							
NA_01, NA_03,	NA_02, NA_04	11-Oct-2018	11-Oct-2018	0	15-Oct-2018	20-Nov-2018	-36
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons							
Soil Glass Jar - Unpreserved							
NA_01, NA_03,	NA_02, NA_04	04-Oct-2018	11-Oct-2018	-7	26-Nov-2018	11-Oct-2018	46
EP080-SD: BTEXN							
Soil Glass Jar - Unpreserved							
NA_01, NA_03,	NA_02, NA_04	04-Oct-2018	11-Oct-2018	-7	26-Nov-2018	11-Oct-2018	46
EP090: Organotin Compounds							



Matrix: **SOIL**

Method Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EP090: Organotin Compounds - Analysis Holding Time Compliance						
Soil Glass Jar - Unpreserved NA_01, NA_03, NA_02, NA_04	08-Oct-2018	11-Oct-2018	-3	10-Oct-2018	17-Nov-2018	-38
EP131A: Organochlorine Pesticides						
Soil Glass Jar - Unpreserved NA_01, NA_03, NA_02, NA_04	11-Oct-2018	11-Oct-2018	0	29-Nov-2018	20-Nov-2018	9
EP132B: Polynuclear Aromatic Hydrocarbons						
Soil Glass Jar - Unpreserved NA_01, NA_03, NA_02, NA_04	05-Oct-2018	11-Oct-2018	-6	29-Nov-2018	14-Nov-2018	15

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Organotin Analysis	0	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	0	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	0	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	0	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	0	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	0	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Organochlorine Pesticides (Ultra-trace)	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.



Matrix: SOIL Evaluation: ✘ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	----	----	----	21-Nov-2018	11-Oct-2018	✘	
EA150: Particle Sizing								
Snap Lock Bag (EA150H) NA_01, NA_04, NA_03	27-Sep-2018	----	----	----	23-Nov-2018	26-Mar-2019	✔	
EA150: Soil Classification based on Particle Size								
Snap Lock Bag (EA150H) NA_01, NA_04, NA_03	27-Sep-2018	----	----	----	23-Nov-2018	26-Mar-2019	✔	
EA151: Settleability 10%								
Snap Lock Bag (EA151-10) NA_01, NA_04, NA_03	27-Sep-2018	----	----	----	23-Nov-2018	26-Mar-2019	✔	
EA151: Settleability 20%								
Snap Lock Bag (EA151-20) NA_01, NA_04, NA_03	27-Sep-2018	----	----	----	23-Nov-2018	26-Mar-2019	✔	
EA152: Soil Particle Density								
Snap Lock Bag (EA152) NA_01, NA_04, NA_03	27-Sep-2018	----	----	----	23-Nov-2018	26-Mar-2019	✔	
EG020-SD: Total Metals in Sediments by ICPMS								
Soil Glass Jar - Unpreserved (EG020-SD) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	28-Nov-2018	26-Mar-2019	✔	28-Nov-2018	26-Mar-2019	✔	
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T-LL) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	28-Nov-2018	25-Oct-2018	✘	28-Nov-2018	25-Oct-2018	✘	
EP003: Total Organic Carbon (TOC) in Soil								
Pulp Bag (EP003) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	26-Nov-2018	25-Oct-2018	✘	26-Nov-2018	25-Oct-2018	✘	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP071-SD) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	11-Oct-2018	11-Oct-2018	✘	15-Oct-2018	20-Nov-2018	✘	



Matrix: **SOIL**

Evaluation: ✘ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080-SD) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	04-Oct-2018	11-Oct-2018	✘	26-Nov-2018	11-Oct-2018	✘
Soil Glass Jar - Unpreserved (EP071-SD) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	11-Oct-2018	11-Oct-2018	✘	15-Oct-2018	20-Nov-2018	✘
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080-SD) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	04-Oct-2018	11-Oct-2018	✘	26-Nov-2018	11-Oct-2018	✘
EP080-SD: BTEXN							
Soil Glass Jar - Unpreserved (EP080-SD) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	04-Oct-2018	11-Oct-2018	✘	26-Nov-2018	11-Oct-2018	✘
EP090: Organotin Compounds							
Soil Glass Jar - Unpreserved (EP090) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	08-Oct-2018	11-Oct-2018	✘	10-Oct-2018	17-Nov-2018	✘
EP131A: Organochlorine Pesticides							
Soil Glass Jar - Unpreserved (EP131A) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	11-Oct-2018	11-Oct-2018	✘	29-Nov-2018	20-Nov-2018	✘
EP132B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP132B-SD) NA_01, NA_03, NA_02, NA_04	27-Sep-2018	05-Oct-2018	11-Oct-2018	✘	29-Nov-2018	14-Nov-2018	✘



Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

Evaluation: ✘ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Analytical Methods							
Laboratory Duplicates (DUP)							
Moisture Content	EA055	1	4	25.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organochlorine Pesticides (Ultra-trace)	EP131A	1	4	25.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	0	4	0.00	10.00	✘	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	0	4	0.00	10.00	✘	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	0	4	0.00	10.00	✘	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	0	4	0.00	10.00	✘	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	4	25.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	0	4	0.00	10.00	✘	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	0	4	0.00	10.00	✘	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	1	4	25.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	0	4	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	0	4	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	0	4	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	0	4	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	0	4	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	0	4	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	0	4	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Settleability 10%	* EA151-10	SOIL	In house: Determination of the settling rate of sediment or sludge in 10% solids slurries in seawater
Settleability 20%	* EA151-20	SOIL	In house: Determination of the settling rate of sediment or sludge in 20% solids slurries in seawater
Soil Particle Density	* EA152	SOIL	Soil Particle Density by AS 1289.3.5.1-2006 : Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Total Metals in Sediments by ICPMS	EG020-SD	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. Analyte list and LORs per NODG.
Total Mercury by FIMS (Low Level)	EG035T-LL	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO ₂) is automatically measured by infra-red detector.
TPH - Semivolatile Fraction	EP071-SD	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
TRH Volatiles/BTEX in Sediments	EP080-SD	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Organotin Analysis	EP090	SOIL	In house: Referenced to USEPA SW 846 - 8270D Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quantified against an established calibration curve.
Organochlorine Pesticides (Ultra-trace)	EP131A	SOIL	In house: Referenced to USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/μECD/μECD) This technique is compliant with NEPM (2013) Schedule B(3)
PAHs in Sediments by GCMS(SIM)	EP132B-SD	SOIL	In house: Referenced to USEPA 8270D GCMS Capillary column, SIM mode using large volume programmed temperature vaporisation injection.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Dry and Pulverise (up to 100g)	GEO30	SOIL	#



<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids/ Sample Cleanup	ORG17A-UTP	SOIL	In house: Mechanical agitation (tumbler). 20g of sample, Na ₂ SO ₄ and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. Samples are extracted, concentrated (by KD) and exchanged into an appropriate solvent for GPC and florisil cleanup as required.
Tumbler Extraction of Solids for LVI (Non-concentrating)	ORG17D	SOIL	In house: 10g of sample, Na ₂ SO ₄ and surrogate are extracted with 50mL 1:1 DCM/Acetone by end over end tumbling. An aliquot is concentrated by nitrogen blowdown to a reduced volume for analysis if required.
Organotin Sample Preparation	ORG35	SOIL	In house: 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EB1828261

Client	: ADVISIAN PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: ALEX KOCHNIEFF	Contact	: Caroline Hill
Address	: LEVEL 3 60 ALBERT STREET BRISBANE QLD, AUSTRALIA 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: alex.kochnieff@advisian.com	E-mail	: Caroline.Hill@Alsglobal.com
Telephone	: ----	Telephone	: +61 7 3552 8662
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: 301001.02018 - Port of Mackay Sediment Sampling	Page	: 1 of 3
Order number	: ----	Quote number	: EB2018ADVISI0003 (BN/185/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	:		

Dates

Date Samples Received	: 21-Nov-2018 14:24	Issue Date	: 21-Nov-2018
Client Requested Due Date	: 28-Nov-2018	Scheduled Reporting Date	: 28-Nov-2018

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	: MEDIUM ESKY	No. of samples received / analysed	: 4 / 4

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Please be advised, due to limited sample volume submitted, PSD analysis has been removed from "NA_02".**
- This workorder has been created to split samples 40-43 from EB1823470.
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **Particle Sizing analysis will be conducted by ALS Environmental, Newcastle, NATA accreditation no. 825, Site No. 1656.**
- **Specialty Organics analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**



Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EG020-SD Total Metals in Sediments by ICPMS (NODG)	SOIL - EG035T-LL Total Mercury by FIMS - Low Level (SOLID)	SOIL - EP071 - SD TRH ultra trace in sediments	SOIL - EP080-SD TRH(V)/BTEXN in Sediments	SOIL - EP090 (solids) Organotins	SOIL - EP132B-SD Ultra-trace PAHs in Sediments
EB1828261-040	21-Nov-2018 00:00	NA_01	✓	✓	✓	✓	✓	✓	✓
EB1828261-041	21-Nov-2018 00:00	NA_02	✓	✓	✓	✓	✓	✓	
EB1828261-042	21-Nov-2018 00:00	NA_03	✓	✓	✓	✓	✓	✓	
EB1828261-043	21-Nov-2018 00:00	NA_04	✓	✓	✓	✓	✓	✓	

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA150H Particle Size Analysis by Hydrometer: AS1289	SOIL - EA151-10 Settleability 10%	SOIL - EA151-20 Settleability 20%	SOIL - EA152 Soil Particle Density for Hydrometer Analysis	SOIL - EP003 Total Organic Carbon (TOC) in Soil	SOIL - EP131A OC Pesticides (Ultratrace)
EB1828261-040	21-Nov-2018 00:00	NA_01	✓	✓	✓	✓	✓	✓
EB1828261-041	21-Nov-2018 00:00	NA_02					✓	✓
EB1828261-042	21-Nov-2018 00:00	NA_03	✓	✓	✓	✓	✓	✓
EB1828261-043	21-Nov-2018 00:00	NA_04	✓	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.



Requested Deliverables

ALEX KOCHNIEFF

- *AU Certificate of Analysis - NATA (COA) Email alex.kochnieff@advisian.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email alex.kochnieff@advisian.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email alex.kochnieff@advisian.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email alex.kochnieff@advisian.com
- A4 - AU Tax Invoice (INV) Email alex.kochnieff@advisian.com
- Chain of Custody (CoC) (COC) Email alex.kochnieff@advisian.com
- EDI Format - ENMRG (ENMRG) Email alex.kochnieff@advisian.com
- EDI Format - XTab (XTAB) Email alex.kochnieff@advisian.com

BILL BOYLSON

- *AU Certificate of Analysis - NATA (COA) Email bill.boylson@advisian.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email bill.boylson@advisian.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email bill.boylson@advisian.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email bill.boylson@advisian.com
- A4 - AU Tax Invoice (INV) Email bill.boylson@advisian.com
- Chain of Custody (CoC) (COC) Email bill.boylson@advisian.com
- EDI Format - ENMRG (ENMRG) Email bill.boylson@advisian.com
- EDI Format - XTab (XTAB) Email bill.boylson@advisian.com

CLIENT DETAILS

Contact **Bill Boylson**
 Client **WORLEYPARSONS SERVICES PTY LTD**
 Address **Level 3
 60 Albert Street
 Brisbane
 QLD 4000**
 Telephone **0437 906 129**
 Facsimile **(Not specified)**
 Email **bill.boylson@advisian.com**
 Project **301001.02018 Port Mackay Sediment Sample**
 Order Number **(Not specified)**
 Samples **1**

LABORATORY DETAILS

Manager **Huong Crawford**
 Laboratory **SGS Alexandria Environmental**
 Address **Unit 16, 33 Maddox St
 Alexandria NSW 2015**
 Telephone **+61 2 8594 0400**
 Facsimile **+61 2 8594 0499**
 Email **au.environmental.sydney@sgs.com**
 SGS Reference **SE184870 R0**
 Date Received **10 Oct 2018**
 Date Reported **17 Oct 2018**

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

Organotins subcontracted to SGS Melbourne, Unit 10/585 Blackburn Road Notting Hill VIC 3168, NATA Accreditation Number 2562, Site number 14420.

SIGNATORIES



Akheevar Beniamen
Chemist



Bennet Lo
Senior Organic Chemist/Metals Chemis



Dong Liang
Metals/Inorganics Team Leader



Ly Kim Ha
Organic Section Head



Teresa Nguyen
Organic Chemist

Sample Number SE184870.001
 Sample Matrix Soil
 Sample Date 28 Sep 2018
 Sample Name D8

Parameter Units LOR

VOC's in Soil Method: AN433 Tested: 11/10/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	<0.1
Toluene	mg/kg	0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2
o-xylene	mg/kg	0.1	<0.1

Polycyclic VOCs

Naphthalene	mg/kg	0.1	<0.1
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Surrogates

Dibromofluoromethane (Surrogate)	%	-	75
d4-1,2-dichloroethane (Surrogate)	%	-	72
d8-toluene (Surrogate)	%	-	76
Bromofluorobenzene (Surrogate)	%	-	75

Totals

Total Xylenes	mg/kg	0.3	<0.3
Total BTEX	mg/kg	0.6	<0.6

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 11/10/2018

TRH C6-C10	mg/kg	25	<25
TRH C6-C9	mg/kg	20	<20

Surrogates

Dibromofluoromethane (Surrogate)	%	-	75
d4-1,2-dichloroethane (Surrogate)	%	-	72
d8-toluene (Surrogate)	%	-	76
Bromofluorobenzene (Surrogate)	%	-	75

Sample Number SE184870.001
 Sample Matrix Soil
 Sample Date 28 Sep 2018
 Sample Name D8

Parameter Units LOR

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 11/10/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	<0.1
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 11/10/2018

TRH C10-C14	mg/kg	20	<20
TRH C15-C28	mg/kg	45	<45
TRH C29-C36	mg/kg	45	<45
TRH C37-C40	mg/kg	100	<100
TRH C10-C36 Total	mg/kg	110	<110
TRH C10-C40 Total (F bands)	mg/kg	210	<210

TRH F Bands

TRH >C10-C16	mg/kg	25	<25
TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120

PAH (Polynuclear Aromatic Hydrocarbons) in Soil Method: AN420 Tested: 11/10/2018

Naphthalene	mg/kg	0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1
Fluorene	mg/kg	0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1
Anthracene	mg/kg	0.1	<0.1
Fluoranthene	mg/kg	0.1	<0.1
Pyrene	mg/kg	0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	<0.1
Chrysene	mg/kg	0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ (mg/kg)	0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2
Total PAH (18)	mg/kg	0.8	<0.8
Total PAH (NEPM/WHO 16)	mg/kg	0.8	<0.8

Sample Number SE184870.001
 Sample Matrix Soil
 Sample Date 28 Sep 2018
 Sample Name D8

Parameter **Units** **LOR**
PAH (Polynuclear Aromatic Hydrocarbons) in Soil Method: AN420 Tested: 11/10/2018 (continued)

Surrogates

Parameter	Units	LOR	Value
d5-nitrobenzene (Surrogate)	%	-	90
2-fluorobiphenyl (Surrogate)	%	-	98
d14-p-terphenyl (Surrogate)	%	-	88

OC Pesticides in Soil Method: AN420 Tested: 11/10/2018

Parameter	Units	LOR	Value
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1
Lindane	mg/kg	0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1
Aldrin	mg/kg	0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1
Dieldrin	mg/kg	0.2	<0.2
Endrin	mg/kg	0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1
Isodrin	mg/kg	0.1	<0.1
Mirex	mg/kg	0.1	<0.1
Total CLP OC Pesticides	mg/kg	1	<1

Surrogates

Parameter	Units	LOR	Value
Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	96

Sample Number SE184870.001
 Sample Matrix Soil
 Sample Date 28 Sep 2018
 Sample Name D8

Parameter Units LOR

TOC in Soil Method: AN188 Tested: 15/10/2018

Total Organic Carbon	%w/w	0.05	1.2
Organic Matter (calc)*	%w/w	0.1	2.0

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES Method: AN040/AN320 Tested: 11/10/2018

Arsenic, As	mg/kg	1	2
Cadmium, Cd	mg/kg	0.3	<0.3
Chromium, Cr	mg/kg	0.3	3.1
Copper, Cu	mg/kg	0.5	11
Nickel, Ni	mg/kg	0.5	2.2
Lead, Pb	mg/kg	1	6
Zinc, Zn	mg/kg	2	18

Mercury in Soil Method: AN312 Tested: 11/10/2018

Mercury	mg/kg	0.05	<0.05
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Moisture Content Method: AN002 Tested: 11/10/2018

% Moisture	%w/w	0.5	40
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Sample Subcontracted Method: Tested: 17/10/2018

SGS Melbourne*	No unit	-	Subcontracted
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MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared to the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

Mercury in Soil Method: ME-(AU)-[ENV]AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB158643	mg/kg	0.05	<0.05	2%	104%	95%

Moisture Content Method: ME-(AU)-[ENV]AN002

Parameter	QC Reference	Units	LOR	DUP %RPD
% Moisture	LB158639	%w/w	0.5	3 - 17%

OC Pesticides in Soil Method: ME-(AU)-[ENV]AN420

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Hexachlorobenzene (HCB)	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Alpha BHC	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Lindane	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Heptachlor	LB158638	mg/kg	0.1	<0.1	0%	75%	85%
Aldrin	LB158638	mg/kg	0.1	<0.1	0%	75%	85%
Beta BHC	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Delta BHC	LB158638	mg/kg	0.1	<0.1	0%	75%	80%
Heptachlor epoxide	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
o,p'-DDE	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Alpha Endosulfan	LB158638	mg/kg	0.2	<0.2	0%	NA	NA
Gamma Chlordane	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Alpha Chlordane	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
trans-Nonachlor	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
p,p'-DDE	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Dieldrin	LB158638	mg/kg	0.2	<0.2	0 - 11%	80%	-340%
Endrin	LB158638	mg/kg	0.2	<0.2	0%	75%	115%
o,p'-DDD	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
o,p'-DDT	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Beta Endosulfan	LB158638	mg/kg	0.2	<0.2	0%	NA	NA
p,p'-DDD	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
p,p'-DDT	LB158638	mg/kg	0.1	<0.1	0%	65%	115%
Endosulfan sulphate	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Endrin Aldehyde	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Methoxychlor	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Endrin Ketone	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Isodrin	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Mirex	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Total CLP OC Pesticides	LB158638	mg/kg	1	<1	0 - 3%	NA	NA

Surrogates

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Tetrachloro-m-xylene (TCMX) (Surrogate)	LB158638	%	-	88%	1 - 5%	96%	93%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil Method: ME-(AU)-[ENV]AN420

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Naphthalene	LB158638	mg/kg	0.1	<0.1	8 - 16%	105%	104%
2-methylnaphthalene	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
1-methylnaphthalene	LB158638	mg/kg	0.1	<0.1	0%	NA	NA
Acenaphthylene	LB158638	mg/kg	0.1	<0.1	4 - 10%	108%	104%
Acenaphthene	LB158638	mg/kg	0.1	<0.1	0%	109%	107%
Fluorene	LB158638	mg/kg	0.1	<0.1	0 - 33%	NA	NA
Phenanthrene	LB158638	mg/kg	0.1	<0.1	7 - 13%	108%	103%
Anthracene	LB158638	mg/kg	0.1	<0.1	5 - 21%	103%	97%
Fluoranthene	LB158638	mg/kg	0.1	<0.1	5%	97%	120%
Pyrene	LB158638	mg/kg	0.1	<0.1	3 - 6%	105%	109%
Benzo(a)anthracene	LB158638	mg/kg	0.1	<0.1	2 - 10%	NA	NA
Chrysene	LB158638	mg/kg	0.1	<0.1	3 - 15%	NA	NA
Benzo(b&j)fluoranthene	LB158638	mg/kg	0.1	<0.1	11 - 21%	NA	NA
Benzo(k)fluoranthene	LB158638	mg/kg	0.1	<0.1	0 - 17%	NA	NA
Benzo(a)pyrene	LB158638	mg/kg	0.1	<0.1	8 - 10%	106%	105%
Indeno(1,2,3-cd)pyrene	LB158638	mg/kg	0.1	<0.1	8 - 10%	NA	NA
Dibenzo(ah)anthracene	LB158638	mg/kg	0.1	<0.1	0 - 9%	NA	NA
Benzo(ghi)perylene	LB158638	mg/kg	0.1	<0.1	10 - 12%	NA	NA
Carcinogenic PAHs, BaP TEQ <LOR=0	LB158638	TEQ (mg/kg)	0.2	<0.2	8 - 11%	NA	NA
Carcinogenic PAHs, BaP TEQ <LOR=LOR	LB158638	TEQ (mg/kg)	0.3	<0.3	8 - 11%	NA	NA
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	LB158638	TEQ (mg/kg)	0.2	<0.2	8 - 11%	NA	NA
Total PAH (18)	LB158638	mg/kg	0.8	<0.8	1 - 7%	NA	NA
Total PAH (NEPM/WHO 16)	LB158638	mg/kg	0.8	<0.8			

Surrogates

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
d5-nitrobenzene (Surrogate)	LB158638	%	-	90%	2 - 4%	86%	96%
2-fluorobiphenyl (Surrogate)	LB158638	%	-	96%	2%	92%	98%
d14-p-terphenyl (Surrogate)	LB158638	%	-	88%	0 - 2%	80%	94%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared to the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

TOC in Soil Method: ME-(AU)-[ENV]AN188

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Organic Carbon	LB158798	%w/w	0.05	<0.05	10 - 11%	98%	NA
Organic Matter (calc)*	LB158798	%w/w	0.1	<0.1			

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES Method: ME-(AU)-[ENV]AN040/AN320

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Arsenic, As	LB158641	mg/kg	1	<1	50%	98%	91%
Cadmium, Cd	LB158641	mg/kg	0.3	<0.3	19%	103%	92%
Chromium, Cr	LB158641	mg/kg	0.3	<0.3	30%	103%	95%
Copper, Cu	LB158641	mg/kg	0.5	<0.5	14%	84%	85%
Nickel, Ni	LB158641	mg/kg	0.5	<0.5	40%	87%	88%
Lead, Pb	LB158641	mg/kg	1	<1	112%	83%	80%
Zinc, Zn	LB158641	mg/kg	2	<2.0	17%	95%	92%

TRH (Total Recoverable Hydrocarbons) in Soil Method: ME-(AU)-[ENV]AN403

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
TRH C10-C14	LB158638	mg/kg	20	<20	0%	75%	60%
TRH C15-C28	LB158638	mg/kg	45	<45	0%	75%	63%
TRH C29-C36	LB158638	mg/kg	45	<45	0%	75%	15%
TRH C37-C40	LB158638	mg/kg	100	<100	0%	NA	NA
TRH C10-C36 Total	LB158638	mg/kg	110	<110	0%	NA	NA
TRH C10-C40 Total (F bands)	LB158638	mg/kg	210	<210	0%	NA	NA

TRH F Bands

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
TRH >C10-C16	LB158638	mg/kg	25	<25	0%	75%	60%
TRH >C10-C16 - Naphthalene (F2)	LB158638	mg/kg	25	<25	0%	NA	NA
TRH >C16-C34 (F3)	LB158638	mg/kg	90	<90	0%	75%	33%
TRH >C34-C40 (F4)	LB158638	mg/kg	120	<120	0%	75%	NA

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

VOC's in Soil Method: ME-(AU)-[ENV]AN433

Monocyclic Aromatic Hydrocarbons

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Benzene	LB158637	mg/kg	0.1	<0.1	0%	132%	109%
Toluene	LB158637	mg/kg	0.1	<0.1	0%	92%	65%
Ethylbenzene	LB158637	mg/kg	0.1	<0.1	0%	89%	66%
m/p-xylene	LB158637	mg/kg	0.2	<0.2	0%	97%	72%
o-xylene	LB158637	mg/kg	0.1	<0.1	0%	88%	67%

Polycyclic VOCs

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Naphthalene	LB158637	mg/kg	0.1	<0.1	0%	NA	NA

Surrogates

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Dibromofluoromethane (Surrogate)	LB158637	%	-	87%	5 - 8%	84%	87%
d4-1,2-dichloroethane (Surrogate)	LB158637	%	-	84%	3 - 7%	81%	85%
d8-toluene (Surrogate)	LB158637	%	-	91%	4 - 10%	87%	79%
Bromofluorobenzene (Surrogate)	LB158637	%	-	76%	4 - 9%	86%	81%

Totals

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Xylenes	LB158637	mg/kg	0.3	<0.3	0%	NA	NA
Total BTEX	LB158637	mg/kg	0.6	<0.6	0%	NA	NA

Volatile Petroleum Hydrocarbons in Soil Method: ME-(AU)-[ENV]AN433

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
TRH C6-C10	LB158637	mg/kg	25	<25	0%	94%	78%
TRH C6-C9	LB158637	mg/kg	20	<20	0%	94%	78%

Surrogates

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Dibromofluoromethane (Surrogate)	LB158637	%	-	87%	5 - 8%	84%	87%
d4-1,2-dichloroethane (Surrogate)	LB158637	%	-	84%	3 - 7%	81%	85%
d8-toluene (Surrogate)	LB158637	%	-	91%	4 - 10%	87%	79%
Bromofluorobenzene (Surrogate)	LB158637	%	-	76%	4 - 9%	86%	81%

VPH F Bands

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Benzene (F0)	LB158637	mg/kg	0.1	<0.1	0%	NA	NA
TRH C6-C10 minus BTEX (F1)	LB158637	mg/kg	25	<25	0%	82%	84%

METHOD

METHODOLOGY SUMMARY

- AN002 The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
- AN040 A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
- AN040/AN320 A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
- AN188 The organic material in the soil sample is oxidised with chromic acid in the presence of excess sulfuric acid, without external heat being applied. The excess dichromate ion is determined by titration with standard ammonium iron (II) sulfate solution and the amount of oxidised material is calculated from the quantity of dichromate reduced. Referenced to NEPM 105 and AS1289.1.1.1.
- AN312 Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
- AN403 Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
- AN403 Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoverable Hydrocarbons - Silica (TRH-Si) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
- AN403 The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
- AN420 (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
- AN420 SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
- AN433 VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC's are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
		-	The sample was not analysed for this analyte
		NVL	Not Validated

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

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

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

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

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

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CLIENT DETAILS

LABORATORY DETAILS

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Project	301001.02018 Port Mackay Sediment Sample	SGS Reference	SE184870 R0
Order Number	(Not specified)	Date Received	10 Oct 2018
Samples	1	Date Reported	17 Oct 2018

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document and was supplied by the Client. This QA/QC Statement must be read in conjunction with the referenced Analytical Report. The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Duplicate	Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES	3 items
Matrix Spike	OC Pesticides in Soil	1 item
	TRH (Total Recoverable Hydrocarbons) in Soil	2 items

SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	Client	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	1 Soil
Date documentation received	10/10/2018	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	11.3°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
D8	SE184870.001	LB158643	28 Sep 2018	10 Oct 2018	26 Oct 2018	11 Oct 2018	26 Oct 2018	16 Oct 2018

Moisture Content

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
D8	SE184870.001	LB158639	28 Sep 2018	10 Oct 2018	12 Oct 2018	11 Oct 2018	16 Oct 2018	15 Oct 2018

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
D8	SE184870.001	LB158638	28 Sep 2018	10 Oct 2018	12 Oct 2018	11 Oct 2018	20 Nov 2018	16 Oct 2018

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
D8	SE184870.001	LB158638	28 Sep 2018	10 Oct 2018	12 Oct 2018	11 Oct 2018	20 Nov 2018	15 Oct 2018

TOC in Soil

Method: ME-(AU)-[ENV]AN188

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
D8	SE184870.001	LB158798	28 Sep 2018	10 Oct 2018	26 Oct 2018	15 Oct 2018	26 Oct 2018	16 Oct 2018

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
D8	SE184870.001	LB158641	28 Sep 2018	10 Oct 2018	27 Mar 2019	11 Oct 2018	27 Mar 2019	16 Oct 2018

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
D8	SE184870.001	LB158638	28 Sep 2018	10 Oct 2018	12 Oct 2018	11 Oct 2018	20 Nov 2018	15 Oct 2018

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
D8	SE184870.001	LB158637	28 Sep 2018	10 Oct 2018	12 Oct 2018	11 Oct 2018	20 Nov 2018	15 Oct 2018

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
D8	SE184870.001	LB158637	28 Sep 2018	10 Oct 2018	12 Oct 2018	11 Oct 2018	20 Nov 2018	15 Oct 2018

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	D8	SE184870.001	%	60 - 130%	96

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	D8	SE184870.001	%	70 - 130%	98
d14-p-terphenyl (Surrogate)	D8	SE184870.001	%	70 - 130%	88
d5-nitrobenzene (Surrogate)	D8	SE184870.001	%	70 - 130%	90

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	D8	SE184870.001	%	60 - 130%	75
d4-1,2-dichloroethane (Surrogate)	D8	SE184870.001	%	60 - 130%	72
d8-toluene (Surrogate)	D8	SE184870.001	%	60 - 130%	76
Dibromofluoromethane (Surrogate)	D8	SE184870.001	%	60 - 130%	75

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	D8	SE184870.001	%	60 - 130%	75
d4-1,2-dichloroethane (Surrogate)	D8	SE184870.001	%	60 - 130%	72
d8-toluene (Surrogate)	D8	SE184870.001	%	60 - 130%	76
Dibromofluoromethane (Surrogate)	D8	SE184870.001	%	60 - 130%	75

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result
LB158643.001	Mercury	mg/kg	0.05	<0.05

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result
LB158638.001	Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
	Alpha BHC	mg/kg	0.1	<0.1
	Lindane	mg/kg	0.1	<0.1
	Heptachlor	mg/kg	0.1	<0.1
	Aldrin	mg/kg	0.1	<0.1
	Beta BHC	mg/kg	0.1	<0.1
	Delta BHC	mg/kg	0.1	<0.1
	Heptachlor epoxide	mg/kg	0.1	<0.1
	Alpha Endosulfan	mg/kg	0.2	<0.2
	Gamma Chlordane	mg/kg	0.1	<0.1
	Alpha Chlordane	mg/kg	0.1	<0.1
	p,p'-DDE	mg/kg	0.1	<0.1
	Dieldrin	mg/kg	0.2	<0.2
	Endrin	mg/kg	0.2	<0.2
	Beta Endosulfan	mg/kg	0.2	<0.2
	p,p'-DDD	mg/kg	0.1	<0.1
	p,p'-DDT	mg/kg	0.1	<0.1
	Endosulfan sulphate	mg/kg	0.1	<0.1
	Endrin Aldehyde	mg/kg	0.1	<0.1
	Methoxychlor	mg/kg	0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1	
Isodrin	mg/kg	0.1	<0.1	
Mirex	mg/kg	0.1	<0.1	
Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	88

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result
LB158638.001	Naphthalene	mg/kg	0.1	<0.1
	2-methylnaphthalene	mg/kg	0.1	<0.1
	1-methylnaphthalene	mg/kg	0.1	<0.1
	Acenaphthylene	mg/kg	0.1	<0.1
	Acenaphthene	mg/kg	0.1	<0.1
	Fluorene	mg/kg	0.1	<0.1
	Phenanthrene	mg/kg	0.1	<0.1
	Anthracene	mg/kg	0.1	<0.1
	Fluoranthene	mg/kg	0.1	<0.1
	Pyrene	mg/kg	0.1	<0.1
	Benzo(a)anthracene	mg/kg	0.1	<0.1
	Chrysene	mg/kg	0.1	<0.1
	Benzo(a)pyrene	mg/kg	0.1	<0.1
	Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
	Dibenzo(ah)anthracene	mg/kg	0.1	<0.1
	Benzo(ghi)perylene	mg/kg	0.1	<0.1
	Total PAH (18)	mg/kg	0.8	<0.8
	Surrogates	d5-nitrobenzene (Surrogate)	%	-
	2-fluorobiphenyl (Surrogate)	%	-	96
	d14-p-terphenyl (Surrogate)	%	-	88

TOC in Soil

Method: ME-(AU)-[ENV]AN188

Sample Number	Parameter	Units	LOR	Result
LB158798.001	Total Organic Carbon	%ww	0.05	<0.05

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR
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Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES (continued)

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result
LB158641.001	Arsenic, As	mg/kg	1	<1
	Cadmium, Cd	mg/kg	0.3	<0.3
	Chromium, Cr	mg/kg	0.3	<0.3
	Copper, Cu	mg/kg	0.5	<0.5
	Nickel, Ni	mg/kg	0.5	<0.5
	Lead, Pb	mg/kg	1	<1
	Zinc, Zn	mg/kg	2	<2.0

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB158638.001	TRH C10-C14	mg/kg	20	<20
	TRH C15-C28	mg/kg	45	<45
	TRH C29-C36	mg/kg	45	<45
	TRH C37-C40	mg/kg	100	<100
	TRH C10-C36 Total	mg/kg	110	<110

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result		
LB158637.001	Monocyclic Aromatic Hydrocarbons	Benzene	mg/kg	0.1	<0.1	
		Toluene	mg/kg	0.1	<0.1	
		Ethylbenzene	mg/kg	0.1	<0.1	
		m/p-xylene	mg/kg	0.2	<0.2	
		o-xylene	mg/kg	0.1	<0.1	
	Polycyclic VOCs	Naphthalene	mg/kg	0.1	<0.1	
		Surrogates	Dibromofluoromethane (Surrogate)	%	-	87
			d4-1,2-dichloroethane (Surrogate)	%	-	84
			d8-toluene (Surrogate)	%	-	91
	Totals	Bromofluorobenzene (Surrogate)	%	-	76	
		Total BTEX	mg/kg	0.6	<0.6	

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result	
LB158637.001	TRH C6-C9	mg/kg	20	<20	
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	87
		d4-1,2-dichloroethane (Surrogate)	%	-	84
		d8-toluene (Surrogate)	%	-	91

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE184881.021	LB158643.007	Mercury	mg/kg	0.05	0.6099332574	0.6205670529	38	2

Moisture Content

Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE184881.007	LB158639.011	% Moisture	%w/w	0.5	11.812297734	12	38	2
SE184881.017	LB158639.022	% Moisture	%w/w	0.5	10.6852497098	2.6524390243	39	17
SE184881.021	LB158639.027	% Moisture	%w/w	0.5	12.3367198838	1.9281045751	38	3

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE184881.005	LB158638.035	Hexachlorobenzene (HCB)	mg/kg	0.1	0	0	200	0
		Alpha BHC	mg/kg	0.1	0	0	200	0
		Lindane	mg/kg	0.1	0	0	200	0
		Heptachlor	mg/kg	0.1	0	0	200	0
		Aldrin	mg/kg	0.1	0	0	200	0
		Beta BHC	mg/kg	0.1	0	0	200	0
		Delta BHC	mg/kg	0.1	0	0	200	0
		Heptachlor epoxide	mg/kg	0.1	0	0	200	0
		o,p'-DDE	mg/kg	0.1	0	0	200	0
		Alpha Endosulfan	mg/kg	0.2	0	0	200	0
		Gamma Chlordane	mg/kg	0.1	0	0	200	0
		Alpha Chlordane	mg/kg	0.1	0	0	200	0
		trans-Nonachlor	mg/kg	0.1	0	0	200	0
		p,p'-DDE	mg/kg	0.1	0	0	200	0
		Dieldrin	mg/kg	0.2	0.92	1.03	40	11
		Endrin	mg/kg	0.2	0	0	200	0
		o,p'-DDD	mg/kg	0.1	0	0	200	0
		o,p'-DDT	mg/kg	0.1	0	0	200	0
		Beta Endosulfan	mg/kg	0.2	0	0	200	0
		p,p'-DDD	mg/kg	0.1	0	0	200	0
		p,p'-DDT	mg/kg	0.1	0	0	200	0
		Endosulfan sulphate	mg/kg	0.1	0	0	200	0
		Endrin Aldehyde	mg/kg	0.1	0	0	200	0
		Methoxychlor	mg/kg	0.1	0	0	200	0
		Endrin Ketone	mg/kg	0.1	0	0	200	0
		Isodrin	mg/kg	0.1	0	0	200	0
Mirex	mg/kg	0.1	0	0	200	0		
		Total CLP OC Pesticides	mg/kg	1	0.92	1.03	133	3
		Surrogates						
		Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.148	0.147	30	1
SE184881.014	LB158638.036	Hexachlorobenzene (HCB)	mg/kg	0.1	0	0	200	0
		Alpha BHC	mg/kg	0.1	0	0	200	0
		Lindane	mg/kg	0.1	0	0	200	0
		Heptachlor	mg/kg	0.1	0	0	200	0
		Aldrin	mg/kg	0.1	0	0	200	0
		Beta BHC	mg/kg	0.1	0	0	200	0
		Delta BHC	mg/kg	0.1	0	0	200	0
		Heptachlor epoxide	mg/kg	0.1	0	0	200	0
		o,p'-DDE	mg/kg	0.1	0	0	200	0
		Alpha Endosulfan	mg/kg	0.2	0	0	200	0
		Gamma Chlordane	mg/kg	0.1	0	0	200	0
		Alpha Chlordane	mg/kg	0.1	0	0	200	0
		trans-Nonachlor	mg/kg	0.1	0	0	200	0
		p,p'-DDE	mg/kg	0.1	0	0	200	0
		Dieldrin	mg/kg	0.2	0.102	0.099	130	0
		Endrin	mg/kg	0.2	0	0	200	0
		o,p'-DDD	mg/kg	0.1	0	0	200	0
		o,p'-DDT	mg/kg	0.1	0	0	200	0
		Beta Endosulfan	mg/kg	0.2	0	0	200	0
		p,p'-DDD	mg/kg	0.1	0	0	200	0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil (continued)

Method: ME-(AU)-IENVJAN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE184881.014	LB158638.036	p,p'-DDT	mg/kg	0.1	0	0	200	0	
		Endosulfan sulphate	mg/kg	0.1	0	0	200	0	
		Endrin Aldehyde	mg/kg	0.1	0	0	200	0	
		Methoxychlor	mg/kg	0.1	0	0	200	0	
		Endrin Ketone	mg/kg	0.1	0	0	200	0	
		Isodrin	mg/kg	0.1	0	0	200	0	
		Mirex	mg/kg	0.1	0	0	200	0	
		Total CLP OC Pesticides	mg/kg	1	0.102	0.099	200	0	
		Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.141	0.148	30	5

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-IENVJAN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE184881.005	LB158638.035	Naphthalene	mg/kg	0.1	0.12	0.13	110	8
		2-methylnaphthalene	mg/kg	0.1	0.03	0.03	200	0
		1-methylnaphthalene	mg/kg	0.1	0.04	0.03	200	0
		Acenaphthylene	mg/kg	0.1	0.51	0.46	51	10
		Acenaphthene	mg/kg	0.1	0.05	0.03	200	0
		Fluorene	mg/kg	0.1	0.14	0.06	130	33
		Phenanthrene	mg/kg	0.1	1.56	1.37	37	13
		Anthracene	mg/kg	0.1	0.68	0.55	46	21
		Fluoranthene	mg/kg	0.1	2.93	2.8	33	5
		Pyrene	mg/kg	0.1	3.14	3.32	33	6
		Benzo(a)anthracene	mg/kg	0.1	1.66	1.69	36	2
		Chrysene	mg/kg	0.1	1.52	1.56	36	3
		Benzo(b&j)fluoranthene	mg/kg	0.1	1.95	2.18	35	11
		Benzo(k)fluoranthene	mg/kg	0.1	0.91	0.91	41	0
		Benzo(a)pyrene	mg/kg	0.1	1.85	2.01	35	8
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	1.13	1.25	38	10
		Dibenzo(ah)anthracene	mg/kg	0.1	0.22	0.24	73	9
		Benzo(ghi)perylene	mg/kg	0.1	1.17	1.32	38	12
		Carcinogenic PAHs, BaP TEQ <LOR=0	mg/kg	0.2	2.6649	2.8808	17	8
		TEQ (mg/kg)	0.2	2.6649	2.8808	17	8	
		Carcinogenic PAHs, BaP TEQ <LOR=LOR	mg/kg	0.3	2.6649	2.8808	21	8
		TEQ (mg/kg)	0.3	2.6649	2.8808	21	8	
		Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	mg/kg	0.2	2.6649	2.8808	17	8
		TEQ (mg/kg)	0.2	2.6649	2.8808	17	8	
		Total PAH (18)	mg/kg	0.8	19.52	19.78	34	1
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.48	0.5	30	4
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.49	0.5	30	2
		d14-p-terphenyl (Surrogate)	mg/kg	-	0.48	0.49	30	2
SE184881.014	LB158638.036	Naphthalene	mg/kg	0.1	0.17	0.2	84	16
		2-methylnaphthalene	mg/kg	0.1	0.04	0.04	200	0
		1-methylnaphthalene	mg/kg	0.1	0.04	0.03	200	0
		Acenaphthylene	mg/kg	0.1	0.44	0.46	52	4
		Acenaphthene	mg/kg	0.1	0.02	0.02	200	0
		Fluorene	mg/kg	0.1	0.05	0.06	200	0
		Phenanthrene	mg/kg	0.1	0.75	0.7	44	7
		Anthracene	mg/kg	0.1	0.38	0.4	56	5
		Fluoranthene	mg/kg	0.1	2.43	2.31	34	5
		Pyrene	mg/kg	0.1	2.72	2.81	34	3
		Benzo(a)anthracene	mg/kg	0.1	1.45	1.6	37	10
		Chrysene	mg/kg	0.1	1.22	1.42	38	15
		Benzo(b&j)fluoranthene	mg/kg	0.1	1.66	2.05	35	21
		Benzo(k)fluoranthene	mg/kg	0.1	0.65	0.77	44	17
		Benzo(a)pyrene	mg/kg	0.1	1.56	1.73	36	10
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	0.89	0.96	41	8
		Dibenzo(ah)anthracene	mg/kg	0.1	0.18	0.18	86	0
		Benzo(ghi)perylene	mg/kg	0.1	0.9	0.99	41	10
		Carcinogenic PAHs, BaP TEQ <LOR=0	mg/kg	0.2	2.2282	2.4761	19	11
		TEQ (mg/kg)	0.2	2.2282	2.4761	19	11	
		Carcinogenic PAHs, BaP TEQ <LOR=LOR	mg/kg	0.3	2.2282	2.4761	23	11

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = | \text{OriginalResult} - \text{ReplicateResult} | \times 100 / \text{Mean}$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times \text{SDL} / \text{Mean} + \text{LR}$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE184881.014	LB158638.036	Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	2.2282	2.4761	23	11
		Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	mg/kg	0.2	2.2282	2.4761	19	11
		Total PAH (18)	mg/kg	0.2	2.2282	2.4761	19	11
			mg/kg	0.8	15.42	16.62	35	7
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.49	0.5	30	2
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.48	0.49	30	2
		d14-p-terphenyl (Surrogate)	mg/kg	-	0.48	0.48	30	0

TOC in Soil

Method: ME-(AU)-[ENV]AN188

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE184823.001	LB158798.004	Total Organic Carbon	%w/w	0.05	0.56	0.62	38	10
SE184823.011	LB158798.016	Total Organic Carbon	%w/w	0.05	0.36	0.40	43	11

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE184881.021	LB158641.007	Arsenic, As	mg/kg	1	7.21035458054.3464603448		47	50 @
		Cadmium, Cd	mg/kg	0.3	0.36123068430.2605909482		126	19
		Chromium, Cr	mg/kg	0.3	10.41865342184.0473271551		34	30
		Copper, Cu	mg/kg	0.5	39.83236754978.2756206896		31	14
		Nickel, Ni	mg/kg	0.5	6.963196743910.4924732756		36	40 @
		Lead, Pb	mg/kg	1	41.18446467981.921982758		30	112 @
		Zinc, Zn	mg/kg	2	17.26124448182.659504310		31	17

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE184881.005	LB158638.035	TRH C10-C14	mg/kg	20	0	0	200	0	
		TRH C15-C28	mg/kg	45	0	0	200	0	
		TRH C29-C36	mg/kg	45	0	0	200	0	
		TRH C37-C40	mg/kg	100	0	0	200	0	
		TRH C10-C36 Total	mg/kg	110	0	0	200	0	
		TRH C10-C40 Total (F bands)	mg/kg	210	0	0	200	0	
		TRH F Bands	TRH >C10-C16	mg/kg	25	0	0	200	0
			TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	0	0	200	0
			TRH >C16-C34 (F3)	mg/kg	90	0	0	200	0
			TRH >C34-C40 (F4)	mg/kg	120	0	0	200	0
SE184881.014	LB158638.036	TRH C10-C14	mg/kg	20	0	0	200	0	
		TRH C15-C28	mg/kg	45	0	0	200	0	
		TRH C29-C36	mg/kg	45	0	0	200	0	
		TRH C37-C40	mg/kg	100	0	0	200	0	
		TRH C10-C36 Total	mg/kg	110	0	0	200	0	
		TRH C10-C40 Total (F bands)	mg/kg	210	0	0	200	0	
		TRH F Bands	TRH >C10-C16	mg/kg	25	0	0	200	0
			TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	0	0	200	0
			TRH >C16-C34 (F3)	mg/kg	90	0	0	200	0
			TRH >C34-C40 (F4)	mg/kg	120	0	0	200	0

VOC's in Soil

Method: ME-(AU)-[ENV]AN33

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE184881.009	LB158637.015	Monocyclic Aromatic	Benzene	mg/kg	0.1	0	0	200	0
			Toluene	mg/kg	0.1	0	0	200	0
		Polycyclic	Ethylbenzene	mg/kg	0.1	0	0	200	0
			m/p-xylene	mg/kg	0.2	0	0	200	0
			o-xylene	mg/kg	0.1	0	0	200	0
		Surrogates	Naphthalene	mg/kg	0.1	0	0	200	0
			Dibromofluoromethane (Surrogate)	mg/kg	-	4.37	4.16	50	5
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.27	4.14	50	3
			d8-toluene (Surrogate)	mg/kg	-	4.54	4.12	50	10
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.29	3.94	50	9
Totals	Total Xylenes	mg/kg	0.3	0	0	200	0		
	Total BTEX	mg/kg	0.6	0	0	200	0		
SE184881.019	LB158637.029	Monocyclic	Benzene	mg/kg	0.1	0	0	200	0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOC's in Soil (continued)

Method: ME-(AU)-IENVJAN433

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE184881.019	LB158637.029	Monocyclic	Toluene	mg/kg	0.1	0	0	200	0
			Aromatic	Ethylbenzene	mg/kg	0.1	0	0	200
		m/p-xylene		mg/kg	0.2	0	0	200	0
		o-xylene		mg/kg	0.1	0	0	200	0
		Polycyclic	Naphthalene	mg/kg	0.1	0.01	0.01	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	3.89	3.6	50	8
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	3.76	3.51	50	7
			d8-toluene (Surrogate)	mg/kg	-	3.97	3.8	50	4
			Bromofluorobenzene (Surrogate)	mg/kg	-	3.81	3.65	50	4
		Totals	Total Xylenes	mg/kg	0.3	0	0	200	0
			Total BTEX	mg/kg	0.6	0	0	200	0

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-IENVJAN433

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE184881.009	LB158637.015	TRH C6-C10	TRH C6-C10	mg/kg	25	0.43	0.26	200	0
			TRH C6-C9	mg/kg	20	0.48	0.37	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.37	4.16	30	5
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.27	4.14	30	3
			d8-toluene (Surrogate)	mg/kg	-	4.54	4.12	30	10
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.29	3.94	30	9
		VPH F Bands	Benzene (F0)	mg/kg	0.1	0	0	200	0
TRH C6-C10 minus BTEX (F1)	mg/kg		25	0.43	0.26	200	0		
SE184881.019	LB158637.029	TRH C6-C10	TRH C6-C10	mg/kg	25	0.48	0.5	200	0
			TRH C6-C9	mg/kg	20	0.62	0.65	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	3.89	3.6	30	8
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	3.76	3.51	30	7
			d8-toluene (Surrogate)	mg/kg	-	3.97	3.8	30	4
			Bromofluorobenzene (Surrogate)	mg/kg	-	3.81	3.65	30	4
		VPH F Bands	Benzene (F0)	mg/kg	0.1	0	0	200	0
TRH C6-C10 minus BTEX (F1)	mg/kg		25	0.48	0.5	200	0		

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB158643.002	Mercury	mg/kg	0.05	0.21	0.2	70 - 130	104

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB158638.002	Heptachlor	mg/kg	0.1	0.2	0.2	60 - 140	75
	Aldrin	mg/kg	0.1	0.2	0.2	60 - 140	75
	Delta BHC	mg/kg	0.1	0.2	0.2	60 - 140	75
	Dieldrin	mg/kg	0.2	<0.2	0.2	60 - 140	80
	Endrin	mg/kg	0.2	<0.2	0.2	60 - 140	75
	p,p'-DDT	mg/kg	0.1	0.1	0.2	60 - 140	65
Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.14	0.15	40 - 130	96

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB158638.002	Naphthalene	mg/kg	0.1	4.2	4	60 - 140	105	
	Acenaphthylene	mg/kg	0.1	4.3	4	60 - 140	108	
	Acenaphthene	mg/kg	0.1	4.4	4	60 - 140	109	
	Phenanthrene	mg/kg	0.1	4.3	4	60 - 140	108	
	Anthracene	mg/kg	0.1	4.1	4	60 - 140	103	
	Fluoranthene	mg/kg	0.1	3.9	4	60 - 140	97	
	Pyrene	mg/kg	0.1	4.2	4	60 - 140	105	
	Benzo(a)pyrene	mg/kg	0.1	4.3	4	60 - 140	106	
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.4	0.5	40 - 130	86
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	92
	d14-p-terphenyl (Surrogate)	mg/kg	-	0.4	0.5	40 - 130	80	

TOC in Soil

Method: ME-(AU)-[ENV]AN188

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB158798.002	Total Organic Carbon	%w/w	0.05	0.32	0.325	80 - 120	98

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB158641.002	Arsenic, As	mg/kg	1	330	336.32	79 - 120	98
	Cadmium, Cd	mg/kg	0.3	430	416.6	69 - 131	103
	Chromium, Cr	mg/kg	0.3	36	35.2	80 - 120	103
	Copper, Cu	mg/kg	0.5	310	370.46	80 - 120	84
	Nickel, Ni	mg/kg	0.5	180	210.88	79 - 120	87
	Lead, Pb	mg/kg	1	90	107.87	79 - 120	83
	Zinc, Zn	mg/kg	2	290	301.27	80 - 121	95

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB158638.002	TRH C10-C14	mg/kg	20	30	40	60 - 140	75	
	TRH C15-C28	mg/kg	45	<45	40	60 - 140	75	
	TRH C29-C36	mg/kg	45	<45	40	60 - 140	75	
	TRH F Bands	TRH >C10-C16	mg/kg	25	30	40	60 - 140	75
		TRH >C16-C34 (F3)	mg/kg	90	<90	40	60 - 140	75
		TRH >C34-C40 (F4)	mg/kg	120	<120	20	60 - 140	75

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB158637.002	Monocyclic	Benzene	mg/kg	0.1	3.8	2.9	60 - 140	132
	Aromatic	Toluene	mg/kg	0.1	2.7	2.9	60 - 140	92
		Ethylbenzene	mg/kg	0.1	2.6	2.9	60 - 140	89
		m/p-xylene	mg/kg	0.2	5.6	5.8	60 - 140	97
		o-xylene	mg/kg	0.1	2.6	2.9	60 - 140	88
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.2	5	60 - 140	84
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.1	5	60 - 140	81
		d8-toluene (Surrogate)	mg/kg	-	4.4	5	60 - 140	87
		Bromofluorobenzene (Surrogate)	mg/kg	-	4.3	5	60 - 140	86

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB158637.002	TRH C6-C10	mg/kg	25	<25	24.65	60 - 140	94	
	TRH C6-C9	mg/kg	20	22	23.2	60 - 140	94	
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.2	5	60 - 140	84
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.1	5	60 - 140	81
		d8-toluene (Surrogate)	mg/kg	-	4.4	5	60 - 140	87
		Bromofluorobenzene (Surrogate)	mg/kg	-	4.3	5	60 - 140	86
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	7.25	60 - 140	82

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE184870.001	LB158643.004	Mercury	mg/kg	0.05	0.21	<0.05	0.2	95

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE184881.002	LB158638.034	Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	0	-	-
		Alpha BHC	mg/kg	0.1	<0.1	0	-	-
		Lindane	mg/kg	0.1	<0.1	0	-	-
		Heptachlor	mg/kg	0.1	0.2	0	0.2	85
		Aldrin	mg/kg	0.1	0.2	0	0.2	85
		Beta BHC	mg/kg	0.1	<0.1	0	-	-
		Delta BHC	mg/kg	0.1	0.2	0	0.2	80
		Heptachlor epoxide	mg/kg	0.1	<0.1	0	-	-
		o,p'-DDE	mg/kg	0.1	<0.1	0	-	-
		Alpha Endosulfan	mg/kg	0.2	<0.2	0	-	-
		Gamma Chlordane	mg/kg	0.1	<0.1	0	-	-
		Alpha Chlordane	mg/kg	0.1	<0.1	0	-	-
		trans-Nonachlor	mg/kg	0.1	<0.1	0	-	-
		p,p'-DDE	mg/kg	0.1	<0.1	0	-	-
		Dieldrin	mg/kg	0.2	0.7	1.35	0.2	-340 ⊕
		Endrin	mg/kg	0.2	0.2	0	0.2	115
		o,p'-DDD	mg/kg	0.1	<0.1	0	-	-
		o,p'-DDT	mg/kg	0.1	<0.1	0	-	-
		Beta Endosulfan	mg/kg	0.2	<0.2	0	-	-
		p,p'-DDD	mg/kg	0.1	<0.1	0	-	-
		p,p'-DDT	mg/kg	0.1	0.2	0	0.2	115
		Endosulfan sulphate	mg/kg	0.1	<0.1	0	-	-
		Endrin Aldehyde	mg/kg	0.1	<0.1	0	-	-
		Methoxychlor	mg/kg	0.1	<0.1	0	-	-
		Endrin Ketone	mg/kg	0.1	<0.1	0	-	-
		Isodrin	mg/kg	0.1	<0.1	0	-	-
		Mirex	mg/kg	0.1	<0.1	0	-	-
		Total CLP OC Pesticides	mg/kg	1	2	1.35	-	-
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.14	0.15	-	93

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE184881.002	LB158638.034	Naphthalene	mg/kg	0.1	4.3	0.15	4	104
		2-methylnaphthalene	mg/kg	0.1	<0.1	0.03	-	-
		1-methylnaphthalene	mg/kg	0.1	<0.1	0.02	-	-
		Acenaphthylene	mg/kg	0.1	4.8	0.62	4	104
		Acenaphthene	mg/kg	0.1	4.3	0.02	4	107
		Fluorene	mg/kg	0.1	<0.1	0.07	-	-
		Phenanthrene	mg/kg	0.1	6.0	1.83	4	103
		Anthracene	mg/kg	0.1	4.7	0.83	4	97
		Fluoranthene	mg/kg	0.1	9.0	4.16	4	120
		Pyrene	mg/kg	0.1	8.8	4.48	4	109
		Benzo(a)anthracene	mg/kg	0.1	2.7	2.16	-	-
		Chrysene	mg/kg	0.1	2.5	2.09	-	-
		Benzo(b&j)fluoranthene	mg/kg	0.1	3.4	2.5	-	-
		Benzo(k)fluoranthene	mg/kg	0.1	1.4	1.3	-	-
		Benzo(a)pyrene	mg/kg	0.1	6.7	2.5	4	105
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	1.7	1.51	-	-
		Dibenzo(ah)anthracene	mg/kg	0.1	0.3	0.26	-	-
		Benzo(ghi)perylene	mg/kg	0.1	1.6	1.59	-	-
		Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ (mg/kg)	0.2	8.0	3.5498	-	-
		Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	8.0	3.5498	-	-
		Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	8.0	3.5498	-	-
		Total PAH (18)	mg/kg	0.8	62	26.04	-	-
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.5	0.5	-	96

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%	
SE184881.002	LB158638.034	Surrogates	2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.52	-	98
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.48	-	94

TOC in Soil

Method: ME-(AU)-[ENV]AN188

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE184870.001	LB158798.033	Total Organic Carbon	%w/w	0.05	1.0	1.2	-	-

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE184870.001	LB158641.004	Arsenic, As	mg/kg	1	48	2	50	91
		Cadmium, Cd	mg/kg	0.3	46	<0.3	50	92
		Chromium, Cr	mg/kg	0.3	50	3.1	50	95
		Copper, Cu	mg/kg	0.5	53	11	50	85
		Nickel, Ni	mg/kg	0.5	46	2.2	50	88
		Lead, Pb	mg/kg	1	46	6	50	80
		Zinc, Zn	mg/kg	2	64	18	50	92

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE184881.002	LB158638.034	TRH C10-C14	mg/kg	20	24	0	40	60
		TRH C15-C28	mg/kg	45	52	27	40	63
		TRH C29-C36	mg/kg	45	<45	33	40	15 @
		TRH C37-C40	mg/kg	100	<100	1	-	-
		TRH C10-C36 Total	mg/kg	110	<110	0	-	-
		TRH C10-C40 Total (F bands)	mg/kg	210	<210	0	-	-
		TRH F Bands						
		TRH >C10-C16	mg/kg	25	25	1	40	60
		TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	25	0	-	-
		TRH >C16-C34 (F3)	mg/kg	90	<90	54	40	33 @
		TRH >C34-C40 (F4)	mg/kg	120	<120	7	-	-

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%	
SE184870.001	LB158637.004	Monocyclic	Benzene	mg/kg	0.1	3.2	<0.1	2.9	109
		Aromatic	Toluene	mg/kg	0.1	1.9	<0.1	2.9	65
			Ethylbenzene	mg/kg	0.1	1.9	<0.1	2.9	66
			m/p-xylene	mg/kg	0.2	4.2	<0.2	5.8	72
			o-xylene	mg/kg	0.1	1.9	<0.1	2.9	67
		Polycyclic	Naphthalene	mg/kg	0.1	<0.1	<0.1	-	-
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.3	3.8	-	87
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.3	3.6	-	85
			d8-toluene (Surrogate)	mg/kg	-	4.0	3.8	-	79
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.1	3.8	-	81
		Totals	Total Xylenes	mg/kg	0.3	6.1	<0.3	-	-
			Total BTEX	mg/kg	0.6	13	<0.6	-	-

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%	
SE184870.001	LB158637.005	TRH C6-C10	mg/kg	25	<25	<25	24.65	78	
		TRH C6-C9	mg/kg	20	<20	<20	23.2	78	
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.3	3.8	-	87
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.3	3.6	-	85
			d8-toluene (Surrogate)	mg/kg	-	4.0	3.8	-	79
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.1	3.8	-	81
		VPH F	Benzene (F0)	mg/kg	0.1	3.2	<0.1	-	-
		Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	7.25	84

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

QC Sample	Sample Number	Parameter	Units	LOR
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Samples analysed as received.

Solid samples expressed on a dry weight basis.

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

- * NATA accreditation does not cover the performance of this service .
 - ** Indicative data, theoretical holding time exceeded.
 - Sample not analysed for this analyte.
 - IS Insufficient sample for analysis.
 - LNR Sample listed, but not received.
 - LOR Limit of reporting.
 - QFH QC result is above the upper tolerance.
 - QFL QC result is below the lower tolerance.
-
- ① At least 2 of 3 surrogates are within acceptance criteria.
 - ② RPD failed acceptance criteria due to sample heterogeneity.
 - ③ Results less than 5 times LOR preclude acceptance criteria for RPD.
 - ④ Recovery failed acceptance criteria due to matrix interference.
 - ⑤ Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
 - ⑥ LOR was raised due to sample matrix interference.
 - ⑦ LOR was raised due to dilution of significantly high concentration of analyte in sample.
 - ⑧ Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
 - ⑨ Recovery failed acceptance criteria due to sample heterogeneity.
 - ⑩ LOR was raised due to high conductivity of the sample (required dilution).
 - † Refer to Analytical Report comments for further information.

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CLIENT DETAILS

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 Email **au.environmental.sydney@sgs.com**
 Project **SE184870**
 Order Number **SE184870**
 Samples **1**

LABORATORY DETAILS

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 Email **Au.SampleReceipt.Melbourne@sgs.com**
 SGS Reference **ME308449 R0**
 Date Received **11 Oct 2018**
 Date Reported **17 Oct 2018**

COMMENTS

Whilst SGS laboratories conform to ISO:17025 standards, results of analysis in this report fall outside of the current scope of NATA accreditation .

SIGNATORIES



Adam Atkinson
Australian Chemistry Manager

Sample Number ME308449.001
 Sample Matrix Soil
 Sample Date 28 Sep 2018
 Sample Name SE184870.001
 D8

Parameter	Units	LOR
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Organotins in Soil Method: MA 1427 Tested: 16/10/2018

Tributyltin	mg/kg	0.1	<0.1
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Moisture Content Method: AN002 Tested: 16/10/2018

% Moisture	%w/w	1	41.4
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MB blank results are compared to the Limit of Reporting
 LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
 DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

Moisture Content Method: ME-(AU)-[ENV]AN002

Parameter	QC Reference	Units	LOR	DUP %RPD
% Moisture	LB023280	%w/w	1	1%

Organotins in Soil Method: MA 1427

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Tributyltin	LB023277	mg/kg	0.1	<0.1	0%	74%	63%

METHOD

METHODOLOGY SUMMARY

AN002

The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.

MA1427

This method is intended for the trace analysis of organotin compounds by high performance liquid chromatography-mass spectrometry (HPLC-MS). This method is based on USEPA Method 8323.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
		-	The sample was not analysed for this analyte
		NVL	Not Validated

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

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

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

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

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

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SAMPLE RECEIPT ADVICE

SE184870

CLIENT DETAILS

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QLD 4000**
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Facsimile **(Not specified)**
Email **bill.boylson@advisian.com**

Project **301001.02018 Port Mackay Sediment Sample**
Order Number **(Not specified)**
Samples **1**

LABORATORY DETAILS

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Laboratory **SGS Alexandria Environmental**
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Alexandria NSW 2015**

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Email **au.environmental.sydney@sgs.com**

Samples Received **Wed 10/10/2018**
Report Due **Wed 17/10/2018**
SGS Reference **SE184870**

SUBMISSION DETAILS

This is to confirm that 1 was received on Wednesday 10/10/2018. Results are expected to be ready by COB Wednesday 17/10/2018. Please quote SGS reference SE184870 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	Client	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	1 Soil
Date documentation received	10/10/2018	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	11.3°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

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

COMMENTS

Organotins subcontracted to SGS Melbourne, Unit 10/585 Blackburn Road Notting Hill VIC 3168, NATA Accreditation Number 2562, Site number 14420.

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SAMPLE RECEIPT ADVICE

SE184870

CLIENT DETAILS

Client **WORLEYPARSONS SERVICES PTY LTD**

Project **301001.02018 Port Mackay Sediment Sample**

SUMMARY OF ANALYSIS

No.	Sample ID	OC Pesticides in Soil	PAH (Polynuclear Aromatic Hydrocarbons) in Soil	TOC in Soil	Total Recoverable Elements in Soil/Waste	TRH (Total Recoverable Hydrocarbons) in Soil	VOC's in Soil	Volatile Petroleum Hydrocarbons in Soil
001	D8	29	26	2	7	10	12	8

CONTINUED OVERLEAF

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



SAMPLE RECEIPT ADVICE

SE184870

CLIENT DETAILS

Client **WORLEYPARSONS SERVICES PTY LTD**

Project **301001.02018 Port Mackay Sediment Sample**

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury in Soil	Moisture Content	Sample Subcontracted
001	D8	1	1	1

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

