360 environmental

Henderson Marine Support Base

Baseline Sediment Investigation – Reclamation Area

Prepared for:

AME Pty Ltd

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people planet professional

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Executive Summary

360 Environmental Pty Ltd was commissioned by AME Pty Ltd to undertake a Baseline Sediment Investigation (BSI) of the proposed reclamation area at Lots 305-307 Clarence Beach Road, Henderson, Western Australia (herein referred to as the site). The site is located adjacent to Jervoise Bay in Cockburn Sound and is under the jurisdiction of the Department of Transport.

AME intends to enhance the ability for ship manufacturing and maintenance at the site by dredging a small area adjacent to the facility and utilising the dredge material for land reclamation to create a land-backed wharf to the maximum reclamation limit of their lease. As such a baseline assessment of the sediment quality in the proposed reclamation area is required.

It is noted that a baseline sediment investigation of the dredge is concurrently being undertaken by 360 Environmental (360 Environmental, 2017) to assess the viability of the sediments for the proposed reclamation sediment and the potential impacts to water quality by mobilisation of sediments during dredging.

The objective of this BSI is to collect sufficient data to quantitatively assess the sediment quality within the proposed reclamation area, to confirm the nature and quality of onshore groundwater and soil prior to land reclamation works. The following scope of work was undertaken:

- Collection of sediment samples from the seabed using a Van Veen grab sampler from the barge, shore or jetty up from seven (7) locations across the site, including one (1) background location
- Groundwater quality monitoring from the onshore groundwater monitoring well
- Collection of a soil sample from one (1) onshore sampling location
- Laboratory analysis of three (3) sediments within the reclamation area, one (1) soil sample and one (1) groundwater sample at National Association of Testing Authorities (NATA) – certified primary and secondary laboratories for the nominated contaminants of potential concern (COPCs)
- Application of field quality assurance/quality control procedures and practices

The following results were reported:

- TKN and TP were detected in all three sediment samples ranging between 0.6 mg.N/g and 1.3 mg.N/g for TKN and between 0.32 mg.P/g and 0.5 mg.P/g for phosphorous. TN and TP were also detected in the groundwater sample at 2,900 ug.N/L and 14 ug.P/L, respectively.
- Copper, mercury, lead, nickel and zinc were detected above the LOR in all sediment samples ranging between 21 mg/kg to 49 mg/kg (copper), 0.01 mg/kg to 0.04 mg/kg (mercury), 6.9 mg/kg to 17 mg/kg (lead), 1.8 mg/kg to 9.9

mg/kg (nickel) and 36 mg/kg to 73 mg/kg (zinc). With the exception of copper (0.3 ug/L), mercury, lead, nickel and zinc were not detected above the LOR in the groundwater sample.

- TBT was detected in all three sediments samples ranging between 10.3 ug/kg and 27.3 ug/kg. TBT was however not detected above the LOR in the groundwater sample.
- TPH and PAHs were reported above the LOR in all three sediments samples, however BTEX remained below the LOR. Total TPH ranged between 34 ug/kg to 62 ug/kg and total PAHs ranged between 319 ug/kg to 1030 ug/kg. The highest hydrocarbon concentrations were reported in sediment sample SD05 collected close to the shore in the central portion of the site and SD03 collected from the offshore barge in the southern portion of the site. With the exception of naphthalene (0.02 ug/L), hydrocarbons were not detected above the LOR in the groundwater sample.
- TBT exceeded the NAGD (2009) Screening Level, the EPA (2017) EQG and the ANZECC/ARMCANZ (2000) ISQG-low in all three sediments samples, however these concentrations are typical of TBT contamination present within the area.
- Total nitrogen exceeded the ANZECC/ARMCANZ Marine water guideline for total nitrogen.

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Acronyms

ACRONYM	DEFINITION
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
COPC	Contaminants of Potential Concern
CSMC	Cockburn Sound Management Council
DoT	Department of Transport
EPA	Environmental Protection Authority
LOR	Limit of Reporting
mAHD	metres Australian Height Datum
MEPA	Moderate Ecological Protection Area
NAGD	National Assessment Guidelines for Dredging
NATA	National Association of Testing Authorities
PAH	Polycyclic Aromatic Hydrocarbons
QAQC	Quality Assurance / Quality Control
SAP	Sampling Analysis Plan
TBT	Tributyltin
TRH	Total Recoverable Hydrocarbons
TSS	Total Suspended Solids

1 Introduction

360 Environmental Pty Ltd (360 Environmental) was commissioned by AME Pty Ltd (AME) to undertake a Baseline Sediment Investigation (BSI) of the proposed reclamation area at Lots 305-307 Clarence Beach Road, Henderson, Western Australia (WA) (herein referred to as the site). The site is located adjacent to Jervoise Bay in Cockburn Sound and is under the jurisdiction of the Department of Transport (DoT) (Figure 1).

AME intends to enhance the ability for ship manufacturing and maintenance at the site by dredging a small area adjacent to the facility and utilising the dredge material for land reclamation to create a land-backed wharf to the maximum reclamation limit of their lease. As such a baseline assessment of the sediment quality in the proposed reclamation area is required.

It is noted that a baseline sediment investigation of the dredge is concurrently being undertaken by 360 Environmental (360 Environmental, 2017) to assess the viability of the sediments for the proposed reclamation sediment and the potential impacts to water quality by mobilisation of sediments during dredging.

1.1 Legal Background

The implementation of these works are required to be undertaken in accordance with the underlying principles of the DoT Environmental Management Framework (EMF), which is an internal reference document primarily focused on maintenance dredge programmes. Further, key elements of the EMF identify that characterisation of the sediment quality, will need to be undertaken in accordance with the Contaminated Sites Act 2003 (CS Act) and Department of Environment Regulations (DER) endorsed guidelines. These are identified as DER's December 2014 *Assessment and Management of Contaminated Sites*, Contaminated Sites Guideline [AMCS Guideline] and relevant *1999 National Environment Protection (Assessment of Site Contamination) Amendment Measure No.1, revised May 2013* [2013 NEPM ASC] schedules.

1.2 Objectives

The objective of this BSI is to collect sufficient data to quantitatively assess the sediment quality within the proposed reclamation area, to confirm the nature and quality of onshore groundwater and soil prior to land reclamation works.

1.3 Scope of Work

In order to satisfy the objectives of the investigation the following scope of work was undertaken:

- Collection of sediment samples from the seabed using a Van Veen grab sampler from the barge, shore or jetty up from seven (7) locations across the site, including one (1) background location
- Groundwater quality monitoring from the onshore groundwater monitoring well
- Collection of a soil sample from one (1) onshore sampling location
- Laboratory analysis of three (3) sediments within the reclamation area, one (1) soil sample and one (1) groundwater sample at National Association of Testing Authorities (NATA) – certified primary and secondary laboratories for the nominated contaminants of potential concern (COPCs)
- Application of field quality assurance/quality control procedures and practices
- Preparation of this report, which outlines the methodology and findings of the assessment and provides recommendations.

2 Site Identification

Key site identification and land use information is summarised in Table A and Figure 1.

Table A: Site Identification and Land Use Information

SITE IDENTIFICATION			
Current Owner	AME Pty Ltd		
Primary Address	49/53 Clarence Beach Road, Henderson, WA		
Site Property Details	The site property details are as follows and illustrated on Figure 2.		
	Lot	**Diagram/ Plan**	**Area [hectares (ha)]**
	305-306	76230	~5
Zoning	'Special Use' under the City of Cockburn – Local planning scheme No. 3		
Current Land Use	Commercial/Industrial		
Future Land Use	Commercial/Industrial		
Abutting land use	East: Commercial/Industrial – Cristal Global (warehouse) West: Indian Ocean North: Commercial/Industrial – Marine Base South: Commercial/Industrial – BAE Systems		

2.1 Previous Studies

Numerous studies focused on water and sediment quality have been undertaken within Cockburn Sound and indicated that tributyltin (TBT), hydrocarbons and heavy metals (particularly copper and zinc) were the main COPCs. Sediments in Australia are known to contain high levels of arsenic and nickel; arsenic was not detected during previous investigations, but nickel was present in low levels in some areas. Due to the potential for some marine paints to have contained lead historically and based on the nature of the site operations, lead and nickel are also considered a COPC for the site.

3 Environmental Values and Assessment Criteria

As identified in the 2013 NEPM ASC schedules and 2014 DER AMCS Guideline, environmental values relate to land, groundwater, and surface water and generally mean the following:

- **Beneficial Use**: conducive to public benefit, public amenity, public safety, public health or aesthetic enjoyment and which requires protection from the effects of emissions or of activities.
- Ecosystem **Health Condition**: relevant to the maintenance of ecological structure, ecological function or ecological process and which requires protection from the effects of emissions or of activities.

The identification of environmental values is used to guide the nomination of appropriate assessment criteria for the evaluation of quality data collected for the site. The results of this evaluation is documented in Table B.

Table B: Environmental Values

RECEPTORS	CONSIDERATIONS	CURRENT/FORSEEABLE FUTURE ENVIRONMENTAL VALUE	
		ON-SITE	OFF-SITE
Land	• The site and surrounding land uses are currently used for commercial/industrial purposes • The future land use for the site is not proposed to be changed • With the exception of a grass area at the back of the site, the site is void of vegetation that has the potential to sustain terrestrial ecosystem life. Further, the site is fenced therefore limiting potential entrance from transient fauna.	commercial/ industrial	commercial/ industrial
Groundwater	• Groundwater is not currently used onsite • Groundwater at the site is tidally influenced	None	Marine Ecosystem Health
Surface Water	• The site is located within Cockburn Sound directly adjacent to the Indian Ocean	Marine Ecosystem	Marine Ecosystem

RECEPTORS	CONSIDERATIONS	CURRENT/FORSEEABLE FUTURE ENVIRONMENTAL VALUE	
		ON-SITE	OFF-SITE
		Health	Health

3.1 Nominated Tier 1 Assessment Criteria

Based on consideration of the environmental values, Table C defines the nominated Tier 1 assessment criteria to be adopted for the evaluation of soil, groundwater and sediment screening data at the site.

Table C: Assessment Criteria, Description, Use, & Application – Soil

Soil Investigation Levels	Description, Use and Application	Nominated Land Use / Environmental Value	Relevant Analytes
Source: 2013 NEPM			
Health Investigation Level (HIL)	• Values that have been developed for a broad range of metals • They apply for assessing human health risk via all relevant pathways of exposure. • The HILs are generic to all soil types and apply generally to a depth of 3 m below the surface.	*Human Health:* • D – Commercial / Industrial	*Heavy Metals*
Ecological Investigation Levels (EIL)	• Values that have been developed for a broad range of metals and organic substances for ecological systems. • EILs depend on specific soil physiochemical properties [i.e., pH, CEC, and % clay] and land use scenarios and generally apply to the top 2 m of soil.	*Terrestrial Ecosystem Health*	*Heavy Metals*

Table D: Assessment Criteria, Description, Use, & Application –Sediments

Soil Investigation Levels	Description, Use and Application	Nominated Land Use / Environmental Value	Relevant Analytes
Source: National Water Quality Management Strategy, Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC & ARMCANZ, 2000)			
Interim Sediment Quality Guidelines (ISQG) - Low	• Values have been developed to define the extent of the threat to ecosystem health posed by sediment-associated contaminants • The ISQG-low is a trigger value that is a threshold concentration and below this concentration the	*Marine Ecosystem Health*	*Heavy Metals* *TBT*

Soil Investigation Levels	Description, Use and Application	Nominated Land Use / Environmental Value	Relevant Analytes
	frequency of adverse effects is expected to be very low		
Source: National Assessment Guidelines for Dredging (Commonwealth of Australia 2009)			
Screening Level (ISQG Trigger Value)	• Values are applied for the assessment of the impact to the marine environment due to dredging operations, but does not apply to disposal of the dredge material in the nearshore environment, as proposed for the intended purpose of land reclamation* • The screening levels are the same as the ISQG-low values in ANZECC/ARMCANZ 2000 guidelines • Where contaminants are present at levels exceeding regional ambient baseline levels in sediments of comparable grainsize, bioavailability and toxicity testing may be required	*Marine Ecosystem Health*	*Heavy Metals* *TBT*
Source: Environmental quality criteria reference document for Cockburn Sound – a supporting document to the State Environmental (Cockburn Sound) Policy 2015 (EPA 2017)			
Environmental Quality Guideline (EQG)	• Values have been developed to protect ecosystem health posed by sediment-associated contaminants • The ISQG-low from ANZECC and ARMCANZ (2000) is the EQG value and the ISQG-high is the EQG re-sampling trigger • EQG have not been developed for aluminium, manganese and titanium at this time because they are generally considered to	*Marine Ecosystem Health*	*Heavy Metals* *TBT***

Soil Investigation Levels	Description, Use and Application	Nominated Land Use / Environmental Value	Relevant Analytes
	have low toxicity in marine sediments • For metals, the guidelines are based on total metal concentration		

*It is noted here that the DER 2014 AMCS guidelines outlines that the NAGD (2009) "are not appropriate for assessing disposal of dredged sediment to land. This would require characterisation of the material and assessment of its compatibility with the receiving environment and associated land uses on a site-specific basis (in accordance with guidance provided in Schedule B2 of the NEPM)".

**The Environmental Quality Criteria reference document for Cockburn Sound (EPA 2017) recommends the normalisation of organic contaminants in sediments to 1% organic carbon. Similarly the Environmental Quality Criteria Reference Document (EPA 2017) note the requirement to normalise organics to 1% TOC. However, the NAGD (2009) requires TBT results to be normalised, and CSIRO similarly recommend that data should be normalised for sediments with a TOC content of 0.2-10% (Graeme Batley, pers comm., CSIRO, June 2005.). To enable correct comparison of TBT data against the EQG, and to maintain consistency with other studies, results from this study have been reported with normalisation to 1% TOC.

Site-specific Ecological Investigation Levels (EILs) for copper, nickel and zinc were calculated for the site's sediments using the following equation:

$$EIL = ACL + ABC$$

Where:

ABC = the ambient background concentration

ACL = added contaminant limit

ACL values are provided in Schedule B1 of the ASC NEPM and are dependent on the cation exchange capacity (CEC), electrical conductivity (EC), pH, and percentage clay in soil (% clay). Table E provides a summary of the sediments property values.

Table E: Site-Specific EIL

COPC	Soil Property	Soil Property Value	ACL	ABC	Calculated EIL
Sediments					
Copper	pH+ or CEC	7.9 (pH) or 31.9 (CEC)	320	49	369
Nickel	CEC	31.9 (CEC)	600	9.9	610
Zinc	CEC & pH	7.9 (pH) and 31.9 (CEC)	1500	73	1573

Table F: Assessment Criteria, Description, Use, & Application – Groundwater

Soil Investigation Levels	Description, Use and Application	Nominated Land Use / Environmental Value	Relevant Analytes
Source: National Water Quality Management Strategy, Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC & ARMCANZ, 2000)			
Groundwater Investigation Level (GIL) – Marine Water	• Values applied for the protection of marine ecosystems.	*Marine Ecosystem Health*	*Nutrients* *Heavy Metals* *TBT* *Naphthalene* *Benzene*
Source: Environmental quality criteria reference document for Cockburn Sound – a supporting document to the State Environmental (Cockburn Sound) Policy 2015 (EPA 2017)			
Environmental Quality Guideline (EQG) – Moderate Protection Area	• Values have been developed to protect ecosystem health posed by groundwater-associated contaminants	*Marine Ecosystem Health*	*Heavy Metals* *TBT* *Naphthalene* *Benzene*

4 Targeted Investigation

The targeted investigation was undertaken at the site on 10 May 2017 for the purpose of providing baseline quality data before the start of reclamation works.

4.1 Sampling Methodology

A total of seven (7) sediment locations were sampled across the proposed reclamation area, and one (1) groundwater sample was collected from the onshore and existing groundwater monitoring well on 10 May 2017 (Figure 2). Due to the presence of limestone, the proposed soil bore could not be advanced at the time of the investigation.

The sediment samples were collected using a Van Veen grab sampler whilst the groundwater sample was collected using a low-flow peristaltic pump in accordance with the 360 Environmental's Technical Standard Operating Procedure (TSOP) presented in the SAQP (360 Environmental, 2017).

Three (3) sediment samples (SD1, SD3 and SD5), one (1) groundwater sample and quality control samples were selected for laboratory analysis at NATA accredited laboratories for the analysis of the following COPC:

- Nutrients: Total Kjeldahl Nitrogen (TKN) and Total Phosphorous (TP)
- Inorganics: Total Organic Carbon (TOC)
- Heavy Metals: Copper, mercury, lead, nickel, zinc
- Organometallics: Tributyltin (TBT)
- Hydrocarbons: Total Recoverable Hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX) and Polycyclic Aromatic hydrocarbons (PAH)

4.2 Data Validation and Usability

The field and analytical results and QC data were evaluated for accuracy, precision and representativeness of the data and compiled into a QA/QC report (Table 1 and 2) and checked against the DQOs specified in the SAQP (360 Environmental, 2017) to ensure that these objectives have been met. Field documentation is provided in Appendix A and laboratory certificates are compiled in Appendix B.

4.2.1 Field QA/QC

Table G summarises the compliance with the field QA/QC procedures.

Table G: Field QA/QC Compliance

FIELD QA/QC	Component	Compliant	Comment
Calibration	Field equipment requiring calibration was calibrated prior to sampling and complied with calibration checks.	Y	The YSI was appropriately calibrated. Calibration certificates provided in Appendix A
Sample Collection	Sediment and groundwater samples were collected in accordance with required monitoring procedures	Y	None
	Standardised field documentation used to record field activities.	Y	Field documentation is provided in Appendix A
	Laboratory prepared sample jars and bottles used for sample collection	Y	None
	Decontamination of sample equipment undertaken between samples	Y	The YSI was decontaminated in line with the TSOP
Sample Handling and Transit	Samples kept chilled at all times following sample collection	Y	None
	Samples appropriately handled between field and laboratory	Y	None
	Samples transported under chain of custody	Y	A copy of the chain of custody is provided in Appendix B
	Samples received in good condition at the laboratory	Y	Laboratory Sample Receipt Notification identifying that samples were received in good condition are provided in Appendix B

Table H summarises the number and frequency of field QC samples and compliance with QC sample frequency and adopted data quality indicator (DQI) assessment criteria as defined in the QAP.

Table H: Sediment and Groundwater Field QA/QC Sample Compliance

QC Sample Type	Primary Sample	QC Sample	Date	% of Primary Sample	No. of QC Samples Acceptable	QC DQI	DQI Non-Compliances
Sediment Investigation							
Duplicate	SD03	QC1	10/05/17	14.5%	Yes	RPD <50%	PAH > 50% Total TPH >50%
Triplicate		QC2		14.5%	Yes	RPD <50%	PAH > 50% Hg > 50%
Groundwater Investigation							
Duplicate	MW03	QC3	10/05/17	100%	Yes	RPD <50%	-

4.2.2 Laboratory QA/QC

Outcomes of the laboratory QA/QC data validation assessment are summarised below in Table I.

Table I: Laboratory QA/QC Summary Table

QA/QC	Compliant?	QC Non-Compliances
Analytes Holding Times	Y	None. All analysis were reported within holding times
Practical Quantification Limit (PQL)	N	LOR has been raised for analyte "pyrene" for sample GW3 due to suspected matrix effects and non-target peak interferences
Laboratory QC (frequency)	N	Quality Control Sample Frequency Outliers exist for metals and SVOCs.
Laboratory Surrogates	N	Poor surrogate recovery for various samples due to matrix effects and non-target analyte peaks.
Laboratory Duplicates	Y	None.
Laboratory Matrix Spikes	N	Poor matrix spike recovery and duplicate precision on the QC1 sample for TPH and PAH due to heterognity, suspected matrix effects and non-

QA/QC	Compliant?	QC Non-Compliances
		target peak interferences.
Laboratory Method Blanks	Y	None. All samples for sediments and groundwater were below acceptance limits (set at LOR).
Laboratory Control Samples (LCS)	N	LCS recovery for BTEX falls outside ALS Dynamic Control lower Limit.

4.2.3 Data Usability

In evaluating the data quality, it was identified that there were field and laboratory QA/QC non-compliances associated with the analytical results. In consideration of the outcomes of the QA/QC evaluation of non-compliances below, the majority of reported non-compliances are not considered to materially impact on the interpretation and use of the data at this stage of the investigation. Where potential bias has been introduced as a result of the QA/QC evaluation, the higher concentration data has conservatively been adopted for use at this stage of the investigation.

4.2.3.1 Field QC

Elevated Sediments RPD's

Elevated RPDs were reported between SD03 and QC1 for various PAHs and Total TPH, and between SD03 and QC2 for various PAHs and Hg. The relatively low levels of the reported compounds and the general heterogeneity of sediment samples are deemed to have been the cause of the elevated RPDs. Primary, duplicate and triplicate sample concentrations for these analytes reported consistent non-exceedances of the relevant assessment criteria, however it was noted that concentrations of PAHs were not usually detected above the LOR in triplicate sample QC2. This indicates potential false positives of PAHs concentrations in the primary samples. The elevated RPDs may therefore have introduced a consequential bias to the interpretation of the data, however given that the concentrations reported in the primary sample are below the assessment criteria, this is not considered to impact the assessment of the results.

4.2.3.2 Laboratory QC

PQLs

The LOR was raised for analyte "pyrene" for sample GW3 due to suspected matrix effects and non-target peak interferences. Concentrations for these analytes reported consistent non-exceedances of the relevant assessment criteria. The elevated RPDs are considered to not have introduced a consequential bias to the interpretation of the data

Laboratory QC Frequency

Insufficient laboratory quality control samples were analysed for heavy metals and SVOCs in sediments however concentrations of VOC and SVOC remained below the

relevant assessment criteria for these specific analytes. Therefore this does not affect the use of the data for risk assessment purposes.

Laboratory Matrix Spikes, Surrogates and Control Samples

Poor surrogate and matrix spike recovery was reported for various samples due to matrix effects and non-target analyte peaks. Poor spike recovery due to sample heterogeneity and possible matrix interference. Given that acceptable recoveries were reported for most laboratory control samples, the impact of the poor recovery in the matrix spikes and surrogates is considered to have minimal impact on the precision and accuracy of the data set.

The laboratory control sample recovery for BTEX was outside ALS's Dynamic Control Upper Limit. As the LCS recover was within the acceptance criteria based on standard USEPA 8270 limits, in internal standard exceedance is not considered to have a consequential impact on the laboratory data. Further, this analyte was reported below the LOR in all samples.

4.3 Results

4.3.1 Field Results

4.3.1.1 Sediment Investigation

A copy of the sediment logging sheet and the groundwater quality measurement form is presented in Appendix A. Key field observations were identified as follows:

- The general lithology of the sediments samples collected across the reclamation area consisted of fine grained black clayey sand and sand with shells. Coarse black and brown sand was reported in sample SD04 and SD06 located offshore to the north of the two onsite barges. Dark orange sand was further reported in SD07 located outside the project scope to the north of the northern site boundary next to the boat ramp.
- An organic odour was reported in sample SD02, SD03 and SD06.

4.3.1.2 Groundwater Investigation

Depth to Groundwater and Inferred Groundwater Flow Direction

The depth to water measurements obtained during the sampling event on 10 May 2017 indicated that groundwater was present at approximately 3 mbgl.

Table J: Groundwater Synoptic Data

Well ID	Flush Mount or Monument	Well Construction Details		GME		
				10/05/2017		
		Distance between TOC and Ground Level	Casing Diameter	Depth to Bottom	Depth to Water	Depth to Water
		m	*(mm)*	*mbTOC*	*mbTOC*	*mbgl*
MW03	Monument	0.485	50	5.46	3.485	3.0

Groundwater Stabilisation Data

Low flow purging and sampling was completed as part of the groundwater monitoring activity. The groundwater low flow purging water quality measurements obtained as part of the sampling are presented in the field documentation provided in Appendix A. An overview of the measurements recorded once stabilisation criteria had been met is provided in Table K. Note that the information provided in Table K represents the final screening results from low flow purging activities associated with demonstrating stabilisation of the aquifer unit. Due to the use of a low flow sampling method, the stabilised data are considered reasonably representative of in-situ groundwater physicochemical conditions and can used as screening criteria for groundwater characterisation purposes.

Table K: Field Parameters

STABILISATION PARAMETER	RESULTS	DISCUSSION
Temperature	22.2 degree Celsius (°C)	Groundwater is characterised as neutral to slightly alkaline, slightly brackish, exhibiting aerobic conditions and oxidising conditions
pH	7.41	
Specific conductivity (EC)	1,235 microsiemens per centimetre (µS/cm)	
Dissolved oxygen (DO)	4.23 milligrams per litre (mg/L)	
Oxygen Reduction Potential (ORP)	139 millivolts (mV)	

4.3.2 Analytical Results

4.3.2.1 Sediments Results

Analytical results for the sediment samples collected are tabulated in Table 3. The following substances were detected above the laboratory Limits of Reporting (LOR):

Nutrients

TKN and TP were detected in all three sediment samples ranging between 0.6 mg.N/g and 1.3 mg.N/g for TKN and between 0.32 mg.P/g and 0.5 mg.P/g for phosphorous. The highest concentrations of TKN and P were reported in sediment sample SD01 collected in the southern-most portion of the site.

Heavy Metals

Copper, mercury, lead, nickel and zinc were detected above the LOR in all sediment samples. The following ranges were noted:

- Copper: 21 mg/kg to 49 mg/kg (SD01)
- Mercury: 0.01 mg/kg to 0.04 mg/kg (SD01)
- Lead: 6.9 mg/kg to 17 mg/kg (SD01)
- Nickel: 1.8 mg/kg to 9.9 mg/kg (SD01)
- Zinc: 36 mg/kg to 73 mg/kg (SD01)

The highest heavy metals were consistently reported in sediment sample SD01 collected in the southern-most portion of the site.

TBT

TBT was detected in all three sediments samples ranging between 10.3 ug/kg and 27.3 ug/kg. The highest concentration of TBT was reported in sediment sample SD05 collected in the central portion of the site, close to the shore.

Hydrocarbons

TPH and PAHs were reported above the LOR in all three sediments samples, however BTEX remained below the LOR. The following ranges were noted:

- Total TPH: 34 ug/kg to 62 ug/kg (SD05)
- Total PAHs: 319 ug/kg to 1030 ug/kg (SD03)

The highest hydrocarbon concentrations were reported in sediment sample SD05 collected close to the shore in the central portion of the site and SD03 collected from the offshore barge in the southern portion of the site.

4.3.2.2 Groundwater Results

Analytical results for the groundwater sample collected are tabulated in Table 4. The following substances were detected above the laboratory Limits of Reporting (LOR):

Nutrients

TN and TP were detected in the groundwater sample at 2,900 ug.N/L and 14 ug.P/L, respectively.

Heavy Metals

With the exception of copper (0.3 ug/L), mercury, lead, nickel and zinc were not detected above the LOR in the groundwater sample.

TBT

TBT was not detected above the LOR in the groundwater sample.

Hydrocarbons

With the exception of naphthalene (0.02 ug/L), hydrocarbons were not detected above the LOR in the groundwater sample.

4.4 Risk Assessment

This section compares sediments and groundwater laboratory data against the nominated numeric Tier 1 Human Health and Ecological Risk Assessment Criteria. It is noted here that due to the size of the tabulated results, only the data that exceeded the Tier 1 criteria are presented in this section.

4.4.1 Sediment Results

The following sediment exceedance was reported:

- TBT exceeded the NAGD (2009) Screening Level, the EPA (2017) EQG and the ANZECC/ARMCANZ (2000) ISQG-low in all three sediments samples.

These concentrations are typical of TBT contamination present within the area and generally understood to be caused by antifouling paint flakes. Previous investigations (Coffey, 2011) to the north of the site indicated TBT concentrations ranging between 174 and 1,200 ug/kg in offshore sediments. These concentrations are ten to hundred times greater than the concentrations reported at the site.

4.4.2 Groundwater Results

The following groundwater exceedance was reported:

- Total nitrogen exceeded the ANZECC/ARMCANZ Marine water guideline for total nitrogen.

The elevated total nitrogen concentration indicates eutrophication of the water.

5 Stakeholder Consultation

This report was issued to DoT for review and comment, in conjunction with the Baseline Sediment Investigation – Dredge Area (360 Environmental 2017). Table L outlines the comments provided by DoT and responses or amendments made to the report.

Table L: Stakeholder Consultation

COMMENT	RESPONSE/EDITS
Consider providing more information regarding the spatial extent of elevated TBT concentrations in sediments by analysing remaining samples in the reclamation area (pending recommended sample storage and holding times), and undertaking elutriate analyses of samples that exceed relevant guidelines for TBT. This process would help determine the risk of mobilising contamination during reclamation activities.	Following further discussion with the DoT representative it was concluded that considering the time elapsed, the samples are significantly outside of holding time and the reliability of data from further analysis would be uncertain. It is considered that the sampling locations within the dredge and reclamation areas provide an acceptable spatial understanding of the contaminants within the proposed reclamation area. The risk of mobilising sediments within the reclamation area is negligible compared to the mobilisation that will occur during dredging. Further, TBT levels within the dredge area were comparable to the levels recorded in the reclamation area and all raw elutriate results were compliant with applicable guidelines (360 Environmental 2017).
Consider the risk of added contaminant concentrations in background water, and the appropriateness of subtracting these background concentrations from individual site elutriate results when determining an exceedance.	Please refer to Baseline Sediment Investigation – Dredge Area (360 Environmental 2017)

COMMENT	RESPONSE/EDITS
Consider terrestrial receptors at the reclamation site by conservatively applying the relevant HILs/EILs, as it is noted that in-line with DER (2014) "[CA (2009) guidelines]... are not appropriate for assessing disposal of dredged sediment to land. This would require characterisation of the material and assessment of its compatibility with the receiving environment and associated land uses on a site-specific basis (in accordance with guidance provided in Schedule B2 of the NEPM)".	Please refer to Baseline Sediment Investigation – Dredge Area (360 Environmental 2017)
No review comments are provided for any groundwater monitoring as it was outside the area of relevant expertise of the reviewer	Noted.

6 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses ("client's information") provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

Subject to the terms of the contract between the Client and 360 Environmental Pty Ltd, copying, reproducing, disclosing or disseminating parts of this report is prohibited (except to the extent required by law) unless the report is produced in its entirety including this page, without the prior written consent of 360 Environmental Pty Ltd.

7 References

360 Environmental 2017, Baseline Sediment Investigation – Dredge Area, draft prepared for AME Pty Ltd, July 2017.

Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000 National Water Quality Management Strategy, Paper No. 4, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, October 2000

National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia 2009)

State Environmental (Cockburn Sound) Policy 2015 (Environmental Protection Authority [EPA] 2015)

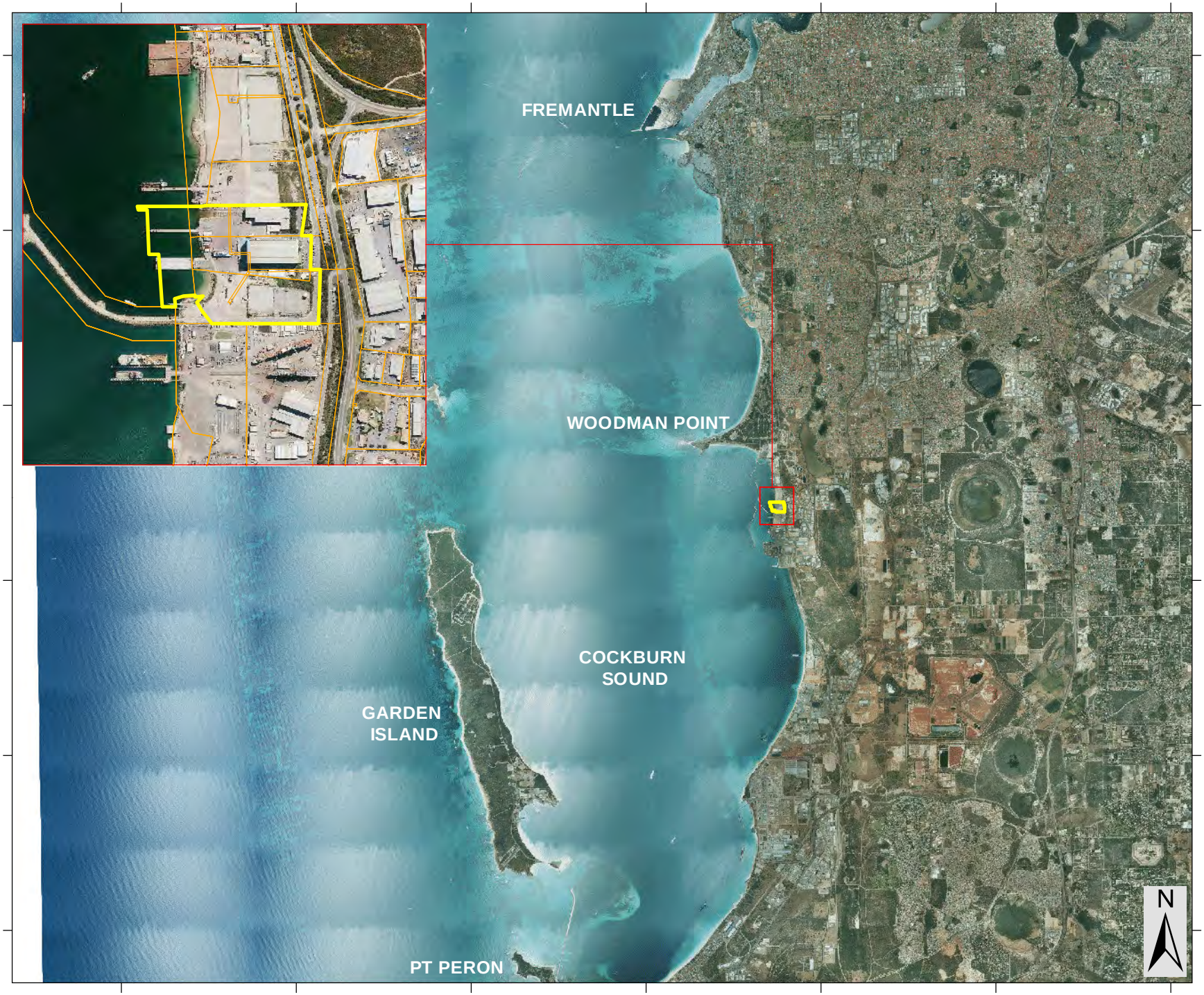
Environmental quality criteria reference document for Cockburn Sound – a supporting document to the State Environmental (Cockburn Sound) Policy 2015 (EPA 2017)

Manual of Standard Operating Procedures: For Environmental Monitoring against the Cockburn Sound Environmental Quality Criteria (2003-2004)1 – a supporting document to the State Environmental (Cockburn Sound) Policy 2005 (now 2015) (EPA Report 21, 2005)

Environmental Factor Guideline: Marine Environmental Quality (EPA 2016)

Technical Guidance: Environmental Impact Assessment of Marine Dredging Proposals (EPA 2016)

FIGURES



Legend

- Site Location
- Cadastre

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- CADASTRE SOURCED FROM LANDGATE 22 DEC 2015
- AERIAL PHOTOGRAPHY SOURCED LANDGATE DEC 2012 / SEPT 2015

(© Western Australian Land Information Authority 2015)

SLIP ENABLER

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0 1 2 3 4 5
Kilometers
1:150,000 @ A4

LOCALITY MAP

PROJECT ID	DATE
1293	24-Dec-15

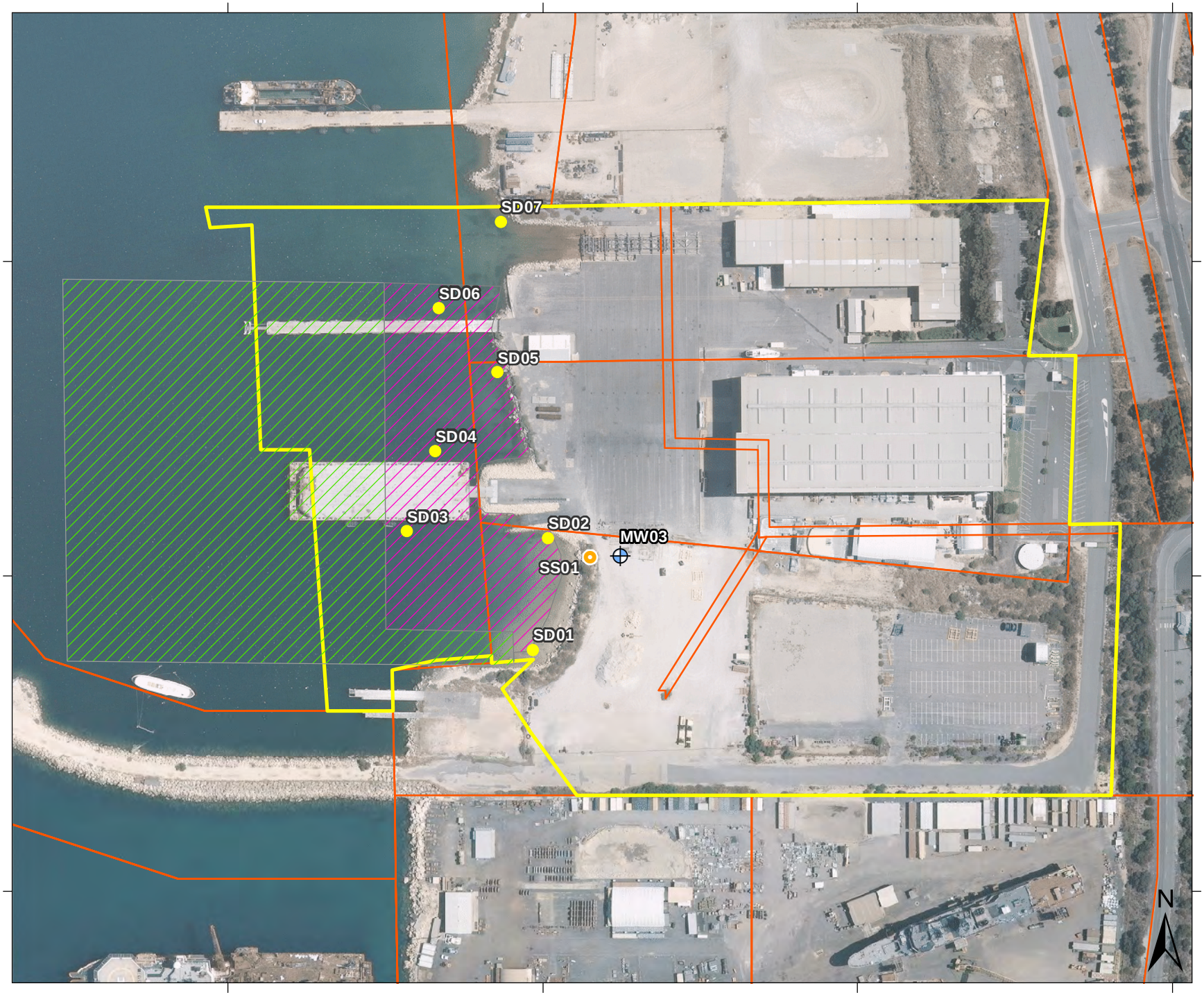
HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	AW	SB	0

AME Pty Ltd
AME Dredge and Reclamation Programme

Sampling Analysis Plan

Figure 1
Site Location



Legend

- Site Location
- Cadastral Boundary
- Reclamation Area*
- Dredge Footprint*
- Proposed Groundwater Monitoring Well
- Proposed Sediment Sample Location
- Proposed Soil Sample Location

Notes:
* areas indicative and subject to final design

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- CADASTRE SOURCED FROM LANDGATE 22 DEC 2015
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2016 (© Western Australian Land Information Authority 2015)

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0 20 40 60 80 100
Meters
1:2,500 @ A4

LOCALITY MAP

PROJECT ID	DATE
1293	21/03/2017

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
ST	AW	RH	0

AME Pty Ltd
AME Dredge and Reclamation Programme

SAQP

Figure 2
Proposed Sampling Locations

K:\Projects\5.0 SWA Projects from 1 July 2013\1293 - AME Offshore Dredge & Reclamation\Figures\FEB2017\1293 F2 - Proposed Sampling Locations_20170321.mxd

TABLES

AME Pty Ltd
Henderson Marine Support Base
Table 1: Sediment QC Results

		Sample ID	SD03	QC1	RPD	SD03	QC2	RPD
		Sample Matrix	Sediment	Sediment		Sediment	Sediment	
		Laboratory	MAFRL, ALS	MAFRL, ALS		MAFRL, ALS	ChemCentre	
		Date Sampled	10/05/2017	10/05/2017		10/05/2017	10/05/2017	
Analyte	**LOR**	**Units**						
Nutrients								
Total Kjeldahl Nitrogen	0.1	mg.N/g	1.0	0.8	22%	1.0	0.86	15%
Total Phosphorous	0.05	mg.P/g	0.35	0.31	12%	0.35	0.28	22%
Inorganics								
Total Organic Carbon	0.2	% C	0.9	0.7	25%	0.9	0.8	12%
Heavy Metals								
Total Copper	0.2	mg/kg	37	30	21%	37	25	39%
Total Mercury	0.01	mg/kg	0.03	0.02	40%	0.03	0.2	148%
Total Lead	0.1	mg/kg	13	12	8%	13	9.4	32%
Total Nickel	0.2	mg/kg	1.8	1.6	12%	1.8	2.1	15%
Total Zinc	0.5	mg/kg	36	32	12%	36	27	29%
Organo-metalloids								
Tributyltin (as Sn)	0.5	ug.Sn/kg	9.3	NT	NA	9.3	5.8	46%
Hydrocarbons								
Total Petroleum Hydrocarbons (sum)	3	mg/kg	56	32	54%	56	<100	NA
Napthalene	5	ug/kg	<5	<5	0%	<5	<10	NA
2-Methylnaphthalene	5	ug/kg	<5	<5	0%	<5	<10	NA
Acenaphthylene	4	ug/kg	8	4	67%	8	<10	NA
Acenaphthene	4	ug/kg	<4	6	0%	<4	<10	NA
Fluorene	4	ug/kg	7	8	13%	7	<10	NA
Phenanthrene	4	ug/kg	54	29	60%	54	<10	NA
Anthracene	4	ug/kg	<4	<4	0%	<4	<10	NA
Fluoranthene	4	ug/kg	137	52	90%	137	20	149%
Pyrene	4	ug/kg	122	41	99%	122	10	170%
Benz(a)anthracene	4	ug/kg	95	36	90%	95	<10	NA
Chrysene	4	ug/kg	51	13	119%	51	<10	NA
Benzo(b+j) fluoranthene	4	ug/kg	120	40	100%	120	<20	NA
Benzo(k)fluoranthene	4	ug/kg	45	9	133%	45	<10	NA
Benzo€pyrene	4	ug/kg	47	15	103%	47	<10	NA
Benzo(a)pyrene	4	ug/kg	101	29	111%	101	<10	NA
Perylene	4	ug/kg	17	<4	0%	17	<10	NA
Benzo(g,h,i)perylene	4	ug/kg	52	19	93%	52	<10	NA
Dibenz(a.h)anthracene	4	ug/kg	15	7	73%	15	<10	NA
Indeno(1.2.3.cd)pyrene	4	ug/kg	46	17	92%	46	<10	NA
Sum of PAHs	4	ug/kg	927	325	96%	927	80	168%
Benzene	0.2	mg/kg	<0.2	<0.2	0%	<0.2	<0.5	0%
Toluene	0.2	mg/kg	<0.2	<0.2	0%	<0.2	<0.5	0%
Ethylbenzene	0.2	mg/kg	<0.2	<0.2	0%	<0.2	<0.5	0%
meta- & para-Xylene	0.2	mg/kg	<0.2	<0.2	0%	<0.2	<1.0	0%
ortho-Xylene	0.2	mg/kg	<0.2	<0.2	0%	<0.2	NT	0%
Total Xylenes	0.5	mg/kg	<0.5	<0.5	0%	<0.5	NT	0%
BTEX (sum)	0.2	mg/kg	<0.2	<0.2	0%	<0.2	<0.25	0%

Notes:
Results expressed as dry weight basis.
Organics are normalised to 1% TOC

Acronyms:
LOR = limits of reporting
mg/kg = milligrams per kilogram
mg.N/g = milligrams of nitrogen per gram
mg.P/g = milligrams of phosphorous per gram
C% = Carbon Percentage
--- = No criteria available
NT = Not Tested

Font and Cells
- grey text denotes value below laboratory limit of reporting
- grey fill denotes exceedance of multiple criteria

AME Pty Ltd
Henderson Marine Support Base
Table 2: Groundwater QC Results

				Sample ID	GW3	QC	RPD
				Sample Matrix	Water	Water	
				Laboratory	MAFRL	MAFRL, ALS	
				Date Sampled	10/05/2017	10/05/2017	
Analyte	**LOR**	**Units**	**EQG (EPA 2017) - Moderate Protection**	**ANZECC & ARMCANZ (2000) - Marine Water**			
Nutrients							
Total Nitrogen	50	ug.N/L	---	**230**	**2900**	**2800**	4%
Total Phosphorous	5	ug.P/L	---	**20**	14	13	7%
Inorganics							
Total Organic Carbon	0.5	mg.C/L	---	---	0.6	0.7	15%
Heavy Metals							
Total Copper	0.2	µg/L	**8**	**3**	0.3	NT	N/A
Total Mercury	0.0001	µg/L	**1.4**	**0.7**	<0.0001	NT	N/A
Total Lead	0.1	µg/L	**12**	**6.6**	<0.1	NT	N/A
Total Nickel	0.3	µg/L	**560**	**200**	<0.3	NT	N/A
Total Zinc	1	µg/L	**43**	**23**	<1	NT	N/A
Organics - normalised to 1% TOC							
Tributyltin (as Sn)	2	ngSn/L	**50**	**20**	<2	NT	N/A
Hydrocarbons - normalised to 1% TOC							
Total Petroleum Hydrocarbons (sum)	50	µg/L	---	---	<50	NT	N/A
Naphthalene	0.02	µg/L	**120**	**90**	0.02	NT	N/A
Total Polycyclic Aromatic Hydrocarbons	0.005	µg/L	---	---	0.02	NT	N/A
Benzene	1	µg/L	**1300**	**900**	<1	NT	N/A
Toluene	2	µg/L	---	---	<2	NT	N/A
Ethylbenzene	2	µg/L	---	---	<2	NT	N/A
meta- & para-Xylene	2	µg/L	---	---	<2	NT	N/A
ortho-Xylene	2	µg/L	---	---	<2	NT	N/A
Total Xylenes	2	µg/L	---	---	<2	NT	N/A
BTEX (sum)	1	µg/L	---	---	<1	NT	N/A

Notes:

ANZECC & ARMCANZ (2000) South-west Australia marine-inshore (nutrients) and 90% species protection for slightly-moderately disturbed marine ecosystems (metals and organics)

EPA (2015) Environmental quality criteria reference document for Cockburn Sound - moderate protection

Acronyms:

LOR = limits of reporting
ug/L = micrograms per litre
mg.N/L = milligrams of nitrogen per litre
mg.P/g = milligrams of phosphorous per litre
mg.C/g = milligrams of carbon per litre
--- = No criteria available

Font and Cells

- grey text denotes value below laboratory limit of reporting

AME Pty Ltd
Henderson Marine Support Base
Table 3: Sediment Analytical Results

								Sample ID	SD01	SD03	SD05
								Sample Matrix	Sediment	Sediment	Sediment
								Laboratory	MAFRL, ALS	MAFRL, ALS	MAFRL, ALS
								Date Sampled	10/05/2017	10/05/2017	10/05/2017
Analyte	**LOR**	**Units**	**Screening Levels (NAGD 2009)**	**EQG (EPA 2017)**	**HIL-D (NEPM 2013)**	**EIL (NEPM 2013)**	**ISQG-Low (ANZECC 2000)**	**ISQG-High (ANZECC 2000)**			
Nutrients											
Total Kjeldahl Nitrogen	0.1	mg.N/g	---	---	---	---	---	---	1.3	1.0	0.6
Total Phosphorous	0.05	mg.P/g	---	---	---	---	---	---	0.5	0.35	0.32
Inorganics											
Total Organic Carbon	0.2	% C	---	---	---	---	---	---	1.2	0.9	0.6
Heavy Metals											
Total Copper	0.2	mg/kg	**65**	**65**	**240000**	**369**	**65**	**270**	49	37	21
Total Mercury	0.01	mg/kg	**0.15**	**0.15**	**730**	**---**	**0.15**	**1**	0.04	0.03	0.01
Total Lead	0.1	mg/kg	**50**	**50**	**1500**	**1800**	**50**	**220**	17	13	6.9
Total Nickel	0.2	mg/kg	**21**	**21**	**6000**	**610**	**21**	**52**	9.9	1.8	2.2
Total Zinc	0.5	mg/kg	**200**	**200**	**400000**	**1573**	**200**	**410**	73	36	36
Organometallics											
Tributyltin (as Sn)	0.5	ug/kg	**9**	**5**	**---**	**---**	**5**	**70**	**17.3**	**10.3**	**27.3**
Organics											
Total Petroleum Hydrocarbons (sum)	3	mg/kg	**550**	**---**	**---**	**---**	**---**	**---**	34	56	62
Napthalene	5	ug/kg	**---**	**---**	**---**	**---**	**---**	**---**	<5	<5	<5
Sum of PAHs	4	ug/kg	**10000**	**4000**	**4000**	**---**	**4000**	**45000**	319	1030	642
BTEX (sum)	0.2	mg/kg	**---**	**---**	**---**	**---**	**---**	**---**	<0.2	<0.2	<0.2

Notes:
Results expressed as dry weight basis.
Organics and Organometallics are normalised to 1% TOC

Acronyms:
LOR = limits of reporting
mg/kg = milligrams per kilogram
mg.N/g = milligrams of nitrogen per gram
mg.P/g = milligrams of phosphorous per gram
C% = Carbon Percentage
--- = No criteria available
NT = Not Tested

Font and Cells
- grey text denotes value below laboratory limit of reporting
- grey fill denotes exceedance of multiple criteria

AME Pty Ltd
Henderson Marine Support Base
Table 4: Groundwater Analytical Results

				Sample ID	GW3
				Sample Matrix	Water
				Laboratory	MAFRL, ALS
				Date Sampled	10/05/2017
Analyte	**LOR**	**Units**	**EQG (EPA 2017) - Moderate Protection**	**ANZECC & ARMCANZ (2000) - Marine Water**	
Nutrients					
Total Nitrogen	50	ug.N/L	---	**230**	**2900**
Total Phosphorous	5	ug.P/L	---	**20**	14
Inorganics					
Total Organic Carbon	0.5	mg.C/L	---	---	0.6
Heavy Metals					
Total Copper	0.2	µg/L	**8**	**3**	0.3
Total Mercury	0.0001	µg/L	**1.4**	**0.7**	<0.0001
Total Lead	0.1	µg/L	**12**	**6.6**	<0.1
Total Nickel	0.3	µg/L	**560**	**200**	<0.3
Total Zinc	1	µg/L	**43**	**23**	<1
Organometallics - normalised to 1% TOC					
Tributyltin (as Sn)	2	ngSn/L	**50**	**20**	<2
Hydrocarbons - normalised to 1% TOC					
Total Petroleum Hydrocarbons (sum)	50	µg/L	---	---	<50
Naphthalene	0.02	µg/L	**120**	**90**	0.02
Total Polycyclic Aromatic Hydrocarbons	0.005	µg/L	---	---	0.02
Benzene	1	µg/L	**1300**	**900**	<1
Toluene	2	µg/L	---	---	<2
Ethylbenzene	2	µg/L	---	---	<2
meta- & para-Xylene	2	µg/L	---	---	<2
ortho-Xylene	2	µg/L	---	---	<2
Total Xylenes	2	µg/L	---	---	<2
BTEX (sum)	1	µg/L	---	---	<1

Notes:
ANZECC & ARMCANZ (2000) South-west Australia marine-inshore (nutrients) and 90% species protection for slightly-moderately disturbed marine ecosystems (metals and organics)
EPA (2015) Environmental quality criteria reference document for Cockburn Sound - moderate protection

Acronyms:
LOR = limits of reporting
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mg.C/g = milligrams of carbon per litre
--- = No criteria available

Font and Cells
- grey text denotes value below laboratory limit of reporting

APPENDIX A

Field Documentation

YSI CALIBRATION LOG

360 environmental

INSTRUMENT:

☐ **YSI 1**
05H1970 AC (Data Logger)
05K1045 AA (Sonde)

☐ **YSI 2**
6050000 (Data Logger)
605790-1 (Sonde)

CALIBRATION DETAILS

Sensor	Calibration Standard	Temp/Press Correction (Y/N)	Compensated Value (If corrected)	Required Accuracy	Pass	Fail	Comment/s
pH	☑ pH 4.00	(Y) / N	pH 4.00	± 0.2	☑	☐	
	☑ pH 7.00	(Y) / N	pH 6.94	± 0.2	☑	☐	
	☑ pH 10.00	(Y) / N	pH 10.06	± 0.2	☑	☐	
Conductivity	☑ 1413 uS/cm	(Y) / N	1389 uS/cm	± 1%	☑	☐	
	☑ 12.88 mS/cm	(Y) / N	11912 uS/cm	± 1%	☑	☐	
Salinity	☑ Auto calibrated using above EC values			-	☑	☐	
Dissolved Oxygen	☑ 100% Saturation	(Y) / N			☑	☐	
Redox	☐ Zorbels	Y	_____ mV	±20mV	☐	☐	
Temperature	☑ Factory calibrated	-	-	±0.15°C	☑	☐	
Battery Level	☐ 0-25% ☐ 25-50% ☐ 50-75% ☑ 75%-100%				☑	☐	

This is to certify that this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument's service manual.

Signed: eladdle

Name: Eleanor Liddle

Date: 09/05/17

Project: _____

SOIL BORE LOG

360 environmental

PROJECT Name: AME Dredge	Soil Bore ID: SB01	SHEET: (of)	
PROJECT #: 1293	PROJECT Location: AME – Henderson		
Project Manager: AW	AOPC: —	Elevation mAHD:	
Client: AME PTY LTD	Zone:	Easting:	Northing:
Date: 10/5/17	Logged by: VM	Checked by:	
Drilled by: —	Rig Type: —	Drilling Method: Hand Auger	

SOIL DESCRIPTION (i.e. soil type, colour, plasticity or particle characteristics (size, grading, shape), secondary/minor soil component)	DEPTH	GRAPHIC LOG	CLASSIFICATION SYMBOL	DRILLING METHOD	FIELD MONITORING: Moisture	FIELD MONITORING: PID	SAMPLE INTERVALS (0.15 / 0.25 / 0.5m intervals)	COMMENTS
	thick	----	----	----	----	----	----	
Limestone Refusal at 0.1m	0.0 1.0 2.0 3.0 4.0							

E.O.B: m bgl

The Classification symbols are based on AS1726-1993. This log is however not intended for geotechnical uses

Abbreviations:
m bgl = meters below ground level

E.O.B = End of Hole
HA: Hand Auger, DP: Direct Push, SA: Solid flight Auger, D: Dry, M: Moist, W: Wet

Sediment Sampling

360 environmental

Project: AME Dredge & Reclamation	Project No.: 1293
Project Manager: Alysia Woodward	Project location: Clarence Beach Rd
Client: AME Pty LTD	Date: 10/5/17

FIELD OBSERVATIONS

Water Clarity:	Clear	Abnormalities: —
Wind Speed:	None	
Water State:	Still	
Weather:	Sunny	

FIELD PARAMETERS

Sampling Location	Sampling Depth	Easting	Northing	Sediment Description	Remarks
SD01	0.2m	383672	6442007	clayey SAND black, fg, ps subang	5% shells
SD02	0.2m	383696	6442072	clayey SAND black, fg, ps angular	5% shell organic odour
SD03	0.2m	383636	6442078	SAND black & brown, fg, ps, angular	10% shells QC1 & QC2.
SD04	0.2m	383645	6442107	SAND black/brown, coarse vg, subrounded	20% Shells.
SD05	0.2m	383654	6442174	clayey SAND black, fg, ps subang.	No shells.
SD06	0.2m	383678	6442157	SAND black/brown, vc, ps, randed	20% shells organic odour
SD07	0.2m	383688	6442218	SAND dark orange, fine, vg, subrounded	5% shells.

Sampled By (print): Signature:

Groundwater Low Flow Purging: Water Quality Measurement Form

360 environmental

Client: AME PTY LTD
Project:
360 Job No.: 1293
Location:
360 Field Representative: Vanessa Mamot
Date: 10.5.17

Pump Type: Peristaltic
Pump Intake (mbTOC): 4.5
Total Volume purged:

Monitoring Well ID: MW03
Inner Diameter:
Depth to Water (mbTOC): 3.485
Depth of Well (mbTOC): 5.46
Top of Well Screen (mbTOC):
Bottom of Well Screen (mbTOC):
Height of Riser*(m above/below ground) 0.5m
Presence & thickness of LNAPL: no

			Temp (°C)	3%	D.O[4] (mg/L)	10%	Spec. Cond. (µS/cm)	3%	pH (unit)	± 0.1	ORP (mV)	±10	Comments
Time[1]	Depth to groundwater (mbTOC)[2]	Purge rate (mL/min)[3]	Reading	% between readings	Reading	% between readings	Reading	% between readings	Reading	±between readings	Reading	±between readings	
Start:	Start:												
12:10			22.0		5.86		1274		6.22		215		clear,
12:15			22.1		4.43		1235		7.40	0.01	158	12	+
12:20			22.2		4.30		1241		7.41		146		QCS
12:25			22.2		4.23		1235		7.41		139		
SAMPLING:													

Notes:
[1] Readings to be collected every five minutes or greater.
[2] Drawdown should not exceed 9 cm ONCE first set of readings obtained. This allows for natural drawdown stabilisation to occur.
[3] Must be such that the drawdown doesn't exceed 9 cm, or if it does exceed, remains stabile.
[4] 10% for values greater than 0.5 mg/L; if three DO values are less that 0.5 mg/L, consider these values as stabilised.
The depth to groundwater measurement must be recorded before SAMPLING
VOC samples must be collected first
Pump intake should be located within the screen interval & at the mid point of the saturated screnn length
* Gatic cover riser height should be a negative value
In the event that the recharge is very slow and the well runs dry, the readings may be collected at intervals of less than 5 minutes or for every litres purged
If a well runs dry, it is assumed that stabilisation will have occurred once the it has recharged and that samples can be collected straight after
A minimum of 4 readings are required, unless the well runs dry
To calculate % difference, use the following equation: ((R2-R1)/((R2+R1)/2))*100

Legend:
mbTOC= metres below top of casing
DO = dissolved oxygen
ORP = oxygen reduction potential

360 environmental

PROJECT FIELD LOG (DAILY)

Date: 10/5/17 **Project Number:** 1893 **Project Name:** AME Reclamation

Arrived: 9:00 **Departed:** _____ **Weather:** Sunny

PM: Alysia Woodward

Field Personnel: Vanessa Mamot

Contractors: —

Client Contact: Saul **Site Contact:** _____

Purpose of Visit (Tick Appropriate Box):

☐ Site Inspection ☐ Well Integrity Assessment

☐ Soil Bore Advancement (Drill Rig) ☒ Hand Augering ☐ Test Pits ☒ Soil Sampling

☐ Monitoring Well Installation (Drill Rig) ☒ Groundwater Monitoring ☒ Sediment Sampling

☐ Sub-slab Vapour Probe Installation ☐ Landfill Gas Well Installation ☐ Gas/ Vapour Sampling

☐ Remediation Works Oversight ☐ Other (Specify):

Equipment Used:

VanVeen Sediment grabber, YSI, peristaltic pump, Hand Auger.

☐ Calibration Certificate Received :_____ ☒ Calibration Undertaken: YSI

Sampling:

Sampling Conducted: ☒ Y ☐ N Matrix: ☐ Soil ☐ Water ☐ Air

CoC Completed: ☒ Y ☐ N

Primary Lab: ALS, MAXXAM, Secondary Lab: NMI, ALS

Quality Control Details:

QC	Type	Date and time	Primary	Media
QC 1	Duplicate	10/5/17	SD03	Sediment
QC 2	Triplicate			
QC 5	Duplicate	10/5/17	MW03	Water
QC				
QC				
QC				
QC				
QC				
QC				
QC				
QC				
QC				
QC				
QC				
QC				
QC				
QC				

QC	Collection Point	Collection Location	Date and time	Rinsate water batch #
RS				
RS				
RS				
RS				
RS				

QC	Date and time	Trip blank batch #
TB		
TB		
TB		
TB		
TB		

QC	Date and time	Collection Location	Blank water batch #
FB			
FB			
FB			
FB			
FB			

Description of Activities:

9.00 Meet with Saul & do site Induction
9:30 Finding exact drive to SD01.
Gate to access is locked - moving on to SD02.
SD02 } all dry
SD03
SD04
SD05
SD06
11:00 SD07 → rocks present, laying over 10 times.
11:30 SD1 → we key & sample.
12:00 Start groundwater sampling
1.15pm: Leave site
1.35pm. Arrive at Mudock.
1.50pm Leave Mudock.

360 environmental

Groundwater Monitoring (Synoptic Water Level Measurements)

Time Started: 12:00 Time Finished: 12:30

Monitoring Well ID	DTW (mBTOC)	DTB (mBTOC)	Construction (Gatic/Riser)	Casing height* (m above/below ground)	Condition
MW03	3.485	5.46	Riser	0.5	Good
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					
MW					

* Gatic cover (also referred to as flush mount) riser height should be a negative value

NAPL Detected: No
Location: —
Thickness: —

APPENDIX B

Laboratory Certificates of Analysis

ChemCentre

Amended Report

PO Box 1250, Bentley Delivery Centre
Bentley WA 6983
T +61 8 9422 9800
F +61 8 9422 9801
www.chemcentre.wa.gov.au
ABN 40 991 885 705

Accredited for compliance with ISO/IEC 17025, Accreditation No. 8

Purchase Order: 1293
ChemCentre Reference: 16S2737 R4
Client Reference No:
CoC No:

360 Environmental Pty Ltd
First Floor
10 Bermondsey Street
West Leederville WA 6007
Attention: Alysia Woodward

Report on: 1 sample received on 10/05/2017

LAB ID	Material	Client ID and Description
16S2737 / 001	sediment	QC2

LAB ID	001
Client ID	QC2
Sampled	10/05/2017

Analyte	Method	Unit	
Dibutyltin as Sn	eNR_35	ng/g	6.8
Monobutyltin as Sn	eNR_35	ng/g	4.0
Tributyltin as Sn	eNR_35	ng/g	5.8
Naphthalene	WL206_SL	mg/kg	<0.01
Acenaphthylene	WL206_SL	mg/kg	<0.01
Acenaphthene	WL206_SL	mg/kg	<0.01
Fluorene	WL206_SL	mg/kg	<0.01
Phenanthrene	WL206_SL	mg/kg	<0.01
Anthracene	WL206_SL	mg/kg	<0.01
Fluoranthene	WL206_SL	mg/kg	0.02
Pyrene	WL206_SL	mg/kg	0.01
Benzo(a)anthracene	WL206_SL	mg/kg	<0.01
Chrysene	WL206_SL	mg/kg	<0.01
Benzo(b+k)fluoranthene	WL206_SL	mg/kg	<0.02
Benzo(a)pyrene	WL206_SL	mg/kg	<0.01
Indeno(1,2,3,c,d)pyrene	WL206_SL	mg/kg	<0.01
Dibenzo(a,h)anthracene	WL206_SL	mg/kg	<0.01
Benzo(g,h,i)perylene	WL206_SL	mg/kg	<0.01
Total PAH (as above)	WL206_SL	mg/kg	<0.16
Benzene	WL244S	mg/kg	<0.5
Toluene	WL244S	mg/kg	<0.5
Ethylbenzene	WL244S	mg/kg	<0.5
Xylene	WL244S	mg/kg	<1.0
Total BTEX	WL244S	mg/kg	<2.5
TRH C6-C10	WL244S	mg/kg	<25
TRH >C10-C16	WL230206_S	mg/kg	<50
TRH >C16-C34	WL230206_S	mg/kg	<100
TRH >C34-C40	WL230206_S	mg/kg	<100
Copper	iMET2SAMS	mg/kg	25

LAB ID			001
Client ID			QC2
Sampled			10/05/2017

Analyte	Method	Unit	
Lead	iMET2SAMS	mg/kg	9.4
Mercury	iHG1STVGA	mg/kg	0.03
Mercury	iHG2STVG	mg/kg	0.03
Nickel	iMET2SAMS	mg/kg	2.1
Total Kjeldahl Nitrogen	WL132_Soil	mg/kg	860
Phosphorus	iMET2SAICP	mg/kg	280
Total Organic Carbon	(combs)	%	0.80
Zinc	iMET2SAMS	mg/kg	27

Date Extracted	WL230206_S	16/05/2017
Date Analysed	(combs)	16/5/2017
	eNR_35	24/5/2017
	iHG1STVGA	8/6/2017
	iHG2STVG	8/6/2017
	iMET2SAICP	26/5/2017
	iMET2SAMS	26/5/2017
	WL132_Soil	30/5/2017
	WL206_SL	23/5/2017
	WL230206_S	22/5/2017
	WL244S	17/5/2017
Sample Condition		Cold

Method	Method Description
(combs)	Total carbon, total organic carbon (acid pretreatment), total inorganic carbon (calculation) and Sulfur in soils by combustion, in-house method S57.
eNR_35	Organotin analysis outsourced to NMI
iHG1STVGA	Mercury in soils as received, digestion USEPA 3051 analysis by CVAAS.
iHG2STVG	Mercury (dry basis) in soil/sediments USEPA 3051A digestion and CV-AAS
iMET2SAICP	Acid digestable metals (dry wt basis) by digestion and ICPAES.
iMET2SAMS	Acid digestable metals (dry wt basis) by ICPMS.
WL132_Soil	Kjeldahl Nitrogen, Total Nitrogen, Protein and Ammonia in soil by digest and colorimetric method
WL206_SL	PAHs in soil GC-MS, SIM, MRM Low level
WL230206_S	Hydrocarbons in soil TPH, TRH, by GC-FID, less Nap
WL244S	BTEX, C6-C9 TPH and C6-C10 TRH by P&T GC-MS in soil

These results apply only to the sample(s) as received. Unless arrangements are made to the contrary, these samples will be disposed of after 30 days of the issue of this report.

*Analysis not covered by scope of ChemCentre's NATA accreditation.

Elena Mcconville-Wolfe
Chemist
Scientific Services Division
12-Jun-2017

Karina Soukos
Chemist
Scientific Services Division

ChemCentre

Report of Examination

PO Box 1250, Bentley Delivery Centre
Bentley WA 6983
T +61 8 9422 9800
F +61 8 9422 9801
www.chemcentre.wa.gov.au
ABN 40 991 885 705

Accredited for compliance with ISO/IEC 17025, Accreditation No. 8

Purchase Order: 1293
ChemCentre Reference: 16S2737 R3
Client Reference No:
CoC No:

360 Environmental Pty Ltd
First Floor
10 Bermondsey Street
West Leederville WA 6007
Attention: Alysia Woodward

Report on: 1 sample received on 10/05/2017

LAB ID	Material	Client ID and Description
16S2737 / 001	sediment	QC2

LAB ID	001
Client ID	QC2
Sampled	10/05/2017

Analyte	Method	Unit	
Dibutyltin as Sn	eNR_35	ng/g	6.8
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Phenanthrene	WL206_SL	mg/kg	<0.01
Anthracene	WL206_SL	mg/kg	<0.01
Fluoranthene	WL206_SL	mg/kg	0.02
Pyrene	WL206_SL	mg/kg	0.01
Benzo(a)anthracene	WL206_SL	mg/kg	<0.01
Chrysene	WL206_SL	mg/kg	<0.01
Benzo(b+k)fluoranthene	WL206_SL	mg/kg	<0.02
Benzo(a)pyrene	WL206_SL	mg/kg	<0.01
Indeno(1,2,3,c,d)pyrene	WL206_SL	mg/kg	<0.01
Dibenzo(a,h)anthracene	WL206_SL	mg/kg	<0.01
Benzo(g,h,i)perylene	WL206_SL	mg/kg	<0.01
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Benzene	WL244S	mg/kg	<0.5
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TRH >C10-C16	WL230206_S	mg/kg	<50
TRH >C16-C34	WL230206_S	mg/kg	<100
TRH >C34-C40	WL230206_S	mg/kg	<100
Copper	iMET2SAMS	mg/kg	25

LAB ID			001
Client ID			QC2
Sampled			10/05/2017

Analyte	Method	Unit	
Lead	iMET2SAMS	mg/kg	9.4
Mercury	iMET2SAMS	mg/kg	0.20
Nickel	iMET2SAMS	mg/kg	2.1
Total Kjeldahl Nitrogen	WL132_Soil	mg/kg	860
Phosphorus	iMET2SAICP	mg/kg	280
Total Organic Carbon	(combs)	%	0.80
Zinc	iMET2SAMS	mg/kg	27

Date Extracted	WL230206_S	16/05/2017
Date Analysed	(combs)	16/5/2017
	eNR_35	24/5/2017
	iMET2SAICP	26/5/2017
	iMET2SAMS	26/5/2017
	WL132_Soil	30/5/2017
	WL206_SL	23/5/2017
	WL230206_S	22/5/2017
	WL244S	17/5/2017
Sample Condition		Cold

Method	Method Description
(combs)	Total carbon, total organic carbon (acid pretreatment), total inorganic carbon (calculation) and Sulfur in soils by combustion, in-house method S57.
eNR_35	Organotin analysis outsourced to NMI
iMET2SAICP	Acid digestable metals (dry wt basis) by digestion and ICPAES.
iMET2SAMS	Acid digestable metals (dry wt basis) by ICPMS.
WL132_Soil	Kjeldahl Nitrogen, Total Nitrogen, Protein and Ammonia in soil by digest and colorimetric method
WL206_SL	PAHs in soil GC-MS, SIM, MRM Low level
WL230206_S	Hydrocarbons in soil TPH, TRH, by GC-FID, less Nap
WL244S	BTEX, C6-C9 TPH and C6-C10 TRH by P&T GC-MS in soil

These results apply only to the sample(s) as received. Unless arrangements are made to the contrary, these samples will be disposed of after 30 days of the issue of this report.

*Analysis not covered by scope of ChemCentre's NATA accreditation.

Elena Mcconville-Wolfe
Chemist
Scientific Services Division
6-Jun-2017

Karina Soukos
Chemist
Scientific Services Division

CHAIN OF CUSTODY

16S2737

Marine and Freshwater Research Laboratory Environmental Science

Murdoch UNIVERSITY

Phone: 93602907

To: Marine and Freshwater Research Laboratory	From: 360 Environmental
Address: Murdoch University, Loading Zone 1,	Address: 10 Bermondsey St
Phys Sc Room 3.026, 90 South St, Murdoch 6150	West Leederville
Phone: 08 93602907	Phone: 93888360 ~~Fax:~~ Mobile: 0477 466 181
Email:	Email: alysia.woodward@360environmental.com.au
Courier Details:	Job Number: 1293 PO/ Account #: QT-02002

Sample Preservation: None / Warm / (Cool) / On Ice / Frozen / Acidified / Filtered / Other: _____

Sample Type: Water / Bore / Fresh / Estuarine / Marine / Brine / Plant / (Sediment) / Soil / Other: _____

No	Sample Code	Sampling Date	Analysis Required							
			As per Quote Attached							
1	QC2	10/5/17	X							
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

16S2737/001
QC2
Sampled: 10 May 2017

Relinquished by:	Date:	Time:	Received by:	Date:	Time	Job Number:
V.M	10.5.17	3.00 pm	Kevin Robins	10/05/17	15:00	16S2737

Sample Condition:
COLD 3x250mL glass jars.

Please acknowledge receipt of samples by signing where appropriate, quoting job number and returning to the sender by fax.

Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

General Enquiries
Ph: 1300 722 845
customerservice@measurement.gov.au
www.measurement.gov.au
ABN: 74 599 608 295

NATIONAL MEASUREMENT INSTITUTE QUOTATION

26 Dick Perry Ave, Kensington WA 6151 105 Delhi Rd, North Ryde NSW 2113 1/153 Bertie St, Port Melbourne VIC 3207

Quotation Number:	MURD03A-CQ1702W 02002 C
Date of Issue:	February 1, 2017
Valid Until:	April 1, 2017
LIMS Reference (NMI use only):	QT-02002 C

Contact Name:	Krzysztof Wienczugow - Manager MAFRL
Company:	Marine and Freshwater Research Laboratory
ABN:	
Street Address:	Murdoch University, 90 South Street, Murdoch Western Australia, 6150
Postal Address:	
Telephone/Mobile:	61 8 9360 6907 M:0414 352907
email address:	k.wienczugow@murdoch.edu.au
Customer Reference:	
Job / Project Reference:	marine sediment

Dear: Kris

Thank you for the opportunity to quote for the analysis of

MATRIX	NO. OF SAMPLES	TEST	LIMIT OF REPORTING (mg/kg)	PRICE PER SAMPLE (excl. GST) $	REFERENCE METHOD
SEDIMENT	1				
		TKN	50 mg/kg	$30.00	✓
		TP	5 mg/kg	$4.80	✓
		TOC	0.01-0.02 %	$48.00	✓
		Total Metals:			✓
		Metals digest	-	$25.00	✓
		Cu	0.5 mg/kg	$4.80	✓
	QC2	Hg	0.1 mg/kg	$4.80	✓
		Ni	1 mg/kg	$4.80	✓
		Pb	0.5 mg/kg	$4.80	✓
		Zn	1 mg/kg	$4.80	✓
		Moisture	0.1 g/100g	$14.00	✓
		PAH's low level NAGD	0.01 mg/kg	$156.00	✓
		TRH NEPM (C6-C40)	25, 50, 100, 100 mg/kg	$75.00	✓
		TBT's	0.5 ug/kg	$204.00	✓
		Sub-total per sample (excludes Handling Fee and GST)		**$580.80**	

HANDLING FEE:	A standard Handling Fee of $33.00 inclusive of GST (GST component $3.00) applies per invoice.	$33.00
MINIMUM INVOICE FEE:	A minimum invoice of $275 inclusive of GST applies. (Includes the $33.00 handling fee).	$275.00

COMMENTS & SPECIAL CONDITIONS

Please Note: LORs are targets only and may be revised if samples are found to contain substances which cause interferences, or if matrix effects become apparent during analysis

Please note minimum 1L of seawater is required for elutriate preparation

RECOMMENDED HOLDING TIME (RHT)

NMI will use their best efforts to commence preparation and analysis of samples within recommended holding time (RHT) provided that samples are delivered to the laboratory in an appropriate timeframe. NMI is not responsible for any breach of RHT.

SAMPLE DELIVERY

Please deliver samples to 26 Dick Perry Ave, Kensington WA 6151 with completed sample submission (chain of custody) form (attached)

Samples to be preserved in accordance with RHT requirements and securely packed in eskies during storage and transit to the Laboratory. Please do not submit samples to the laboratory until you have established a credit account

AGREED TURNAROUND TIME

Typically 10-15 working days from receipt at laboratory. Premiums will apply for fast TATs if available.

Fast TATs **must** be agreed to before dispatch of samples and requested in writing on the chain of custody / sample submission form.

Premiums applied to fast TATs:

Same day - **200% Premium**, 24 hrs -**100% Premium,** 48 hrs - **50% Premium**, 3-5 working days - **25% Premium**

QUOTED BY: Carine Quah - Chemist **DATE:** 1/02/2017

When providing samples to NMI, the client must give written notice of all known safety or health hazards and special procedures relevant to the handling, testing

Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

NATA

REPORT OF ANALYSIS

Report No. RN1159272

Client	: CHEMCENTRE	**Job No.**	: CHEM06/170512/2
	CORNER MANNING ROAD AND SOUTH ENTRANCE	**Quote No.**	: QT-02029
	OF CURTIN UNIVERSITY	**Order No.**	:
	BENTLEY WA 6103	**Date Sampled**	:
		Date Received	: 12-MAY-2017
Attention	: JENNY MCGUIRE	**Sampled By**	: CLIENT
Project Name	:		
Your Client Services Manager	: RICHARD COGHLAN	**Phone**	: (02) 94490161

Lab Reg No.	Sample Ref	Sample Description
N17/014004	16S2737/001	SEDIMENT

Lab Reg No.		N17/014004				
Sample Reference	Units	16S2737/001				Method
Organotins						
Monobutyltin as Sn	ng/g	4.0				NR_35
Dibutyltin as Sn	ng/g	6.8				NR_35
Tributyltin as Sn	ng/g	5.8				NR_35
Surrogate: Tripropyltin	%REC	94				NR_35
Dates						
Date extracted		22-MAY-2017				
Date analysed		22-MAY-2017				

Danny Slee, Section Manager
Organic - NSW
Accreditation No. 198

23-MAY-2017

Lab Reg No.		N17/014004				
Sample Reference	Units	16S2737/001				Method
Trace Elements						
Total Solids	%	77.1				NT2_49

Lisa Liu, Analyst
Inorganics - NSW
Accreditation No. 198

23-MAY-2017

REPORT OF ANALYSIS

All results are expressed on a dry weight basis.

This Report supersedes reports: *RN1159257* *RN1159271*

Chemical Accreditation 198: 105 Delhi Road, North Ryde, NSW, 2133

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: 360 Environmental	TURNAROUND REQUIREMI ☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle):	
OFFICE: 10 Bermondsey Street, West Leederville	(Standard TAT may be longer for some tests e.g., Ultra Trace ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes / No / N/A
PROJECT: AME Reclamation	ALS QUOTE NO.: EP/565/17	Free ice / frozen ice bricks present upon receipt?	Yes / No / N/A
ORDER NUMBER: 1293	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 5.3 °C	
PROJECT MANAGER: Alysia Woodward CONTACT PH:	OF: 1 2 3 4 5 6 7	Other comments:	
SAMPLER: Vanessa Mamet SAMPLER MOBILE: 0431157282	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY: Sulin 7658
COC emailed to ALS? (YES / NO) EDD FORMAT (or default):	DATE/TIME:	DATE/TIME:	DATE/TIME: 4:15 10/5/17
Email Reports to: labresults@360environmental.com.au			
Email invoice to: accounts@360environmental.com.au			

RECEIVED BY:	DATE/TIME:
M Wakell	10/5/17 1100

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Suite P-22	Suite EP090 (TBT)	Suite EP132B-SD (PAH)	Suite EP080-SD (TRH)	Suite EP071-SD (TRH ULT)	Suite GW1	Copper, lead, mercury, nickel, zinc	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SD01 ✓	10/05/2017	Sed				X	X	X	X				
2	SD02 ✓	10/05/2017	Sed										X	
3	SD03 ✓	10/05/2017	Sed				X	X	X	X				
4	SD04 ✓	10/05/2017	Sed										X	
5	SD05 ✓	10/05/2017	Sed				X	X	X	X				
6	SD06 ✓	10/05/2017	Sed										X	
7	SD07 ✓	10/05/2017	Sed			X	X	X	X	X				
8	QC1 ✓	10/05/2017	Sed					X	X	X				
SNR	MW03	10/05/2017	W				X				X			
9	QC3	10/05/2017	W										X	
	~~SS01~~	10/05/2017	Soil			X	X	X	X	X				Please check if ultra trace is required or not, as this is a soil sample
	~~QC05~~	10/05/2017	Soil										X	
10	GW3.						X				X			
				TOTAL		2	6	6	6	6	1	1	5	

Environmental Division Perth
Work Order Reference
EP1704830

Telephone : 61-8-9209 7655

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

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP1704830**	Page	: 1 of 9
Amendment	: **1**		
Client	: **360 ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: ALYSIA WOODWARD	Telephone	: 08 9209 7631
Project	: 1293 AME Reclamation	Date Samples Received	: 10-May-2017
Site	: ----	Issue Date	: 23-May-2017
Sampler	: VANESSA MAMET	No. of samples received	: 11
Order number	: 1293	No. of samples analysed	: 10

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.**
- **Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

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

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							
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Phenanthrene**	85-01-8	48.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Fluoranthene**	206-44-0	38.8 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Pyrene**	129-00-0	40.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Benz(a)anthracene**	56-55-3	36.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Chrysene**	218-01-9	23.4 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Benzo(b+j)fluoranthene**	205-99-2 205-82-3	48.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Benzo(e)pyrene**	192-97-2	44.4 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Benzo(a)pyrene**	50-32-8	44.6 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Benzo(g.h.i)perylene**	191-24-2	35.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Indeno(1.2.3.cd)pyrene**	193-39-5	34.3 %	0% - 20%	**RPD exceeds LOR based limits**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--007	SD07	**Sum of PAHs**	----	38.6 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EP090: Organotin Compounds	EP1704830--002	SD02	**Tributyltin**	56573-85-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--002	SD02	**Phenanthrene**	85-01-8	60.4 %	70-130%	**Recovery less than lower data quality objective**
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--002	SD02	**Benzo(b+j)fluoranthene**	205-99-2 205-82-3	64.7 %	70-130%	**Recovery less than lower data quality objective**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP132B: Polynuclear Aromatic Hydrocarbons	EP1704830--010	GW3	**Pyrene**	129-00-0	196 %	0% - 20%	**RPD exceeds LOR based limits**
Laboratory Control Spike (LCS) Recoveries							
EP080: BTEXN	QC-887345-001	----	**Ethylbenzene**	100-41-4	114 %	84-113%	**Recovery greater than upper control limit**
EP080: BTEXN	QC-887345-001	----	**ortho-Xylene**	95-47-6	112 %	87-111%	**Recovery greater than upper control limit**

Regular Sample Surrogates

Sub-Matrix: **SEDIMENT**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP132T: Base/Neutral Extractable Surrogates	EP1704830-003	SD03	**2-Fluorobiphenyl**	321-60-8	69.2 %	70-130 %	**Recovery less than lower data quality objective**

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
Total Metals by ICP-AES	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Organotin Compounds (Soluble)	0	1	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	1	18	5.56	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Organotin Compounds (Soluble)	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
PAH Compounds in Water	0	1	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*
EA001: pH in soil using 0.01M CaCl extract							
Soil Glass Jar - Unpreserved (EA001)							
SD01	**10-May-2017**	**16-May-2017**	17-May-2017	✓	**16-May-2017**	16-May-2017	✓
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
SD01, SD02, SD03, SD04, SD05, SD06, SD07, QC1	**10-May-2017**	**----**	----	----	**16-May-2017**	24-May-2017	✓
EA150: Soil Classification based on Particle Size							
Snap Lock Bag - Subsampled by ALS (EA150H)							
SD01	**10-May-2017**	**----**	----	----	**18-May-2017**	06-Nov-2017	✓
EA152: Soil Particle Density							
Snap Lock Bag - Subsampled by ALS (EA152)							
SD01	**10-May-2017**	**----**	----	----	**18-May-2017**	06-Nov-2017	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
SD01	**10-May-2017**	**17-May-2017**	07-Jun-2017	✓	**17-May-2017**	07-Jun-2017	✓

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
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
SD01	**10-May-2017**	**17-May-2017**	06-Nov-2017	✓	**17-May-2017**	06-Nov-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP071-SD)							
SD01, SD02, SD03, SD04, SD05, SD06, QC1	**10-May-2017**	**15-May-2017**	24-May-2017	✓	**15-May-2017**	24-Jun-2017	✓
Soil Glass Jar - Unpreserved (EP071-SD)							
SD07	**10-May-2017**	**16-May-2017**	24-May-2017	✓	**16-May-2017**	25-Jun-2017	✓
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071-SD)							
SD01, SD02, SD03, SD04, SD05, SD06, QC1	**10-May-2017**	**15-May-2017**	24-May-2017	✓	**15-May-2017**	24-Jun-2017	✓
Soil Glass Jar - Unpreserved (EP080-SD)							
SD01, SD02, SD03, SD04, SD05, SD06, QC1	**10-May-2017**	**15-May-2017**	24-May-2017	✓	**17-May-2017**	24-May-2017	✓
Soil Glass Jar - Unpreserved (EP071-SD)							
SD07	**10-May-2017**	**16-May-2017**	24-May-2017	✓	**16-May-2017**	25-Jun-2017	✓
Soil Glass Jar - Unpreserved (EP080-SD)							
SD07	**10-May-2017**	**16-May-2017**	24-May-2017	✓	**17-May-2017**	24-May-2017	✓
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080-SD)							
SD01, SD02, SD03, SD04, SD05, SD06, QC1	**10-May-2017**	**15-May-2017**	24-May-2017	✓	**17-May-2017**	24-May-2017	✓
Soil Glass Jar - Unpreserved (EP080-SD)							
SD07	**10-May-2017**	**16-May-2017**	24-May-2017	✓	**17-May-2017**	24-May-2017	✓
EP080-SD: BTEXN							
Soil Glass Jar - Unpreserved (EP080-SD)							
SD01, SD02, SD03, SD04, SD05, SD06, QC1	**10-May-2017**	**15-May-2017**	24-May-2017	✓	**17-May-2017**	24-May-2017	✓
Soil Glass Jar - Unpreserved (EP080-SD)							
SD07	**10-May-2017**	**16-May-2017**	24-May-2017	✓	**17-May-2017**	24-May-2017	✓

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)							
SD01, SD02, SD03, SD04, SD05, SD06, SD07	**10-May-2017**	**17-May-2017**	24-May-2017	✓	**18-May-2017**	26-Jun-2017	✓
EP132B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP132B-SD)							
SD01, SD02, SD03, SD04, SD05, SD06, QC1	**10-May-2017**	**15-May-2017**	24-May-2017	✓	**18-May-2017**	24-Jun-2017	✓
Soil Glass Jar - Unpreserved (EP132B-SD)							
SD07	**10-May-2017**	**16-May-2017**	24-May-2017	✓	**18-May-2017**	25-Jun-2017	✓

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
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
GW3	**10-May-2017**	**15-May-2017**	17-May-2017	✓	**17-May-2017**	24-Jun-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
GW3	**10-May-2017**	**15-May-2017**	24-May-2017	✓	**15-May-2017**	24-May-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
GW3	**10-May-2017**	**15-May-2017**	17-May-2017	✓	**17-May-2017**	24-Jun-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
GW3	**10-May-2017**	**15-May-2017**	24-May-2017	✓	**15-May-2017**	24-May-2017	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
GW3	**10-May-2017**	**15-May-2017**	24-May-2017	✓	**15-May-2017**	24-May-2017	✓
EP090: Organotin Compounds (Soluble)							
Amber Glass Bottle - Unpreserved (EP090S)							
GW3	**10-May-2017**	**17-May-2017**	17-May-2017	✓	**18-May-2017**	26-Jun-2017	✓
EP132B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP132-LL)							
GW3	**10-May-2017**	**15-May-2017**	17-May-2017	✓	**18-May-2017**	24-Jun-2017	✓

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		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Exchangeable Cations with pre-treatment	ED008	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055-103	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	8	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH in soil using a 0.01M CaCl2 extract	EA001	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	2	8	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	2	8	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Exchangeable Cations with pre-treatment	ED008	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	8	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH in soil using a 0.01M CaCl2 extract	EA001	2	5	**40.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	2	8	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	2	8	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Exchangeable Cations with pre-treatment	ED008	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	8	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	2	8	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	2	8	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organotin Analysis	EP090	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	0	1	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fraction	EP071-SD	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	1	8	**12.50**	**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		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Organotin Compounds (Soluble)	EP090S	0	1	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
PAH Compounds in Water	EP132-LL	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP) - Continued							
TRH - Semivolatile Fraction	EP071	1	18	**5.56**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Organotin Compounds (Soluble)	EP090S	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH Compounds in Water	EP132-LL	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Organotin Compounds (Soluble)	EP090S	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH Compounds in Water	EP132-LL	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organotin Compounds (Soluble)	EP090S	0	1	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
PAH Compounds in Water	EP132-LL	0	1	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**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
pH in soil using a 0.01M CaCl2 extract	EA001	SOIL	In house: Referenced to Rayment and Higginson 4B1 (mod.) 10 g of soil is mixed with 50 mL of 0.01M CaCl2 and tumbled end over end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 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
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
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Higginson (2011) Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. 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)
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 quanitified against an established calibration curve.
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.
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of 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)
PAH Compounds in Water	EP132-LL	WATER	In house: Referenced to USEAP SW846 8270D GCMS, LVI, Capiliary column, SIM mode. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
pH in soil using a 0.01M CaCl2 extract	EA001-PR	SOIL	In house: Referenced to Rayment and Higginson 4B1, 10 g of soil is mixed with 50 mL of 0.01M CaCl2 and tumbled end over end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
Hot 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)
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 for LVI (Non-concentrating)	ORG17D	SOIL	In house: 10g of sample, Na2SO4 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.
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Sep. Funnel Extraction /Acetylation of Phenolic Compounds	ORG14-AC	WATER	In house: Referenced to USEPA 3510 (Extraction) / In-house (Acetylation): A 1L sample is extracted into dichloromethane and concentrated to 1 mL with echange into cyclohexane. Phenolic compounds are reacted with acetic anhydride to yield phenyl acetates suitable for ultra-trace analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.
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 derivitisated, extracted and the subtitution 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.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP1704830**	Page	: 1 of 12
Amendment	: **1**		
Client	: **360 ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: ALYSIA WOODWARD	Contact	: Luke Jones
Address	: 10 Bermondsey St West Leederville 6007	Address	: 10 Hod Way Malaga WA Australia 6090
Telephone	: +61 08 93210420	Telephone	: 08 9209 7631
Project	: 1293 AME Reclamation	Date Samples Received	: 10-May-2017
Order number	: 1293	Date Analysis Commenced	: 15-May-2017
C-O-C number	: ----	Issue Date	: 23-May-2017
Sampler	: VANESSA MAMET		
Site	: ----		
Quote number	: EP/565/17		
No. of samples received	: 11		
No. of samples analysed	: 10		

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

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

This 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.

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Huynh Huynh	Organic Chemist	Perth Organics, Malaga, WA
Jeremy Truong	Laboratory Manager	Perth Inorganics, Malaga, WA
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
ShukHui Li	Client Services - Technical Manager	Perth Organics, Malaga, WA
Vanessa Nguyen	Organic Chemist	Perth Organics, Malaga, WA

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 (%)*
EA001: pH in soil using 0.01M CaCl extract (QC Lot: 889560)									
EP1704830-001	SD01	EA001: pH (CaCl2)	----	0.1	pH Unit	7.9	7.9	0.00	0% - 20%
EA055: Moisture Content (QC Lot: 890066)									
EP1704830-001	SD01	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	36.0	36.4	0.975	0% - 20%
ED008: Exchangeable Cations (QC Lot: 889582)									
EP1704830-001	SD01	ED008: Exchangeable Calcium	----	0.1	meq/100g	27.1	26.8	1.21	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	4.0	3.8	7.36	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 891708)									
EP1704830-001	SD01	EG005T: Iron	7439-89-6	50	mg/kg	0.489	4410	10.4	0% - 20%
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 882934)									
EP1704830-001	SD01	EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	<3	0.00	0% - 3%
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 882936)									
EP1704830-001	SD01	EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
		EP071-SD: C15 - C28 Fraction	----	3	mg/kg	22	25	14.2	No Limit
		EP071-SD: C10 - C36 Fraction (sum)	----	3	mg/kg	41	45	9.30	0% - 50%
		EP071-SD: C29 - C36 Fraction	----	5	mg/kg	19	20	0.00	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 885606)									
EP1704830-007	SD07	EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	<3	0.00	0% - 3%
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 885630)									
EP1704830-007	SD07	EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
		EP071-SD: C15 - C28 Fraction	----	3	mg/kg	33	33	0.00	0% - 50%
		EP071-SD: C10 - C36 Fraction (sum)	----	3	mg/kg	58	56	3.51	0% - 50%

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 Petroleum Hydrocarbons (QC Lot: 885630) - continued									
EP1704830-007	SD07	EP071-SD: C29 - C36 Fraction	----	5	mg/kg	25	23	7.55	No Limit
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QC Lot: 882934)									
EP1704830-001	SD01	EP080-SD: C6 - C10 Fraction	C6_C10	3	mg/kg	<3	<3	0.00	0% - 3%
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QC Lot: 882936)									
EP1704830-001	SD01	EP071-SD: >C10 - C16 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
		EP071-SD: >C16 - C34 Fraction	----	3	mg/kg	37	41	9.66	0% - 50%
		EP071-SD: >C10 - C40 Fraction (sum)	----	3	mg/kg	46	52	12.2	0% - 50%
		EP071-SD: >C34 - C40 Fraction	----	5	mg/kg	9	11	17.7	No Limit
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QC Lot: 885606)									
EP1704830-007	SD07	EP080-SD: C6 - C10 Fraction	C6_C10	3	mg/kg	<3	<3	0.00	0% - 3%
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QC Lot: 885630)									
EP1704830-007	SD07	EP071-SD: >C10 - C16 Fraction	----	3	mg/kg	<3	<3	0.00	No Limit
		EP071-SD: >C16 - C34 Fraction	----	3	mg/kg	53	51	2.99	0% - 50%
		EP071-SD: >C10 - C40 Fraction (sum)	----	3	mg/kg	70	69	1.44	0% - 20%
		EP071-SD: >C34 - C40 Fraction	----	5	mg/kg	17	18	7.84	No Limit
EP080-SD: BTEXN (QC Lot: 882934)									
EP1704830-001	SD01	EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: Total Xylenes	1330-20-7	0.2	mg/kg	<0.5	<0.5	0.00	0% - .2%
		EP080-SD: Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: Naphthalene	91-20-3	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
EP080-SD: BTEXN (QC Lot: 885606)									
EP1704830-007	SD07	EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: Total Xylenes	1330-20-7	0.2	mg/kg	<0.5	<0.5	0.00	0% - .2%
		EP080-SD: Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
		EP080-SD: Naphthalene	91-20-3	0.2	mg/kg	<0.2	<0.2	0.00	0% - .2%
EP090: Organotin Compounds (QC Lot: 891707)									
EP1704830-004	SD04	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	3.9	4.4	12.3	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 882937)									
EP1704830-001	SD01	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	4	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 (%)*
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 882937) - continued									
EP1704830-001	SD01	EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	5	<4	25.8	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	6	5	25.2	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	24	142	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	64	58	10.9	0% - 50%
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	53	44	18.1	0% - 50%
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	41	37	8.66	0% - 50%
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	17	12	33.4	No Limit
		EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	56	41	31.8	0% - 50%
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	12	7	47.7	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	21	17	19.6	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	38	31	19.5	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	4	<4	0.00	No Limit
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	27	22	16.8	No Limit
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	9	8	0.00	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	23	20	15.3	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	383	337	12.8	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	7	7	0.00	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 885629)									
EP1704830-007	SD07	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	9	10	13.4	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	28	12	78.5	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	15	16	7.18	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	125	# 76	48.0	0% - 20%
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	4	<4	0.00	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	266	# 180	38.8	0% - 20%
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	217	# 145	40.0	0% - 20%
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	144	# 100	36.0	0% - 20%
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	126	# 100	23.4	0% - 20%
		EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	244	# 149	48.0	0% - 20%
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	78	57	30.1	0% - 50%
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	101	# 64	44.4	0% - 20%
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	177	# 112	44.6	0% - 20%
		EP132B-SD: Perylene	198-55-0	4	µg/kg	33	21	45.7	No Limit
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	114	# 80	35.0	0% - 20%
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	32	21	42.4	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	95	# 67	34.3	0% - 20%

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 885629) - continued									
EP1704830-007	SD07	EP132B-SD: Sum of PAHs	----	4	µg/kg	1830	# 1240	38.6	0% - 20%
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	12	79.2	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	25	18	35.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 882988)									
EP1704838-005	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.00	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 887345)									
EP1704810-003	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP1704810-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 882988)									
EP1704838-005	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.00	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 887345)									
EP1704810-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP1704810-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 887345)									
EP1704810-003	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EP1704810-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 882995)									
EP1704830-010	GW3	EP132-LL: Benzo(a)pyrene	50-32-8	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP132-LL: Total PAH	----	0.005	µg/L	0.020	<0.005	120	No Limit
		EP132-LL: Benzo(a)pyrene TEQ (zero)	----	0.005	µg/L	<0.005	<0.005	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 882995) - continued									
EP1704830-010	GW3	EP132-LL: Naphthalene	91-20-3	0.02	µg/L	0.02	<0.02	0.00	No Limit
		EP132-LL: Acenaphthylene	208-96-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Acenaphthene	83-32-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Fluorene	86-73-7	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Phenanthrene	85-01-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Anthracene	120-12-7	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Fluoranthene	206-44-0	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Pyrene	129-00-0	0.02	µg/L	<2.00	# <0.02	196	0% - 20%
		EP132-LL: Benz(a)anthracene	56-55-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Chrysene	218-01-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Benzo(k)fluoranthene	207-08-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Indeno(1.2.3.cd)pyrene	193-39-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Dibenz(a.h)anthracene	53-70-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP132-LL: Benzo(g.h.i)perylene	191-24-2	0.02	µg/L	<0.02	<0.02	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			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA001: pH in soil using 0.01M CaCl extract (QCLot: 889560)								
EA001: pH (CaCl2)	----	----	pH Unit	----	4 pH Unit	100	99	101
				----	7 pH Unit	100	99	101
ED008: Exchangeable Cations (QCLot: 889582)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	10.925 meq/100g	104	91	109
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	5.9518 meq/100g	107	89	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.4769 meq/100g	87.1	79	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.8718 meq/100g	82.1	75	118
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	18.2255 meq/100g	104	88	110
EG005T: Total Metals by ICP-AES (QCLot: 891708)								
EG005T: Iron	7439-89-6	50	mg/kg	<50	34900 mg/kg	104	70	120
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 882934)								
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	800 mg/kg	73.0	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 882936)								
EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	138 mg/kg	108	70	130
EP071-SD: C15 - C28 Fraction	----	3	mg/kg	<3	290 mg/kg	106	70	130
EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	51 mg/kg	98.4	70	130
EP071-SD: C10 - C36 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 885606)								
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	800 mg/kg	82.9	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 885630)								
EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	138 mg/kg	104	70	130
EP071-SD: C15 - C28 Fraction	----	3	mg/kg	<3	290 mg/kg	104	70	130
EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	51 mg/kg	102	70	130
EP071-SD: C10 - C36 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 882934)								
EP080-SD: C6 - C10 Fraction	C6_C10	3	mg/kg	<3	925 mg/kg	79.6	70	130
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 882936)								
EP071-SD: >C10 - C16 Fraction	----	3	mg/kg	<3	202 mg/kg	108	70	130
EP071-SD: >C16 - C34 Fraction	----	3	mg/kg	<3	258 mg/kg	104	70	130
EP071-SD: >C34 - C40 Fraction	----	5	mg/kg	<5	18 mg/kg	95.8	70	130
EP071-SD: >C10 - C40 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 885606)								
EP080-SD: C6 - C10 Fraction	C6_C10	3	mg/kg	<3	925 mg/kg	84.2	70	130

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 885630)								
EP071-SD: >C10 - C16 Fraction	----	3	mg/kg	<3	202 mg/kg	105	70	130
EP071-SD: >C16 - C34 Fraction	----	3	mg/kg	<3	258 mg/kg	103	70	130
EP071-SD: >C34 - C40 Fraction	----	5	mg/kg	<5	18 mg/kg	103	70	130
EP071-SD: >C10 - C40 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----
EP080-SD: BTEXN (QCLot: 882934)								
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	50 mg/kg	123	70	130
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	50 mg/kg	103	70	130
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	50 mg/kg	104	70	130
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	100 mg/kg	102	70	130
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	50 mg/kg	99.2	70	130
EP080-SD: Total Xylenes	1330-20-7	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	50 mg/kg	108	70	130
EP080-SD: BTEXN (QCLot: 885606)								
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	50 mg/kg	91.9	70	130
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	50 mg/kg	90.0	70	130
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	50 mg/kg	92.7	70	130
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	100 mg/kg	90.5	70	130
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	50 mg/kg	89.4	70	130
EP080-SD: Total Xylenes	1330-20-7	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	50 mg/kg	109	70	130
EP090: Organotin Compounds (QCLot: 891707)								
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	105	52	139
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 882937)								
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	102	55	131
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	----	----	----	----
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	88.1	64	110
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	87.1	62	112
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	87.6	64	118
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	90.1	59	117
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	88.7	69	111
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	87.8	66	118
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	98.3	70	116
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	89.8	59	121
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	90.7	68	116

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 882937) - continued								
EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	<4	25 µg/kg	83.7	51	107
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	92.1	52	118
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	----	----	----	----
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	103	55	111
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	----	----	----	----
EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	77.8	62	106
EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	81.0	35	141
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	80.7	48	122
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	----	----	----	----
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 885629)								
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	79.9	55	131
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	----	----	----	----
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	99.3	64	110
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	92.7	62	112
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	94.3	64	118
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	87.3	59	117
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	94.8	69	111
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	100	66	118
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	112	70	116
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	93.5	59	121
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	85.4	68	116
EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	<4	25 µg/kg	80.2	51	107
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	94.8	52	118
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	----	----	----	----
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	78.4	55	111
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	----	----	----	----
EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	75.7	62	106
EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	86.2	35	141
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	82.2	48	122
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	----	----	----	----
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 882988)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 882988) - continued								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	69.1	35	95
EP071: C15 - C28 Fraction	----	100	µg/L	<100	400 µg/L	91.2	34	111
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	92.5	34	105
EP080/071: Total Petroleum Hydrocarbons (QCLot: 887345)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	320 µg/L	106	74	113
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 882988)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	400 µg/L	74.9	37	99
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	600 µg/L	92.7	35	108
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	200 µg/L	100	11	117
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 887345)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	370 µg/L	108	74	115
EP080: BTEXN (QCLot: 887345)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	112	84	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	107	81	115
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	# 114	84	113
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	113	84	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	# 112	87	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	20 µg/L	109	77	118
EP090: Organotin Compounds (Soluble) (QCLot: 890603)								
EP090S: Tributyltin	56573-85-4	2	ngSn/L	<2	147 ngSn/L	74.1	20	125
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 882995)								
EP132-LL: Naphthalene	91-20-3	0.02	µg/L	<0.02	0.025 µg/L	73.6	42	136
EP132-LL: Acenaphthylene	208-96-8	0.02	µg/L	<0.02	0.025 µg/L	69.7	40	124
EP132-LL: Acenaphthene	83-32-9	0.02	µg/L	<0.02	0.025 µg/L	72.5	42	128
EP132-LL: Fluorene	86-73-7	0.02	µg/L	<0.02	0.025 µg/L	69.2	48	126
EP132-LL: Phenanthrene	85-01-8	0.02	µg/L	<0.02	0.025 µg/L	75.1	59	125
EP132-LL: Anthracene	120-12-7	0.02	µg/L	<0.02	0.025 µg/L	74.9	45	117
EP132-LL: Fluoranthene	206-44-0	0.02	µg/L	<0.02	0.025 µg/L	80.9	60	120
EP132-LL: Pyrene	129-00-0	0.02	µg/L	<0.02	0.025 µg/L	85.0	63	121
EP132-LL: Benz(a)anthracene	56-55-3	0.02	µg/L	<0.02	0.025 µg/L	73.9	65	133
EP132-LL: Chrysene	218-01-9	0.02	µg/L	<0.02	0.025 µg/L	73.8	56	124
EP132-LL: Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.02	µg/L	<0.02	0.025 µg/L	73.2	55	131
EP132-LL: Benzo(k)fluoranthene	207-08-9	0.02	µg/L	<0.02	0.025 µg/L	79.6	45	125
EP132-LL: Benzo(a)pyrene	50-32-8	0.005	µg/L	<0.005	0.025 µg/L	89.9	53	111
EP132-LL: Indeno(1.2.3.cd)pyrene	193-39-5	0.02	µg/L	<0.02	0.025 µg/L	74.1	58	122
EP132-LL: Dibenz(a.h)anthracene	53-70-3	0.02	µg/L	<0.02	0.025 µg/L	79.2	59	121

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 882995) - continued								
EP132-LL: Benzo(g.h.i)perylene	191-24-2	0.02	µg/L	<0.02	0.025 µg/L	84.1	50	134
EP132-LL: Total PAH	----	0.005	µg/L	<0.005	----	----	----	----
EP132-LL: Benzo(a)pyrene TEQ (zero)	----	0.005	µg/L	<0.005	----	----	----	----

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	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 882934)							
EP1704830-002	SD02	EP080-SD: C6 - C9 Fraction	----	600 mg/kg	82.4	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 882936)							
EP1704830-002	SD02	EP071-SD: C10 - C14 Fraction	----	138 mg/kg	91.0	70	130
		EP071-SD: C15 - C28 Fraction	----	290 mg/kg	95.7	70	130
		EP071-SD: C29 - C36 Fraction	----	51 mg/kg	93.2	70	130
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 882934)							
EP1704830-002	SD02	EP080-SD: C6 - C10 Fraction	C6_C10	725 mg/kg	85.2	70	130
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 882936)							
EP1704830-002	SD02	EP071-SD: >C10 - C16 Fraction	----	202 mg/kg	92.7	70	130
		EP071-SD: >C16 - C34 Fraction	----	258 mg/kg	95.1	70	130
		EP071-SD: >C34 - C40 Fraction	----	18 mg/kg	98.0	70	130
EP080-SD: BTEXN (QCLot: 882934)							
EP1704830-002	SD02	EP080-SD: Benzene	71-43-2	50 mg/kg	109	70	130
		EP080-SD: Toluene	108-88-3	50 mg/kg	104	70	130
EP090: Organotin Compounds (QCLot: 891707)							
EP1704830-002	SD02	EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	# Not Determined	20	130
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 882937)							
EP1704830-002	SD02	EP132B-SD: Naphthalene	91-20-3	25 µg/kg	93.0	70	130
		EP132B-SD: Acenaphthylene	208-96-8	25 µg/kg	106	70	130
		EP132B-SD: Acenaphthene	83-32-9	25 µg/kg	94.5	70	130
		EP132B-SD: Fluorene	86-73-7	25 µg/kg	90.4	70	130
		EP132B-SD: Phenanthrene	85-01-8	25 µg/kg	# 60.4	70	130
		EP132B-SD: Anthracene	120-12-7	25 µg/kg	126	70	130
		EP132B-SD: Fluoranthene	206-44-0	25 µg/kg	85.4	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
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 882937) - continued							
EP1704830-002	SD02	EP132B-SD: Pyrene	129-00-0	25 µg/kg	74.8	70	130
		EP132B-SD: Benz(a)anthracene	56-55-3	25 µg/kg	81.7	70	130
		EP132B-SD: Chrysene	218-01-9	25 µg/kg	73.0	70	130
		EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	25 µg/kg	# 64.7	70	130
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	25 µg/kg	100	70	130
		EP132B-SD: Benzo(a)pyrene	50-32-8	25 µg/kg	79.3	70	130
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	25 µg/kg	84.0	70	130
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	25 µg/kg	85.8	70	130
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	25 µg/kg	84.7	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 882988)							
EP1704838-005	Anonymous	EP071: C10 - C14 Fraction	----	400 µg/L	65.3	45	122
		EP071: C15 - C28 Fraction	----	400 µg/L	80.5	55	143
		EP071: C29 - C36 Fraction	----	400 µg/L	86.7	54	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 887345)							
EP1704810-002	Anonymous	EP080: C6 - C9 Fraction	----	240 µg/L	83.2	77	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 882988)							
EP1704838-005	Anonymous	EP071: >C10 - C16 Fraction	----	400 µg/L	69.4	45	122
		EP071: >C16 - C34 Fraction	----	600 µg/L	83.6	55	143
		EP071: >C34 - C40 Fraction	----	200 µg/L	92.5	54	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 887345)							
EP1704810-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	89.0	77	137
EP080: BTEXN (QCLot: 887345)							
EP1704810-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	92.0	77	122
		EP080: Toluene	108-88-3	20 µg/L	89.1	74	126

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP1704830**	Page	: 1 of 11
Amendment	: **1**		
Client	: **360 ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: ALYSIA WOODWARD	Contact	: Luke Jones
Address	: 10 Bermondsey St West Leederville 6007	Address	: 10 Hod Way Malaga WA Australia 6090
Telephone	: +61 08 93210420	Telephone	: 08 9209 7631
Project	: 1293 AME Reclamation	Date Samples Received	: 10-May-2017 17:00
Order number	: 1293	Date Analysis Commenced	: 15-May-2017
C-O-C number	: ----	Issue Date	: 23-May-2017 17:19
Sampler	: VANESSA MAMET		
Site	: ----		
Quote number	: EP/565/17		
No. of samples received	: 11		
No. of samples analysed	: 10		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- 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.

Signatories	*Position*	*Accreditation Category*
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ShukHui Li	Client Services - Technical Manager	Perth Organics, Malaga, WA
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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 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.

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.

- TBT conducted by ALS Brisbane, NATA Site No. 818.
- Metals conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP132-LL: LOR has been raised for sample "GW3" for "Pyrene" due to suspected matrix effects and interferences.
- EP132-SD: Poor matrix spike recovery and duplicate precision on QC sample; due to heterogenity, suspected matrix effects and high moisture content.
- EP132-SD: Poor surrogate recovery for various samples due to suspected matrix effects and interferences.
- Amendment (23/05/2017): This report has been amended following changes to the analytical data reported. The quality system is being utilised to resolve this issue. The specific data affected includes sample "SD03" EP132-SD results.
- EP090: Particular samples required dilution prior to extraction due to matrix interferences. LOR values have been adjusted accordingly and surrogate recovery not determined.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Client sample ID	SD01	SD02	SD03	SD04	SD05
			Client sampling date / time	[10-May-2017]	[10-May-2017]	[10-May-2017]	[10-May-2017]	[10-May-2017]
Compound	CAS Number	LOR	Unit	EP1704830-001	EP1704830-002	EP1704830-003	EP1704830-004	EP1704830-005
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.9	----	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	36.0	32.2	39.6	35.5	31.6
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	27.1	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	4.0	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	<0.1	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.6	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	31.9	----	----	----	----
EG005T: Total Metals by ICP-AES								
Iron	7439-89-6	0.005	%	0.489	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
>C10 - C16 Fraction	----	3	mg/kg	<3	<3	<3	<3	<3
>C16 - C34 Fraction	----	3	mg/kg	37	44	44	31	34
>C34 - C40 Fraction	----	5	mg/kg	9	10	12	10	10
>C10 - C40 Fraction (sum)	----	3	mg/kg	46	54	56	41	44
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg	<3	<3	<3	<3	<3
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	3	mg/kg	<3	<3	<3	<3	<3
C10 - C14 Fraction	----	3	mg/kg	<3	<3	<3	<3	<3
C15 - C28 Fraction	----	3	mg/kg	22	29	24	18	22
C29 - C36 Fraction	----	5	mg/kg	19	18	26	18	15
^ C10 - C36 Fraction (sum)	----	3	mg/kg	41	47	50	36	37
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons								
C6 - C10 Fraction	C6_C10	3	mg/kg	<3	<3	<3	<3	<3
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3	mg/kg	<3.0	<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	<0.2
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<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	<0.2
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Client sample ID	SD01	SD02	SD03	SD04	SD05
			Client sampling date / time	[10-May-2017]	[10-May-2017]	[10-May-2017]	[10-May-2017]	[10-May-2017]
Compound	CAS Number	LOR	Unit	EP1704830-001	EP1704830-002	EP1704830-003	EP1704830-004	EP1704830-005
				Result	Result	Result	Result	Result
EP080-SD: BTEXN - Continued								
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	91-20-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EP090: Organotin Compounds								
Tributyltin	56573-85-4	0.5	µgSn/kg	20.8	67.1	9.3	3.9	16.4
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	5	8	<4	5
Acenaphthene	83-32-9	4	µg/kg	5	9	<4	<4	<4
Fluorene	86-73-7	4	µg/kg	6	8	7	<4	6
Phenanthrene	85-01-8	4	µg/kg	<4	53	54	9	28
Anthracene	120-12-7	4	µg/kg	<4	<4	<4	<4	<4
Fluoranthene	206-44-0	4	µg/kg	64	102	137	58	62
Pyrene	129-00-0	4	µg/kg	53	84	122	45	50
Benz(a)anthracene	56-55-3	4	µg/kg	41	58	95	47	38
Chrysene	218-01-9	4	µg/kg	17	37	51	27	19
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	56	78	120	45	50
Benzo(k)fluoranthene	207-08-9	4	µg/kg	12	12	45	8	8
Benzo(e)pyrene	192-97-2	4	µg/kg	21	31	47	15	21
Benzo(a)pyrene	50-32-8	4	µg/kg	38	58	101	23	36
Perylene	198-55-0	4	µg/kg	4	8	17	<4	<4
Benzo(g.h.i)perylene	191-24-2	4	µg/kg	27	38	52	15	26
Dibenz(a.h)anthracene	53-70-3	4	µg/kg	9	12	15	7	8
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	23	33	46	15	22
Coronene	191-07-1	5	µg/kg	7	9	10	<5	6
^ Sum of PAHs	----	4	µg/kg	383	635	927	314	385
EP080-SD: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	78.6	76.5	77.1	75.1	82.1
Toluene-D8	2037-26-5	0.2	%	74.2	75.2	71.9	71.3	79.7
4-Bromofluorobenzene	460-00-4	0.2	%	75.4	75.6	74.3	75.3	80.6
EP090S: Organotin Surrogate								
Tripropyltin	----	0.5	%	130	Not Determined	123	113	104
EP132T: Base/Neutral Extractable Surrogates								

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Client sample ID	SD01	SD02	SD03	SD04	SD05
				Client sampling date / time	[10-May-2017]	[10-May-2017]	[10-May-2017]	[10-May-2017]	[10-May-2017]
Compound	CAS Number	LOR	Unit		EP1704830-001	EP1704830-002	EP1704830-003	EP1704830-004	EP1704830-005
					Result	Result	Result	Result	Result
EP132T: Base/Neutral Extractable Surrogates - Continued									
2-Fluorobiphenyl	321-60-8	10	%		Not Determined	108	69.2	107	98.7
Anthracene-d10	1719-06-8	10	%		103	110	77.2	113	104
4-Terphenyl-d14	1718-51-0	10	%		113	105	70.7	Not Determined	104

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Client sample ID	SD06	SD07	QC1	----	----
				Client sampling date / time	[10-May-2017]	[10-May-2017]	[10-May-2017]	----	----
Compound	CAS Number	LOR	Unit		EP1704830-006	EP1704830-007	EP1704830-008	--------	--------
					Result	Result	Result	----	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		19.9	32.9	29.9	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg		<3	<3	<3	----	----
>C16 - C34 Fraction	----	3	mg/kg		11	53	28	----	----
>C34 - C40 Fraction	----	5	mg/kg		<5	17	8	----	----
>C10 - C40 Fraction (sum)	----	3	mg/kg		11	70	36	----	----
>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		8	33	18	----	----
C29 - C36 Fraction	----	5	mg/kg		<5	25	14	----	----
^ C10 - C36 Fraction (sum)	----	3	mg/kg		8	58	32	----	----
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	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	1330-20-7	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									
Tributyltin	56573-85-4	0.5	µgSn/kg		5.3	148	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		<5	<5	<5	----	----
2-Methylnaphthalene	91-57-6	5	µg/kg		<5	<5	<5	----	----
Acenaphthylene	208-96-8	4	µg/kg		<4	9	4	----	----
Acenaphthene	83-32-9	4	µg/kg		<4	28	6	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Client sample ID	SD06	SD07	QC1	----	----
				Client sampling date / time	[10-May-2017]	[10-May-2017]	[10-May-2017]	----	----
Compound	CAS Number	LOR	Unit		EP1704830-006	EP1704830-007	EP1704830-008	--------	--------
					Result	Result	Result	----	----
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
Fluorene	86-73-7	4	µg/kg		4	15	8	----	----
Phenanthrene	85-01-8	4	µg/kg		13	125	29	----	----
Anthracene	120-12-7	4	µg/kg		<4	4	<4	----	----
Fluoranthene	206-44-0	4	µg/kg		17	266	52	----	----
Pyrene	129-00-0	4	µg/kg		10	217	41	----	----
Benz(a)anthracene	56-55-3	4	µg/kg		14	144	36	----	----
Chrysene	218-01-9	4	µg/kg		<4	126	13	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		12	244	40	----	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg		<4	78	9	----	----
Benzo(e)pyrene	192-97-2	4	µg/kg		<4	101	15	----	----
Benzo(a)pyrene	50-32-8	4	µg/kg		5	177	29	----	----
Perylene	198-55-0	4	µg/kg		<4	33	<4	----	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		<4	114	19	----	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		<4	32	7	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		4	95	17	----	----
Coronene	191-07-1	5	µg/kg		<5	25	<5	----	----
^ Sum of PAHs	----	4	µg/kg		79	1830	325	----	----
EP080-SD: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		85.0	83.1	78.9	----	----
Toluene-D8	2037-26-5	0.2	%		83.0	72.9	77.5	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		83.8	91.7	77.5	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		102	128	----	----	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		120	104	119	----	----
Anthracene-d10	1719-06-8	10	%		108	115	122	----	----
4-Terphenyl-d14	1718-51-0	10	%		113	113	114	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SD01	----	----	----	----
				Client sampling date / time	10-May-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP1704830-011	--------	--------	--------	--------
					Result	----	----	----	----
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		**7**	----	----	----	----
EA152: Soil Particle Density									
ø Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3		**2.64**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GW3	----	----	----	----
				Client sampling date / time	10-May-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP1704830-010	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP090: Organotin Compounds (Soluble)									
Tributyltin	56573-85-4	2	ngSn/L		<2	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.02	µg/L		**0.02**	----	----	----	----
Acenaphthylene	208-96-8	0.02	µg/L		<0.02	----	----	----	----
Acenaphthene	83-32-9	0.02	µg/L		<0.02	----	----	----	----
Fluorene	86-73-7	0.02	µg/L		<0.02	----	----	----	----
Phenanthrene	85-01-8	0.02	µg/L		<0.02	----	----	----	----
Anthracene	120-12-7	0.02	µg/L		<0.02	----	----	----	----
Fluoranthene	206-44-0	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GW3	----	----	----	----
				Client sampling date / time	10-May-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP1704830-010	--------	--------	--------	--------
					Result	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
Pyrene	129-00-0	0.02	µg/L		<2.00	----	----	----	----
Benz(a)anthracene	56-55-3	0.02	µg/L		<0.02	----	----	----	----
Chrysene	218-01-9	0.02	µg/L		<0.02	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.02	µg/L		<0.02	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.02	µg/L		<0.02	----	----	----	----
Benzo(a)pyrene	50-32-8	0.005	µg/L		<0.005	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.02	µg/L		<0.02	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.02	µg/L		<0.02	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.02	µg/L		<0.02	----	----	----	----
^ **Total PAH**	----	0.005	µg/L		**0.020**	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.005	µg/L		<0.005	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**88.8**	----	----	----	----
Toluene-D8	2037-26-5	2	%		**105**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**98.8**	----	----	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	5	%		**94.4**	----	----	----	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	0.02	%		**100**	----	----	----	----
Anthracene-d10	1719-06-8	0.02	%		**124**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.02	%		**108**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080-SD: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	70	130
Toluene-D8	2037-26-5	70	130
4-Bromofluorobenzene	460-00-4	70	130
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	70	130
Anthracene-d10	1719-06-8	70	130
4-Terphenyl-d14	1718-51-0	70	130

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125
EP090S: Organotin Surrogate			
Tripropyltin	----	24	116
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	38	122
Anthracene-d10	1719-06-8	64	130
4-Terphenyl-d14	1718-51-0	47	147

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP1704830**

Client	: **360 ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: ALYSIA WOODWARD	Contact	: Luke Jones
Address	: 10 Bermondsey St West Leederville 6007	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: alysiawoodward@360environmental.com.au	E-mail	: LUKE.JONES@alsglobal.com
Telephone	: +61 08 93210420	Telephone	: 08 9209 7631
Facsimile	: +61 08 92260739	Facsimile	: +61-8-9209 7600
Project	: 1293 AME Reclamation	Page	: 1 of 4
Order number	: 1293	Quote number	: EP2017360ENV0007 (EP/565/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: VANESSA MAMET		

Dates

Date Samples Received	: 10-May-2017 17:00	Issue Date	: 11-May-2017
Client Requested Due Date	: 19-May-2017	Scheduled Reporting Date	: **19-May-2017**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not intact.
No. of coolers/boxes	: 2	Temperature	: 5.3 - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 11 / 10

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 see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (SamplesPerth@alsenviro.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of Work Order.
- **TBT analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818.**
- **Metals analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**

Sample Container(s)/Preservation Non-Compliances

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

Method Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Particle Size Analysis by Hydrometer : EA150H		
Composite SD01, SD02, SD03, SD06	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag
Soil Particle Density : EA152		
Composite SD01, SD02, SD03, SD06	- Snap Lock Bag - Subsampled by ALS	- Dried soil

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

EP1704830-011 : [10-May-2017] : Composite - SD01, SD02, SD03, SD06

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 - ED008 Def Exchangeable Cations with pre-treatment Default	SOIL - EP004 (Carbon) Organic Matter & Total Organic Carbon (Calc.)	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
EP1704830-001	[10-May-2017]	SD01	✓			✓	✓	✓	✓
EP1704830-002	[10-May-2017]	SD02	✓			✓	✓	✓	✓
EP1704830-003	[10-May-2017]	SD03	✓			✓	✓	✓	✓
EP1704830-004	[10-May-2017]	SD04	✓			✓	✓	✓	✓
EP1704830-005	[10-May-2017]	SD05	✓			✓	✓	✓	✓
EP1704830-006	[10-May-2017]	SD06	✓			✓	✓	✓	✓
EP1704830-007	[10-May-2017]	SD07	✓	✓	✓	✓	✓	✓	✓
EP1704830-008	[10-May-2017]	QC1	✓			✓	✓		✓

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA001 pH (CaCl)	SOIL - EA150H-C Clay Content by Hydrometer	SOIL - EG005T (solids) Total Metals by ICP-AES
EP1704830-007	[10-May-2017]	SD07	✓		✓
EP1704830-011	10-May-2017 00:00	Composite SD01, SD0...		✓	

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	(On Hold) WATER No analysis requested	WATER - EP090S Organotins (TBT)	WATER - GW-1 TRH/BTEX/SUT PAH
EP1704830-009	10-May-2017 00:00	QC3	✓		
EP1704830-010	10-May-2017 00:00	GW3		✓	✓

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	admin@360environmental.com.au

ALYSIA WOODWARD

- *AU Certificate of Analysis - NATA (COA)	Email	alysiawoodward@360environmental.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	alysiawoodward@360environmental.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	alysiawoodward@360environmental.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	alysiawoodward@360environmental.com.au
- A4 - AU Tax Invoice (INV)	Email	alysiawoodward@360environmental.com.au
- Chain of Custody (CoC) (COC)	Email	alysiawoodward@360environmental.com.au
- EDI Format - ENMRG (ENMRG)	Email	alysiawoodward@360environmental.com.au
- EDI Format - ESDAT (ESDAT)	Email	alysiawoodward@360environmental.com.au
- EDI Format - XTab (XTAB)	Email	alysiawoodward@360environmental.com.au

INVOICING ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	accounts@360environmental.com.au

RESULTS ADDRESS

- *AU Certificate of Analysis - NATA (COA)	Email	labresults@360environmental.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	labresults@360environmental.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	labresults@360environmental.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	labresults@360environmental.com.au
- A4 - AU Tax Invoice (INV)	Email	labresults@360environmental.com.au
- Chain of Custody (CoC) (COC)	Email	labresults@360environmental.com.au
- EDI Format - ENMRG (ENMRG)	Email	labresults@360environmental.com.au
- EDI Format - ESDAT (ESDAT)	Email	labresults@360environmental.com.au
- EDI Format - XTab (XTAB)	Email	labresults@360environmental.com.au

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: CHEMCENTRE

NMI QA Report No: CHEM06_170512_2 **Sample Matrix:** Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		ng/g	ng/g	ng/g	ng/g	%	%	%
Organics Section								
Organotin								
Monobutyltin	NR_35	0.5	<0.5	NA	NA	NA	73	NA
Dibutyltin	NR_35	0.5	<0.5	NA	NA	NA	86	NA
Tributyltin	NR_35	0.5	<0.5	NA	NA	NA	80	NA
Organotin Surrogate								
Tripropyltin (%Rec)	NR_35	-	-	NA	NA	NA	101	NA

Results expressed in percentage (%) or ng/g wherever appropriate.
Acceptable Spike recovery is 30-150% (monobutyltin and Tripropyltin); 40-160% (dibutyltin and tributyltin)
Maximum acceptable RPDs on spikes and duplicates is 60%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference, LCS = Laboratory Control Spike, LOR = Limit of Reporting.
This report shall not be reproduced except in full.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **23/05/2017**

Marine and Freshwater
Research Laboratory
Environmental Science
Tel: +61 8 93602907 Address: 90 South St, Murdoch, WA, 6150

Accreditation Number: 10603
Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included is this document are traceable to Australian/national standards.

Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Alysia Woodward
Customer: 360 Environmental
Address: 10 Bermondsey Street, West Leederville 6007

Date of Issue: 14/06/2017
Date Received: 10/05/2017
Our Reference: 360E17-4
Your Reference: 1293

METHOD SAMPLE CODE	Sampling Date	4700 TOTAL-P µg.P/L	2700 TOTAL-N µg.N/L	6000 NPTOC mg.C/L	MS001 Filtered Ni µg/L	MS001 Filtered Cu µg/L	MS001 Filtered Zn µg/L	MS001 Filtered Pb µg/L	ICP006 Hg mg/L
Reporting Limit		**<5**	**<50**	**<0.5**	**<0.3**	**<0.2**	**<1**	**<0.1**	**<0.0001**
File		**17052401**		**17051702**	**17051801**	**17051801**	**17051801**	**17051801**	**17051901**
MW03	10/05/2017	14	2900	0.6	<0.3	0.3	<1	<0.1	<0.0001
QC3	10/05/2017	13	2800	0.7					
QA/QC Data									
Duplicate % Difference		6%	5%	3%	<RL	14%	<RL	<RL	<RL
Spike Recovery		103%	86%	-	98%	100%	94%	98%	93%
Seawater control		101%	98%	97%	111%	109%	95%	99%	101%
Freshwater control		103%	104%	95%	106%	104%	102%	105%	99%

Signatory: Jamie Woodward
Date: 14/06/2017

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

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Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Alysia Woodward
Customer: 360 Environmental
Address: 10 Bermondsey Street, West Leederville 6007

Date of Issue: 30/05/2017
Date Received: 10/05/2017
Our Reference: 360E17-4
Your Reference: 1293

METHOD SAMPLE CODE	Sampling Date	4700 TOTAL-P µg.P/L	2700 TOTAL-N µg.N/L	6000 NPTOC mg.C/L	MS001 Filtered Ni µg/L	MS001 Filtered Cu µg/L	MS001 Filtered Zn µg/L	MS001 Filtered Pb µg/L	ICP006 Hg mg/L
Reporting Limit		**<5**	**<50**	**<0.5**	**<0.3**	**<0.2**	**<1**	**<0.1**	**<0.0001**
File		**17052401**		**17051702**	**17051801**	**17051801**	**17051801**	**17051801**	**17051901**
MW03	10/05/2017	14	2900	0.6	<0.3	0.3	<1	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 30/05/2017

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

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Murdoch UNIVERSITY

SEDIMENT DATA

Contact: Alysia Woodward
Customer: 360 Environmental
Address: 10 Bermondsey Street, West Leederville 6007

Date of Issue: 13/06/2017
Date Received: 10/05/2017
Our Reference: 360E17-3b
Your Reference: 1293

METHOD	Sampling	MS002	MS002	MS002	MS002	ICP007	2600	4500	6200
SAMPLE CODE	Date	Total Ext Ni	Total Ext Cu	Total Ext Zn	Total Ext Pb	Total Ext Hg	TKN	TOTAL P	TOC
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg.N/g	mg.P/g	% C
Reporting Limit		<0.2	<0.2	<0.5	<0.1	<0.01	<0.1	<0.05	<0.2
File		17051602	17051602	17051602	17051602	17051902	17051602	17051602	17051801
SD01	10/05/2017	9.9	49	73	17	0.04	1.3	0.50	1.2
SD03	10/05/2017	1.8	37	36	13	0.03	1.0	0.35	0.9
SD05	10/05/2017	2.2	21	36	6.9	0.01	0.6	0.32	0.6
SD07	10/05/2017	1.6	63	52	11	<0.01	0.3	0.36	0.3
QC1	10/05/2017	1.6	30	32	12	0.02	0.8	0.31	0.7
QA/QC Data									
Duplicate % Difference		2%	1%	0%	0%	6%	0%	0%	0%
Spike Recovery		91%	high conc	high conc	high conc	96%	99%	101%	102%
Blank		<0.2	<0.2	<0.5	<0.1	<0.01	<0.1	<0.05	<0.2
Inhouse Control		100%	96%	95%	104%	96%	103%	102%	104%
Certified Conrol		104%	99%	99%	108%	99%			

Signatory: Jamie Woodward
Date: 13/06/2017

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

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Research Laboratory
Environmental Science
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Murdoch UNIVERSITY

SEDIMENT DATA

Contact: Alysia Woodward
Customer: 360 Environmental
Address: 10 Bermondsey Street, West Leederville 6007

Date of Issue: 19/05/2017
Date Received: 10/05/2017
Our Reference: 360E17-3
Your Reference: 1293

METHOD	Sampling	MS002	MS002	MS002	MS002	ICP007	2600	4500	6200
SAMPLE CODE	Date	Total Ext Ni	Total Ext Cu	Total Ext Zn	Total Ext Pb	Total Ext Hg	TKN	TOTAL P	TOC
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg.N/g	mg.P/g	% C
Reporting Limit		<0.2	<0.2	<0.5	<0.1	<0.01	<0.1	<0.05	<0.2
File		17051602	17051602	17051602	17051602	17051902	17051602	17051602	17051801
SD01	10/05/2017	9.9	49	73	17	0.04	1.3	0.50	1.2
SD03	10/05/2017	1.8	37	36	13	0.03	1.0	0.35	0.9
SD05	10/05/2017	2.2	21	36	6.9	0.01	0.6	0.32	0.6
SD07	10/05/2017	1.6	63	52	11	<0.01	0.3	0.36	0.3
QC1	10/05/2017	1.6	30	32	12	0.02	0.8	0.31	0.7

Signatory: Jamie Woodward
Date: 19/05/2017

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

CHAIN OF CUSTODY

Marine and Freshwater Research Laboratory Environmental Science

Murdoch UNIVERSITY

Phone: 93602907

To: Marine and Freshwater Research Laboratory	From: 360 Environmental
Address: Murdoch University, Loading Zone 1,	Address: 10 Bermondsey Street, West Leederville
Phys Sc Room 3.026, 90 South St, Murdoch 6150	
Phone: 08 93602907	Phone: 9388 8360 Fax:
Email:	Email: alysiawoodward@360environmental.com.au
Courier Details:	Job Number: 1293 PO/ Account #:

Sample Preservation: None / Warm / Cool / On Ice / Frozen / Acidified / Filtered / Other: _____

Sample Type: Water / Bore / Fresh / Estuarine / Marine / Brine / Plant / Sediment / Soil / Other: _____

No	Sample Code	Sampling Date	Analytical Suite						
			TKN, TOC, TP	Copper, mercury, lead, nickel, zinc	HOLD	TN, TP, TOC			
1	SD01	10/05/2017	X	X					
2	SD02	10/05/2017			X				
3	SD03	10/05/2017	X	X					
4	SD04	10/05/2017			X				
5	SD05	10/05/2017	X	X					
6	SD06	10/05/2017			X				
7	SD07	10/05/2017	X	X					
8	QC1	10/05/2017	X	X					
9	MW03	10/05/2017		X		X			
10	QC3	10/05/2017		hold		hold			
11	~~SS01~~	10/05/2017	X	X					
12	~~QC05~~	10/05/2017			X				
13									
14									
15									
16									
17									
18									
19									
20									

Relinquished by:	Date:	Time:	Received by:	Date:	Time	Job Number:
Vanessa M.	10.5.17	1.25pm	VG	10/5/17	1.30pm	

Sample Condition:

Please acknowledge receipt of samples by signing where appropriate, quoting job number and returning to the sender by fax.