Sediment Quality Assessment 2023

Mardie Project

ENVIRONMENT
An O2Marine company

CLIENT: BCI Minerals

STATUS: Rev 0

REPORT NUMBER: R220345

ISSUE DATE: 20 September 2023

MARINE

WA MARINE PTY LTD | ABN 84 168 014 819 | www.o2marine.com.au

Important Note

This report has been prepared for the sole use of BCI Minerals Limited (herein, 'the client'), for a specific site (herein 'the site', the specific purpose specified in Section 1 of this report (herein 'the purpose'). This report is strictly limited for use by the client, to the purpose and site and may not be used for any other purposes.

Third parties, excluding regulatory agencies assessing an application in relation to the purpose, may not rely on this report. O2 Marine waive all liability to any third-party loss, damage, liability or claim arising out of or incidental to a third-party publishing, using or relying on the facts, content, opinions or subject matter contained in this report.

O2 Marine waive all responsibility for loss or damage where the accuracy and effectiveness of information provided by the client or other third parties were inaccurate or not up to date and was relied upon, wholly or in part in reporting.

Maps are created in WGS 84 - Pseudo-Mercator (EPSG:3857) coordinate reference system and are not to be used for navigational purposes. Positional accuracy should be considered as approximate.

Acknowledgement Of Country

In the spirit of reconciliation O2 Marine Pty Ltd acknowledge that this project is proposed on the lands of the Yaburara and Mardudhunera People. We pay our respects to Elders past, present and emerging and recognise their continuing connection to land, sea, culture and community.

WA Marine Pty Ltd t/as O2 Marine
ACN 168 014 819
Fremantle Office – Western Australia
20 Mews Road FREMANTLE WA 6160
T 1300 219 801 | info@o2marine.com.au

Version Register

Version	Status	Author	Reviewer	Comment	Authorised for Release (signed and dated)
Rev A	Internal Review	N Claydon	J Abbott	Draft	
Rev B	Client Review	N Claydon	J Abbott	Draft for client review	J Abbott 25 Aug 2023
Rev 0	Final	N Claydon	J Abbott	Final for Use	J Abbott 26 Sept 2023

Transmission Register

Controlled copies of this document are issued to the persons/companies listed below. Any copy of this report held by persons not listed in this register is deemed uncontrolled. Updated versions of this report if issued will be released to all parties listed below via the email address listed.

Name	Email Address
Spencer Shute	Spencer.shute@bciminerals.com.au

Acronyms and Abbreviations

Term	Full term
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council / Agriculture and Resource Management Council of Australia and New Zealand
BCH	Benthic Communities and Habitat
CoC	Chain of Custody
DEC	Department of Environment and Conservation
ISQG	Interim Sediment Quality Guideline
LoR	Limit of Reporting
m	Metres
m^3	Cubic metres
NAGD	National Australian Guidelines for Dredging
NEPM	National Environment Protection Measures
PSD	particle size distribution
QA/QC	quality assurance/quality control
RPD	Relative percent difference
RSD	Relative standard deviation
SoP	Sulphate of Potash
TBT	Tributyltin
TOC	Total Organic Carbon
TPH	Total petroleum hydrocarbons
UCL	Upper Confidence Limit
WA	Western Australia

Contents

Tables

Figures

1. Introduction

Mardie Minerals Pty Ltd (Mardie Minerals) has approval to develop a greenfields high quality salt and sulphate of Potash (SoP project) and associated export facility at Mardie, approximately 80 km south-west of Karratha, in the Pilbara region of Western Australia (WA). In 2022, Mardie Minerals submitted an application for the expansion of the approved Mardie Project (Ministerial Statement 1175) including expanded concentrator and crystalliser ponds, an increase salt and SoP production rate, new secondary seawater intake option, a port facility laydown area, a quarry, and minor changes to the dredge channel. The combination of the approved Mardie Project and the proposed expansion is known as the Optimised Mardie Project.

Also part of this Optimised Mardie Project, a 4 km long trestle jetty will need to be constructed to convey slat and SoP to the transhipment berth pocket for loading onto the transhipping barge. The jetty will not impede coastal water or sediment movement, maintaining coastal processes.

Dredging of up to 436,000 cubic metres (m^3)(which includes a 5.5 % 'over dredging' contingency of 23,000 m^3) will ensure sufficient depth for the transhipper berth pocket at the end of the trestle jetty, as well as along the 4 km long channel out to deeper water. The average depth of dredging is approximately 1 m below the current sea floor. Initially, the spoil was to be placed onshore, however due to design modifications, and the equipment required to undertake the work, spoil must be placed offshore. The dredge channel has also been modified, and therefore further sediment quality investigations were undertaken to characterise the dredge channel and Spoil Ground E. This report presents a summary of this investigation.

2. Previous sediment investigations

O2 Marine previously prepared a sediment quality assessment report (O2 Marine 2019) with the following objectives:

- Describe the implementation of the sediment quality assessment undertaken in 2018 and 2019
- Analyse the sediment results for a range of physical and chemical properties
- Compare chemical concentrations against the ANZECC/ARMCANZ (2000) Interim Sediment Quality Guideline (ISQG) values
- Inform dredge plume modelling and determine baseline sediment quality.

The results from this sediment quality assessment were also compared to the Department of Environment and Conservation (DEC) investigation of marine sediments of the Pilbara coast (DEC 2006) which provided a baseline relevant to the region.

Sediment sampling took place over three separate field campaigns in December 2018, January 2019 and March 2019 (O2 Marine 2019). The marine project footprint was revised following the first two sampling events, with one further sampling event conducted following modification of the marine project design. Sediment samples were collected using a combination of vibro-coring, surface grab sampling and diver-coring from thirty-two (32) sites with 34 samples collected in total (excluding QA/QC samples). The vibro-corer experienced refusal at 0.5 m depth on hard substrate (i.e. gravel and/or limestone layers) at all locations except two (2) where samples were collected up to 1 m depth and subsamples were collected from two horizons; 0 m to 0.5 m and 0.5 m to 1 m. The sediment samples were analysed for physical properties (PSD), metals and metalloids (Al, Ag, As, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Sb, V and Zn), organic compounds (TPH/TRH, BTEXN, PAHs, TBT), nutrients (TN, TKN, NH4, NO2+NO3, TP, FRP), pesticides, potential acid sulfate soils (PASS) and Benthic infauna.

The samples collected within the nearshore proposed Development Envelope at Mardie were found to be comprised of uncontaminated sediments. The background sediment quality at the site was considered representative of natural environmental conditions that are largely un-impacted by anthropogenic influences. However, some concentrations for metals and nutrients in sediments were naturally higher than recorded for marine sediment programs in other areas of the Pilbara and revised site-specific EQC were proposed.

In 2022, the dredge channel design was updated, and sediment sampling was undertaken within the updated design and analysed for particle size distribution (PSD). The results of this assessment were presented in a technical note and provided in Appendix A (O2 Marine 2022).

3. Methods

Sediment investigations for the project were undertaken over three sperate campaigns. This was largely due to changes in project design and adhering to data collection timeframes. Dredge channel investigations were undertaken on 12 June 2022 and 2 June 2023. Spoil Ground E investigations were undertaken on 24 April 2023. Sampling locations and methods are outlined below.

3.1. Sample locations

3.1.1. Dredge Channel (PSD 2022)

PSD was analysed in 10 samples in June 2022 within the update dredge channel footprint. Full details of this sampling campaign are described in O2 Marine (2022, Appendix A). The sample locations of this campaign are provided in O2 Marine (2022) and in Table 1 and Figure 1 below.

Table 1: PSD sampling coordinates for the sampling conducted in June 2022

Site	Easting	Northing
SS1	390006	7676672
SS2	389988	7676450
SS3	389916	7675550
SS4	389899	7675350
SS5	389886	7675183
SS6	389847	7674707
SS7	389774	7673807
SS8	389739	7673369
SS9	389703	7672929
SS10	389619	7672433

Figure 1: Location of PSD sediment sampling sites SS1–SS10

3.1.2. Dredge channel 2023 (Contaminants)

Following the PSD analysis in June 2022, contaminant sampling was conducted within the dredge channel on 2 June 2023 at 6 of the sites previously sampled. The sampling locations are presented in Table 2 and Figure 2.

Table 2: Contaminant sampling coordinates undertaken in June 2023

Sample ID	Easting	Northing
G1 (same location as SS10)	389619	7672433
G2 (same location as SS8)	389739	7673369
G3 (same location as SS7)	389774	7673807
G4 (same location as SS5)	389886	7675183
G5 (same location as SS3)	389916	7675550
G6 (same location as SS1)	390006	7676672

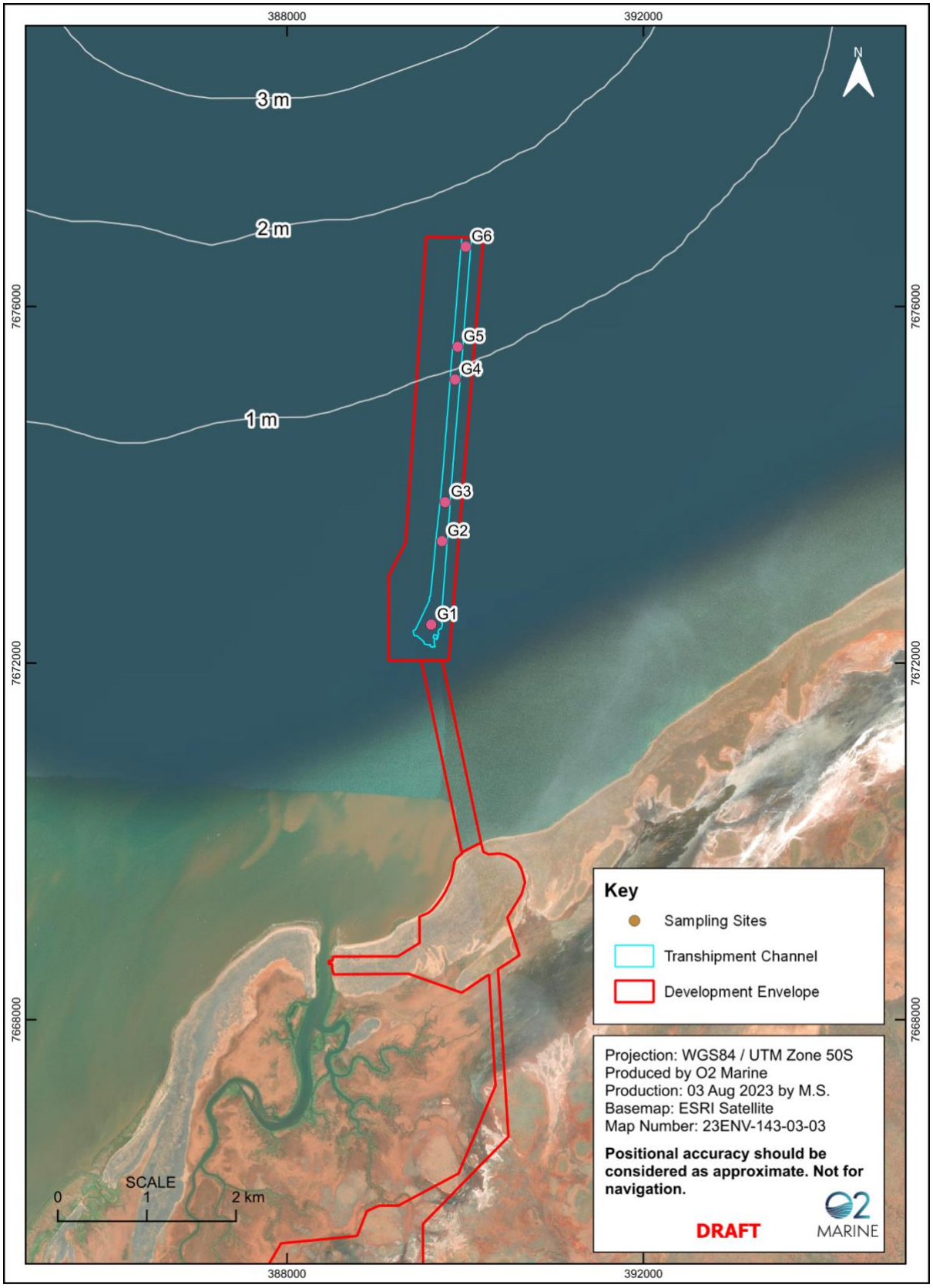


Figure 2: Location of sediment sampling sites G1 to G6

3.1.3. Spoil Ground E

Sediment sampling for both contaminants and PSD were conducted within the Spoil Ground E on 24 April 2023. The sampling location coordinates are provided in Table 3 and shown in Figure 3.

Table 3: Sample locations coordinates of the spoil ground sampling undertaken in April 2023

Sample ID	Easting	Northing
S1	275561	7637121
S2	275454	7637899
S3	274445	7638345
S4	275815	7638418
S5	276448	7637919

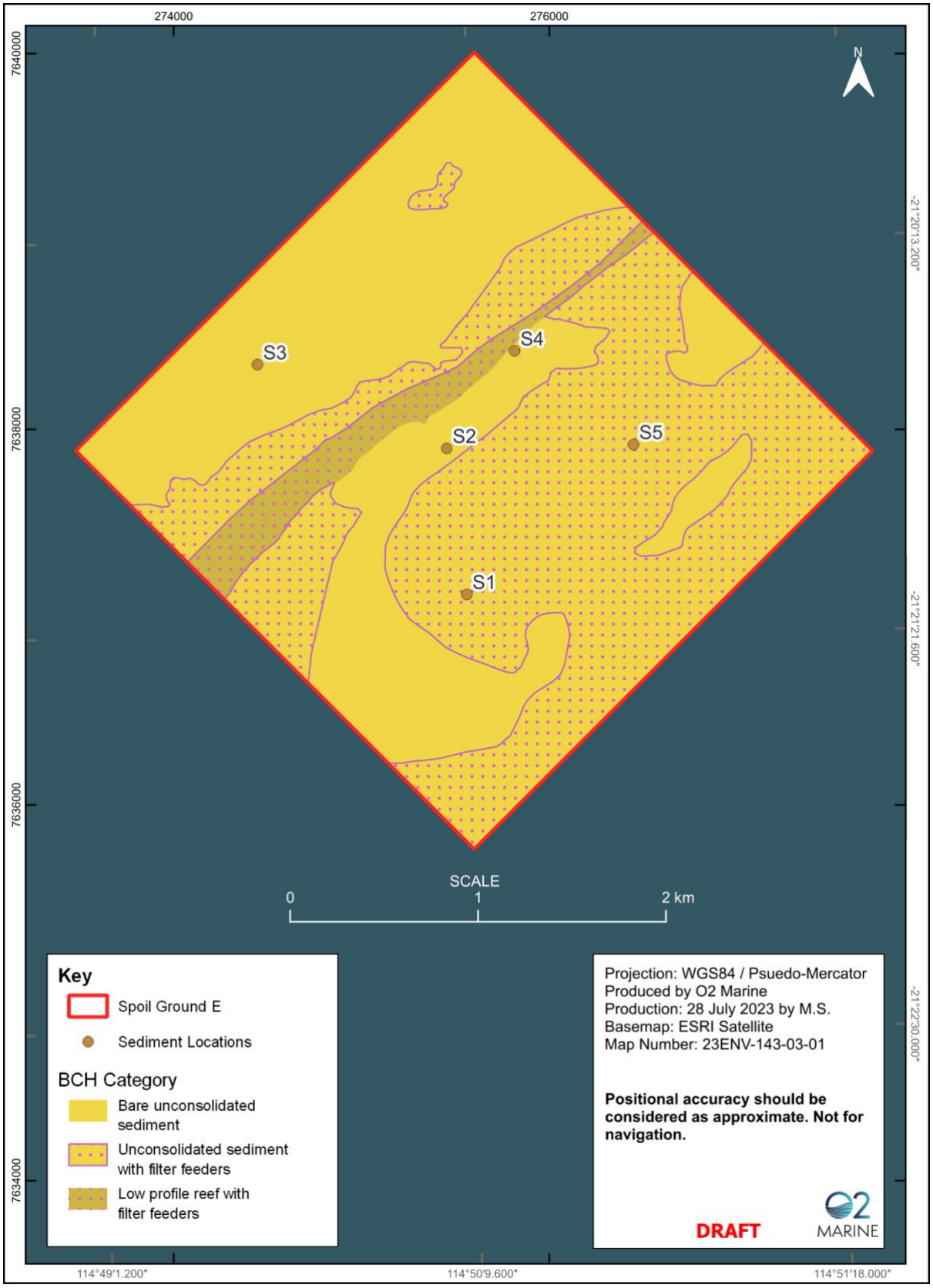


Figure 3: Location of sediment sampling sites S1 to S5

3.2. Sample collection methods

Samples across all campaigns were collected using a Van Veen grab sampler (Figure 4). At each sampling location the grab sampler was deployed by hand, once the sampler was on the seabed a GPS mark was recorded. Samples collected at Spoil Ground E were retrieved using a mechanical capstan due to the increased depth. Once retrieved onto the vessel, sediments were transferred into a pre-cleaned glass sampling container and homogenised. Observations (colour, texture, odour, shell grit and organics) and photos of the sample were recorded. Photographs of each sample are presented in Appendix B. Sediments for PSD analysis were transferred into pre-labelled laboratory supplied zip lock bags, while sediments for contaminant analysis were transferred into pre-labelled laboratory supplied glass jars. Samples were then stored in a chilled esky, ready for transport to a NATA accredited laboratory. Samples were consigned with a chain of custody (CoC) form to allow sample tracking and ensure the correct sample analyses, storage and holding times.

To avoid cross-contamination, sampling equipment was washed with Decon 90 after each sampling site and rinsed with site water. Nitrile gloves were used (and replaced between site locations) by all scientists handling the samples and sampling equipment.

Figure 4: Van Veen Sediment Sampler

3.3. Contaminants of concern

The contaminants of potential concern (CoPC) within the sediments were determined prior to the initial sediment sampling campaign in 2018 and 2019 based on literature review and the level of coastal development of the area (O2 Marine 2019). These were then further refined based on the results of that initial campaign, including the removal of pesticides from the sampling as there was no evidence of this in the 2018 samples. Nutrients also were removed from the list as they were either below the laboratory LOR or recorded at very low concentrations. Therefore, the analytes investigated in this 2023 sediment sampling campaign included the following:

- Total organic carbon
- Organotins including TBT
- Metals (Al, Ag, As, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni and Sb)
- Hydrocarbons.

3.4. Field Quality Assurance / Quality Control

The field quality assurance/quality control (QA/QC) measures undertaken by O2 Marine include:

- Ensuring sampling was undertaken in accordance with the NAGD (2009), including using sample containers that had been pre-cleaned by the laboratory, the use of powder-free nitrile gloves, and decontaminating sampling equipment before and in between each sample.
- A field duplicate and split sample collected for each campaign, where sediment from a selected site is homogenised and split into three sub samples. Two of these were sent to the primary laboratory (duplicate), and the third (split) sent to a secondary laboratory for inter-laboratory comparison.
- Appropriate storage and handling of sediment samples to adhere to laboratory specified holding times and preservation. A CoC was included with each batch of samples provided to the laboratory.

4. Results

4.1. Dredge Channel

The results have been compared to the low interim sediment quality guideline (ISQG-Low) values from NAGD (2009) where applicable.

4.1.1. PSD

PSD was analysed in samples taken in 2022 and were presented in a technical memo (O2 Marine 2022) provided in Appendix A. Overall, larger particle sizes dominated the offshore locations, and the proportion of smaller particle sizes became higher in the inshore locations, though the coarser fractions are still generally dominant (Figure 5).

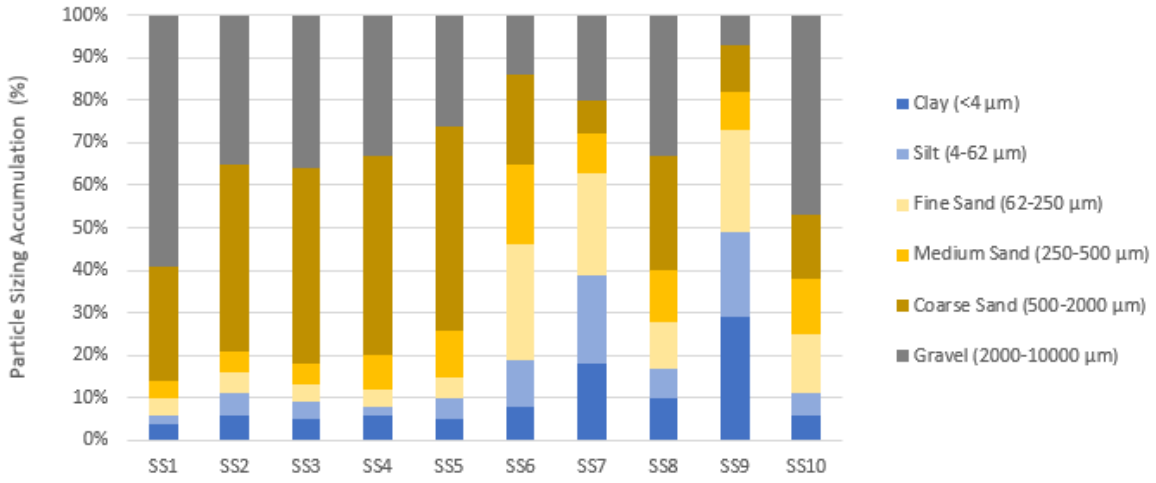


Figure 5: particle size distribution within dredge channel sediments (O2 Marine 2022)

4.1.2. Moisture Content and Total Organic Carbon

The moisture content and total organic carbon (TOC) results for the dredge channel are presented in Table 4 and 0. The moisture content of the samples ranged between 23 % (G4) and 40 % (G3). The TOC ranged from <0.1 % (G5) and 5.6 % (G1).

Table 4: Moisture content and total organic carbon within dredge channel

Site	Moisture content (%)	Total organic carbon (%)
G1	34	5.6
G2	26	1.3
G3	40	0.5
G4	23	3.2
G5	27	<0.1
G6	24	4.3

4.1.3. Metals

Total metal concentrations in sediment samples (June 2023) from the project footprint are presented in Table 5 and Appendix C. Metal concentrations within the samples were all below the NAGD screening levels (ISQG-low). Aluminium ranged between 1300 mg/kg and 2800 mg/kg, and though it does not have a NAGD screening level for comparison, these results were lower than results from DEC (2006) samples taken around the Onslow region. Manganese ranged between 32 and 79 mg/kg and also does not have a NAGD screening level and was not analysed within the DEC (2006) study.

Table 5: Metals concentrations within the samples within the dredge channel

	Aluminium	Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Manganese	Mercury	Nickel	Silver
LOR	*1*	*2*	*5*	*0.1*	*1*	*1*	*1*	*1*	*0.02*	*1*	*1*
Units	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
NAGD Screening level (ISQG-Low)	*-*	*2*	*20*	*1.5*	*80*	*65*	*50*	*-*	*0.15*	*21*	*1*
G1	2200	< 2	< 5	< 0.1	4.9	< 1	1	52	< 0.02	1.9	< 1
G2	1800	< 2	< 5	< 0.1	3.3	< 1	< 1	49	< 0.02	1.3	< 1
G3	2800	< 2	5.2	< 0.1	9.5	1.8	1.8	79	< 0.02	3.6	< 1
G4	1900	< 2	< 5	< 0.1	1.4	< 1	< 1	32	< 0.02	< 1	< 1
G5	1800	< 2	< 5	< 0.1	1.9	< 1	< 1	43	< 0.02	< 1	< 1
G6	1300	< 2	< 5	< 0.1	1.3	< 1	< 1	44	< 0.02	< 1	< 1

4.1.4. Hydrocarbons

The results for all hydrocarbons are presented in Table 6 and Appendix C. Total Recoverable Hydrocarbons (TRH) were all below the detection limit except in sample G1 and G4 in the C10-C14 fraction (using the National Environment Protection Measures (NEPM) 1999 fraction analysis method) with 29 mg/kg and 24 mg/kg, which were both slightly above the LoR of 20 mg/kg and well below the total petroleum hydrocarbons (TPH) screening level (ISQG-Low) of 550 mg/kg. Using the 2013 NEPM Fractions analysis method, all TRH concentrations were below the LoR.

Table 6: Hydrocarbon concentrations within the Spoil Ground E samples

	Total Recoverable Hydrocarbons - 1999 NEPM Fractions					Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
	TRH C10-C14	TRH C10-C36 (Total)	TRH C15-C28	TRH C29-C36	TRH C6-C9	Naphthalene	TRH >C10-C16	TRH >C10-C16 less Naphthalene (F2)	TRH >C10-C40 (total)*	TRH >C16-C34	TRH >C34-C40	TRH C6-C10	TRH C6-C10 less BTEX (F1)
LOR	*20*	*50*	*50*	*50*	*20*	*0.5*	*50*	*50*	*100*	*100*	*100*	*20*	*20*
Units	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
G1	29	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20
G2	< 20	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20
G3	< 20	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20
G4	24	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20
G5	< 20	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20
G6	< 20	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20

4.1.5. Organotins

Organotin results are presented in Table 7 and Appendix C. All organotins were below the respective LoRs, and therefore Tributyltin (TBT) was also below the NAGD screening level (ISQG Low) of 9 µg/kg.

Table 7: Organotins within the Spoil Ground E samples

	Monobutyltin as Sn	Dibutyltin as Sn	Tributyltin as Sn
LoR	*20*	*0.5*	*0.5*
Unit	*µg/kg*	*µg/kg*	*µg/kg*
NAGD Screening Level (ISQG-Low)	*NA*	*NA*	*9*
G1	<20	<0.50	<0.50
G2	<20	<0.50	<0.50
G3	<40	<1.0	<1.0
G4	<20	<0.50	<0.50
G5	<20	<0.50	<0.50
G6	<20	<0.50	<0.50

4.1.6. Quality assurance/quality control results

Analysis of the results from these QA/QC samples found the relative percent difference (RPD) within the field duplicates for all contaminants were within 50 %. The relative standard deviation (RSD) within the results from the primary and secondary laboratories for the field triplicate were within 50 % in most contaminants, though there was a higher discrepancy in several of the metals analysed. Aluminium, chromium, copper, manganese, nickel and zinc were all significantly higher than the primary results. Table 8 includes QA/QC results for the analytes that exceeded the RSD limits outlined in NAGD (2009), all other parameters were below the recommended limits. The results of arsenic from the secondary laboratory also exceeded the NAGD (2009) screening level. Communications with the laboratories highlighted that the material was non-homogeneous and varied moisture content which may have led to variation in the analysis. Laboratory QA/QC processes were within acceptable limits at both laboratories.

Therefore in accordance with NAGD (2009) these metals results above the RSD are to be treated as estimates rather than precise values. It should be noted that all metals results were well below the ISQG-low values in all primary samples (and field duplicate analysed at the same laboratory).

Table 8: QA/QC results for analytes that exceed the RSD limit of ±50% (NAGD 2009).

Analyte	LoR	Units	Primary Result	Duplicate	Split Result	RPD	RSD
Aluminium	1	mg/kg	2800	1900	4460	11%	57%
Chromium	1	mg/kg	1.4	1.4	42	25%	140%

Analyte	LoR	Units	Primary Result	Duplicate	Split Result	RPD	RSD
Copper	1	mg/kg	1	1	8	0%	121%
Manganese	1	mg/kg	32	32	636	38%	145%
Nickle	1	mg/kg	1*	1*	10	0%	130%
Zinc	1	mg/kg	1*	1*	12	0%	136%

**Result was reported as <1 mg/kg (below LoR). Calculation of RPD and RSD was undertaking assuming value was at LoR (i.e. 1 mg/kg).*

RED values above the NAGD (2009) RSD limit of ±50%.

4.2. Spoil Ground E

The results from the sampling at Spoil Ground E have been compared to the low interim sediment quality guideline (ISQG-Low) values from NAGD (2009) where applicable.

4.2.1. PSD

PSD within Spoil Ground E was found to be predominantly sand with silt, and small proportions of clay and gravel (Figure 6). However, Site S1 had the most gravel with 34.52 % which was much higher than the other sites. Clay was less than 8% in all samples.

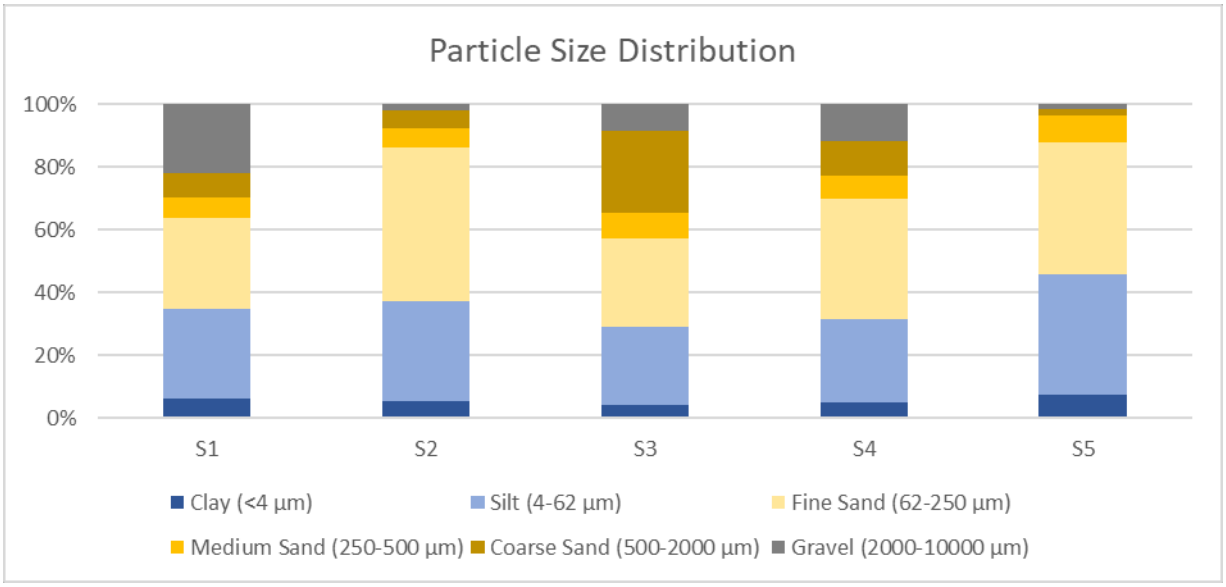


Figure 6: Particle size distribution at Spoil Ground E

4.2.2. Moisture Content and Total Organic Carbon

The moisture content and total organic carbon (TOC) results for the dredge channel are presented in Table 9 and Appendix C. The moisture content of the samples ranged between 28 % (S1) and 42 % (S2), similar to the results within the dredge channel. The TOC ranged from 3.2 % (S1) and 9.3 % (S4), slightly higher than those in the dredge channel.

Table 9: Moisture content and total organic carbon within Spoil Ground E

Site	Moisture content (%)	Total organic carbon (%)
S1	28	3.2
S2	42	7.8
S3	34	9.1
S4	37	9.3
S5	38	3.7

4.2.3. Metals

Total metal concentrations in sediment samples from within Spoil Ground E footprint are presented in Table 10 and Appendix C. Metal concentrations within the samples at the spoil ground were all below the NAGD screening levels (ISQG-low). Aluminium ranged from 1900 mg/kg to 4700 mg/kg.

Table 10: Metals concentrations within the samples within Spoil Ground E

	Aluminium	Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Manganese	Mercury	Nickel	Silver
LOR	*1*	*2*	*5*	*0.1*	*1*	*1*	*1*	*1*	*0.02*	*1*	*1*
Units	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
NAGD Screening level (ISQG-Low)	*-*	*2*	*20*	*1.5*	*80*	*65*	*50*	*-*	*0.15*	*21*	*1*
S1	4700	< 2	12	< 0.1	40	15	6.2	150	< 0.02	11	< 1
S2	3500	< 2	7.1	< 0.1	26	9.1	3.7	110	< 0.02	7.6	< 1
S3	2000	< 2	< 5	< 0.1	17	6.7	2.8	78	< 0.02	4.8	< 1
S4	1900	< 2	5.4	< 0.1	17	8.4	3.4	91	< 0.02	5.5	< 1
S5	4600	< 2	9.8	< 0.1	37	11	4.5	160	< 0.02	10	< 1

4.2.4. Hydrocarbons

The results for all hydrocarbons are presented in Table 11 and Appendix C. Total Recoverable Hydrocarbons (TRH) were all below the detection limit using both 1999 NEPM fractions and 2013 NEPM fractions.

Table 11: Hydrocarbon concentrations within the Spoil Ground E samples

	Total Recoverable Hydrocarbons - 1999 NEPM Fractions					Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
	TRH C10-C14	TRH C10-C36 (Total)	TRH C15-C28	TRH C29-C36	TRH C6-C9	Naphthalene	TRH >C10-C16	TRH >C10-C16 less Naphthalene (F2)	TRH >C10-C40 (total)*	TRH >C16-C34	TRH >C34-C40	TRH C6-C10	TRH C6-C10 less BTEX (F1)
LoR	*20*	*50*	*50*	*50*	*20*	*0.5*	*50*	*50*	*100*	*100*	*100*	*20*	*20*
Units	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
S1	< 20	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20
S2	< 20	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20
S3	< 20	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20
S4	< 20	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20
S5	< 20	< 50	< 50	< 50	< 20	< 0.5	< 50	< 50	< 100	< 100	< 100	< 20	< 20

4.2.5. Organotins

Organotin results are presented in Table 12 and Appendix C. All organotins were below the respective LoRs, and therefore Tributyltin (TBT) was also below the NAGD screening level (ISQG Low) of 9 µg/kg.

Table 12: Organotins within the Spoil Ground E samples

	Monobutyltin as Sn	Dibutyltin as Sn	Tributyltin as Sn
LoR	*20*	*0.5*	*0.5*
Unit	*µg/kg*	*µg/kg*	*µg/kg*
NAGD Screening Level (ISQG-Low)	*NA*	*NA*	*9*
S1	<20	<0.50	<0.50
S2	<20	<0.50	<0.50
S3	<20	<0.50	<0.50
S4	<20	<0.50	<0.50
S5	<20	<0.50	<0.50

4.2.6. Quality assurance/quality control results

Analysis of the results from these QA/QC samples found the RPD and RSD of the contaminants within field duplicate and split samples were all within 50 % (NAGD 2009), with the exception of total organic carbon. Laboratory QA/QC processes were within acceptable limits at both laboratories.

5. Discussion

A sediment investigation was undertaken within the updated dredge channel and within Spoil Ground E to characterise both areas and determine the suitability of the dredge material for disposal within the spoil ground. A previous sediment assessment was undertaken within the original and revised dredge channel footprints in 2019, and this assessment has been used to supplement the additional sampling. Six additional samples were collected within the updated dredge channel and were tested for chemical toxicants only (PSD data previously collected in 2022), and five samples within Spoil Ground E were taken and analysed for PSD and chemical toxicants. All analytes from these additional samples were below the NAGD (2009) ISQG-low screening levels where applicable, with most analytes below their respective LoRs. These results are comparable to the 2019 sediment assessment, which found that most analytes were generally below the screening levels except at a few locations for arsenic and nickel where the 95 % Upper Confidence Limit (UCL)was exceeded. The 2019 assessment also compared the results to the DEC (2006) study, which found that the 95 % UCL was above background for aluminium, cobalt, iron and vanadium.

PSD within Spoil Ground E was found to be predominantly sand with silt, and small proportions of clay and gravel. Site S1 had higher gravel than the other sites with 34.52 %. Clay was less than 3% in all samples. PSD results obtained within the dredging footprint from O2 Marine (2019) found sand and gravel fractions were dominant within the channel and outer channel, and sites closer to shore had higher fines. Further PSD studies were undertaken in 2022 by O2 Marine (2022) at 10 sampling locations within the shipping channel. These results found that sediments collected at the northern extent of the shipping channel had a larger proportion of gravel and coarse sand, and the sites closer to the shore had comparatively higher proportions of clay and fine sand fractions. However, most sites did have higher gravel and sand fractions and less fines. Therefore, sediment within the dredge footprint have been found to have higher gravel composition than the sediments within the spoil ground, though sand was predominant in all samples.

Moisture content in the dredge channel samples was similar to the spoil ground samples. The total organic carbon content was slightly lower in the dredge channel samples in comparison to the spoil ground.

Metal concentrations within the dredge footprint and spoil ground samples were all below the NAGD screening levels (ISQG-low). Aluminium ranged between 1300 mg/kg and 2800 mg/kg within the dredge footprint and was generally higher at the spoil ground, with concentrations ranging between 1900 mg/kg and 4700 mg/kg. Aluminium does not have a NAGD screening level for comparison, and therefore these results were compared to and found lower than results from DEC (2006) samples taken around the Onslow region. Manganese ranged between 32 and 79 mg/kg within the dredge footprint, which was lower than Spoil Ground E, which ranged between 78 and 160 mg/kg. Manganese also does not have a NAGD screening level and was not analysed within the DEC (2006) study.

Hydrocarbons were generally below the laboratory limit of reporting for each analyte.

QA/QC results for the dredge channel sampling campaign indicated that sediments were non-homogeneous, resulting in several RSD limited exceedances for aluminium, chromium, copper, manganese, nickel and zinc.

Overall, the sediment concentrations were similar within both areas, indicating that the dredge material would not have a significant impact if disposed in Spoil Ground E.

6. References

ANZECC/ARMCANZ (Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand)(2000) Australian and New Zealand guidelines for fresh and marine water quality. Volume 1, The guidelines.

DEC (Department of Environment and Conservation) (2006) Background quality of the marine sediments of the Pilbara coast. DEC, Marine Technical Report Series No MTR 1.

EPA (Environmental Protection Authority) (2021) Technical Guidance: Environmental impact assessment of marine dredging proposals. EPA, September 2021.

NAGD (2009) National Assessment Guideline for Dredging. Commonwealth of Australia.

O2 Marine (2019) Mardie Project: Sediment Quality Assessment Report. Report prepared for Mardie Minerals Pty Ltd.

O2 Marine (2023a) Spoil Ground E: Benthic communities and habitats mapping. Prepared for BCI Minerals. Report number R220284.

O2 Marine (2022) Technical Note: Mardie Marine Environmental Baseline Survey (21-WAU-060-03). Seabed Sampling at Mardie – Channel Alignment.

O2 Metocean (2023a) Spoil Ground Modelling: Mardie Project at Spoil Ground E. Prepared for BCI Minerals Ltd. Report number 22MET115/R220290.

O2 Metocean (2023b) Mardie Spoil Ground Hydrographic Survey: Hydrographic Survey Report. Prepared for BCI Minerals. Report number BSA-2301-O2M-R01.

Appendix A. Technical note: Seabed sampling at Mardie – Channel Alignment

Technical Note

From	Adam Gartner	To	David Todd, Robert Ernst
Organisation	O2 Marine	Organisation	BCI Minerals
Project	Mardie Marine Environmental Baseline Survey (21-WAU-060-03)		
Subject	Seabed Sampling at Mardie - Channel Alignment		

Background

This technical note (data report) provides the outcome of marine sediment sampling for particle size distribution (PSD) of samples collected within the proposed Mardie shipping channel, requested of O2 Marine (O2M) by BCI Minerals on 29 June 2022.

Sampling

Surface sediments were collected between 14 and 18 July 2022, at ten sites within the proposed Mardie shipping channel (Figure 1, Table 1). While sites were designated according to priority (Table 1), O2M were able to complete sampling at all sites. Sediments were collected by scuba divers using polycarbonate cores (60 mm diameter) to a depth of 0.5 m, or refusal (Figure 2).

At each site, two cores were collected by divers from within the same square metre. Following collection, sediment samples were photographed and their colour, texture, oxidation layer and presence of biota described. Sediments were then homogenised to form a single composite sample (~0.5 kg) for analysis and a spare (~0.5 kg) from each monitoring site.

Composite samples were placed in zip-lock containers following collection and stored chilled for transport to the laboratory for analysis. Samples were consigned with a CoC form to allow sample tracking and ensure the correct sample analyses, storage and holding times.

To avoid cross-contamination, sampling equipment was washed with Decon 90 after each monitoring site and rinsed with site water. Sample analysis was conducted by ALS, a National Association of Testing Authorities accredited laboratory (Limit of reporting 1%, 0.01 g/cm^3).

WA Marine Pty Ltd trading as O2Marine
ACN 168 014 819
11 Mews Road Fremantle 6160
T: 1300 739 449
E: info@o2marine.com.au

Figure 1Location of sediment sampling sites SS1–SS10

WA Marine Pty Ltd trading as O2Marine
ACN 168 014 819
11 Mews Road Fremantle 6160
T: 1300 739 449
E: info@o2marine.com.au

Table 1 Sediment site coordinates

Site	Easting	Northing	BCI assigned priority
SS1	7676672	390006	Medium
SS2	7676450	389988	High
SS3	7675550	389916	High
SS4	7675350	389899	High
SS5	7675183	389886	High
SS6	7674707	389847	Low
SS7	7673807	389774	Low
SS8	7673369	389739	Medium
SS9	7672929	389703	Low
SS10	7672433	389619	Medium

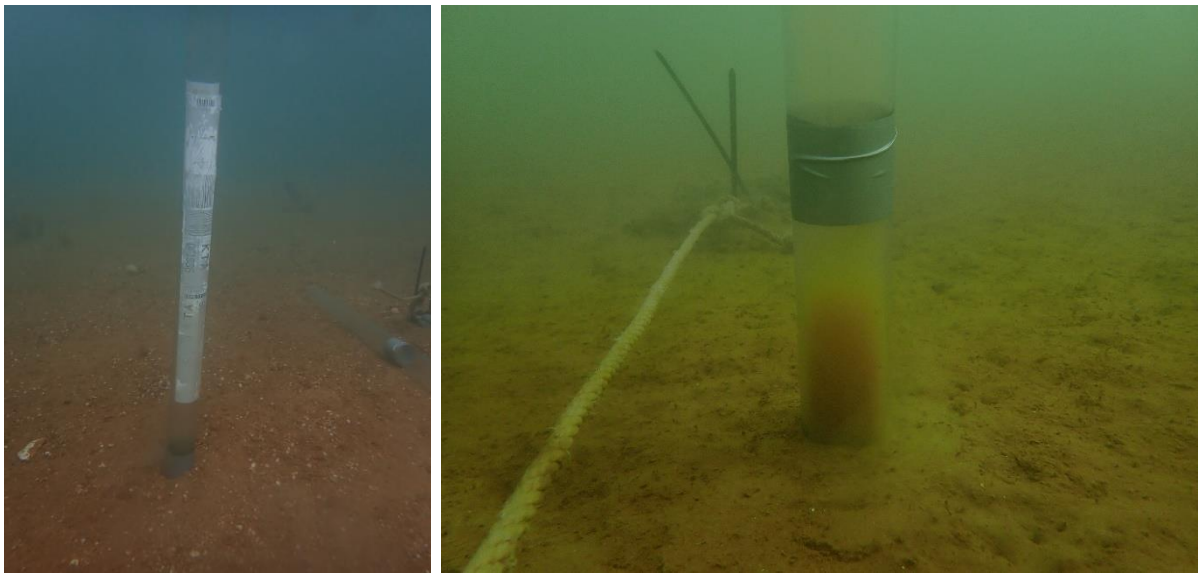


Figure 2 Sediment core collected to 0.5 m depth (left) and to refusal (right)

WA Marine Pty Ltd trading as O2Marine
ACN 168 014 819
11 Mews Road Fremantle 6160
T: 1300 739 449
E: info@o2marine.com.au

Results

General Description of Sediments

Table 2 General descriptors

Site	Notes	Image
SS1	Colour: red-brown Texture: grit Odour: nil Oxidation layer: nil Shell / biota: present	
SS2	Colour: red-brown Texture: grit Odour: nil Oxidation layer: nil Shell / biota: present	Image missing
SS3	Colour: red-brown Texture: blended sandy / grit / rocks Odour: nil Oxidation layer: nil Shell / biota: present	
SS4	Colour: brown Texture: blended sandy grit Odour: nil Oxidation layer: nil Shell / biota: present	
SS5	Colour: red-brown Texture: grit Odour: nil Oxidation layer: nil Shell / biota: present	

WA Marine Pty Ltd trading as O2Marine
ACN 168 014 819
11 Mews Road Fremantle 6160
T: 1300 739 449
E: info@o2marine.com.au

SS6	Colour: brown Texture: fine silt sand Odour: nil Oxidation layer: nil Shell / biota: present	
SS7	Colour: brown Texture: clay composite Odour: nil Oxidation layer: nil Shell / biota: present	
SS8	Colour: brown Texture: sandy composite Odour: nil Oxidation layer: nil Shell / biota: present	
SS9	Colour: red-brown Texture: clay composite Odour: nil Oxidation layer: nil Shell / biota: present	
SS10	Colour: red-brown Texture: silt / sand composite Odour: nil Oxidation layer: nil Shell / biota: present	

WA Marine Pty Ltd trading as O2Marine
ACN 168 014 819
11 Mews Road Fremantle 6160
T: 1300 739 449
E: info@o2marine.com.au

Particle Size Distribution

Sediments collected at the northern extent of the proposed shipping channel (SS1) had the greatest proportion of large particles (59% gravel and 27% coarse sand; Table 3, Figure 3). Sites SS2–SS5 had relatively similar PSD's, comprising large proportions of course (<500-2000 µm) and medium sand material (<250-500 µm; Table 3, Figure 3). Sites located closer to the mainland shore – SS6 to SS10 – typically had comparatively greater proportions of small sized particles - clay (<4 µm) silt (4-62 µm) and fine sand (62-250 µm) - than did offshore sites (Table 3, Figure 3).

Table 3 Particle size distributions of sediment samples at each site

EA150: Particle Sizing	Site									
	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10
Clay (<4 µm)	4	6	5	6	5	8	18	10	29	6
Silt (4-62 µm)	2	5	4	2	5	11	21	7	20	5
Fine Sand (62-250 µm)	4	5	4	4	5	27	24	11	24	14
Medium Sand (250-500 µm)	4	5	5	8	11	19	9	12	9	13
Coarse Sand (500-2000 µm)	27	44	46	47	48	21	8	27	11	15
Gravel (2000-10000 µm)	59	35	36	33	26	14	20	33	7	47
Soil Particle Density	2.70	2.63	2.68	2.70	2.66	2.70	2.64	2.45	2.60	2.56

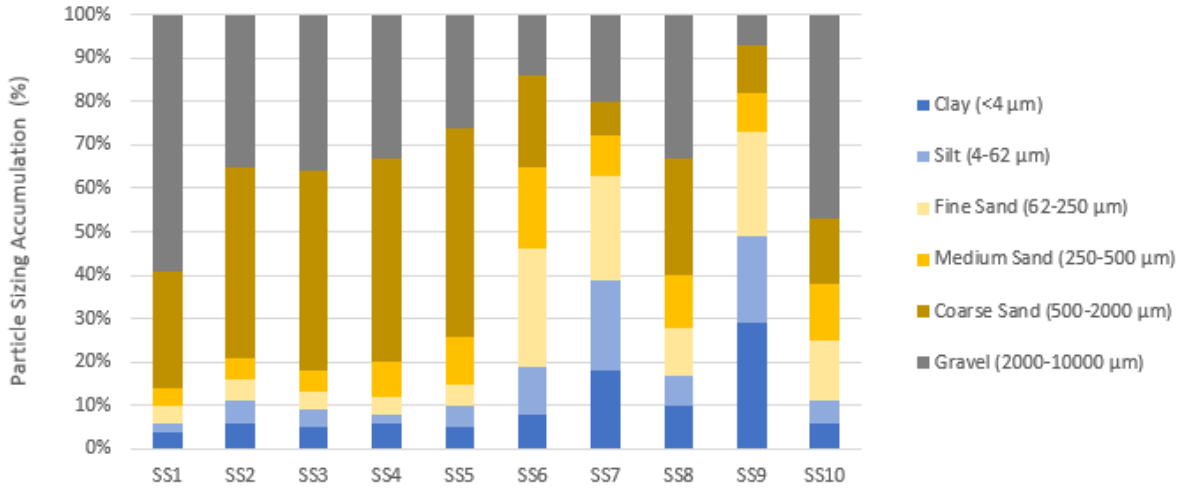
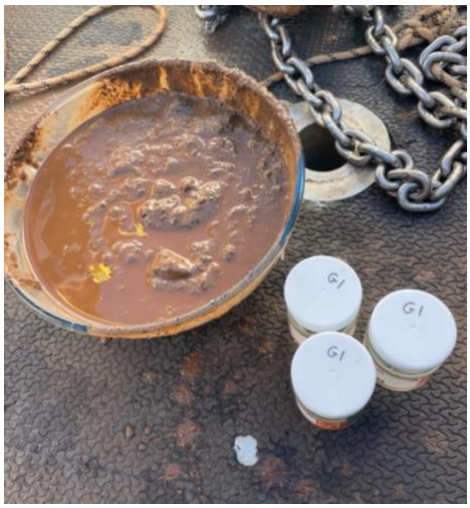


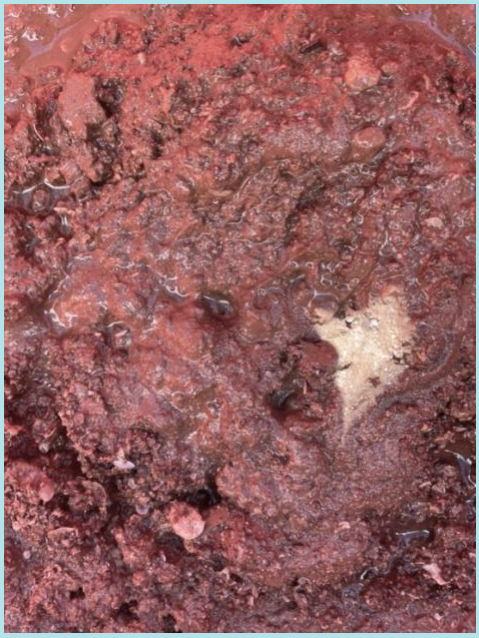
Figure 3 Cumulative particle size distributions for sediments at each site

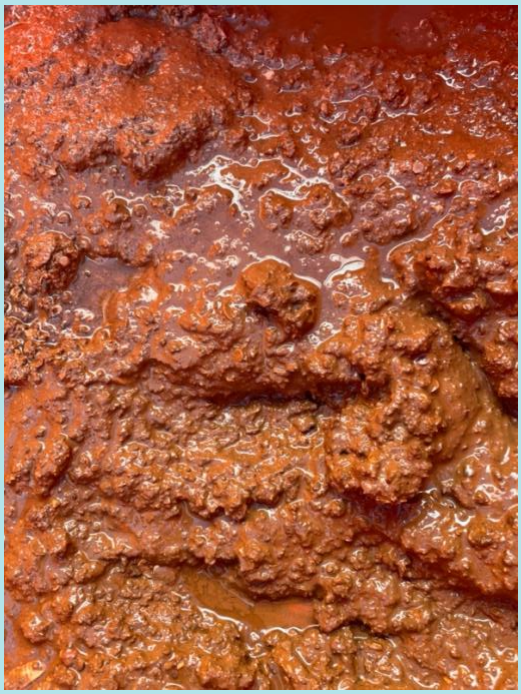
WA Marine Pty Ltd trading as O2Marine
ACN 168 014 819
11 Mews Road Fremantle 6160
T: 1300 739 449
E: info@o2marine.com.au

Appendix B. Dredge Channel and Spoil Ground E sediment survey photographs and general description

Dredge Channel (June 2023)

Site Name	General Description	
G1	Medium to fine grained sand with shell grit. Brown, shell grit, no odour.	
G2	Medium to fine grained sand with shell grit. Brown, shell grit, no odour.	

G3	Medium grained sand with lots of shell grit. Brown, shell grit, no odour.	
G4	Coarse grained sand with gravel. Brown, shell grit, no odour.	

G5	Coarse grained sand with gravel. Brown, shell grit, no odour.	
G6	Coarse grained sand with gravel. Brown, shell grit, no odour.	

Spoil Ground E

Site Name	General Description	
S1	Gravel with silt/sand, brown, nil odour, nil shell or organic matter	
S2	Gravel with silt/sand, brown, nil odour, nil shell or organic matter	

S3	Gravel with silt/sand, brown, nil odour, with some shell and organic matter	
S4	Gravel with silt/sand, brown, nil odour, with some shell and organic matter	
S5	Gravel with silt/sand, brown, nil odour, with some shell and organic matter	

Appendix C. Sediment sampling laboratory results

Envirolab Services (WA) Pty Ltd trading as MPL Laboratories
ABN 53 140 099 207
16-18 Hayden Court Myaree WA 6154
ph +61 8 9317 2505 fax +61 8 9317 4163
lab@mpl.com.au
www.mpl.com.au

Certificate of Analysis PEE0460

Client Details

Client	Eurofins ARL Pty Ltd
Contact	Eurofins Accounts
Address	46-48 Banksia Rd, Welshpool, WA, 6106

Sample Details

Your Reference	894682
Number of Samples	6 Soil
Date Samples Received	05/05/2023
Date Samples Registered	05/05/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	16/05/2023
Date of Issue	15/05/2023

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Todd Lee, Group Operations Manager Travis Carey, Organics Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEE0460

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PEE0460-01	23-Ap0059976	Soil	05/05/2023	05/05/2023
PEE0460-02	23-Ap0059977	Soil	05/05/2023	05/05/2023
PEE0460-03	23-Ap0059978	Soil	05/05/2023	05/05/2023
PEE0460-04	23-Ap0059979	Soil	05/05/2023	05/05/2023
PEE0460-05	23-Ap0059980	Soil	05/05/2023	05/05/2023
PEE0460-06	23-Ap0059981	Soil	05/05/2023	05/05/2023

Certificate of Analysis PEE0460

Organometallics (Soil)

Envirolab ID	Units	PQL	PEE0460-01	PEE0460-02	PEE0460-03	PEE0460-04	PEE0460-05
Your Reference			23-Ap0059976	23-Ap0059977	23-Ap0059978	23-Ap0059979	23-Ap0059980
Date Sampled			05/05/2023	05/05/2023	05/05/2023	05/05/2023	05/05/2023
Monobutyltin as Sn	µg/kg	20	<20	<20	<20	<20	<20
Dibutyltin as Sn	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tributyltin as Sn	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Surrogate Triphenyltin	%		*96.1*	*99.9*	*109*	*106*	*110*

Envirolab ID	Units	PQL	PEE0460-06
Your Reference			23-Ap0059981
Date Sampled			05/05/2023
Monobutyltin as Sn	µg/kg	20	<20
Dibutyltin as Sn	µg/kg	0.50	<0.50
Tributyltin as Sn	µg/kg	0.50	<0.50
Surrogate Triphenyltin	%		*97.3*

Certificate of Analysis PEE0460

Inorganics - Moisture (Soil)

Envirolab ID	Units	PQL	PEE0460-01	PEE0460-02	PEE0460-03	PEE0460-04	PEE0460-05
Your Reference			23-Ap0059976	23-Ap0059977	23-Ap0059978	23-Ap0059979	23-Ap0059980
Date Sampled			05/05/2023	05/05/2023	05/05/2023	05/05/2023	05/05/2023
Moisture	%	0.10	23	37	32	32	30

Envirolab ID	Units	PQL	PEE0460-06
Your Reference			23-Ap0059981
Date Sampled			05/05/2023
Moisture	%	0.10	32

Method Summary

Method ID	Methodology Summary
INORG-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
ORG-025_TBT_S	Determination of Organometallic Compounds by derivatisation and analysis by GC-MS-MS.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PEE0460

Client Details

Client	Eurofins ARL Pty Ltd
Your Reference	894682
Date Issued	15/05/2023

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEE0460

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Organotins | Soil	1-6	05/05/2023	10/05/2023	11/05/2023	Yes
Moisture | Soil	1-6	05/05/2023	10/05/2023	11/05/2023	Yes

Quality Control PEE0460

ORG-025_TBT_S|Organometallics (Soil) | Batch BEE1060

Analyte	Units	PQL	Blank	DUP1 PEE0460-01 Samp | QC | RPD %	LCS %	Spike % PEE0460-02
Monobutyltin	µg/kg	20		<20 | <20 | [NA]	[NA]	[NA]
Monobutyltin as Sn	µg/kg	20	<20	<20 | <20 | [NA]	[NA]	[NA]
Dibutyltin	µg/kg	0.5		<0.50 | <0.50 | [NA]	91.5	93.9
Dibutyltin as Sn	µg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	[NA]	[NA]
Tributyltin	µg/kg	0.5		<0.50 | <0.50 | [NA]	107	104
Tributyltin as Sn	µg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	[NA]	[NA]
Surrogate Triphenyltin	*%*		*95.7*	*96.1 | 94.2*	*95.5*	*91.8*

INORG-008|Inorganics - Moisture (Soil) | Batch BEE1062

Analyte	Units	PQL	Blank	DUP1 PEE0460-01 Samp | QC | RPD %	LCS %
Moisture	%	0.1		23.0 | 25.5 | 10.3	[NA]

O2 Marine
Suite 2, 4B Mews Rd
Fremantle
WA 6160

Attention: **Josh Abbott**

Report **984682-S**
Project name BCI MARDIE PROJECT
Project ID 23ENV143
Received Date Apr 26, 2023

Client Sample ID			**S1**	**S2**	**S3**	**S4**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**L23-Ap0059976**	**L23-Ap0059977**	**L23-Ap0059978**	**L23-Ap0059979**
Date Sampled			**Not Provided**[I12]	**Not Provided**[I12]	**Not Provided**[I12]	**Not Provided**[I12]
Test/Reference	LOR	Unit				
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
BTEX						
4-Bromofluorobenzene (surr.)	1	%	92	84	72	73
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	< 100
PAH in Soil/Solid						
Naphthalene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1

Client Sample ID			S1	S2	S3	S4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			L23-Ap0059976	L23-Ap0059977	L23-Ap0059978	L23-Ap0059979
Date Sampled			Not Provided[I12]	Not Provided[I12]	Not Provided[I12]	Not Provided[I12]
Test/Reference	LOR	Unit				
PAH in Soil/Solid						
Pyrene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benz(a)anthracene	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chrysene	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Benzo(b)fluoranthene	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Benzo(k)fluoranthene	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Benzo(a)pyrene	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Indeno(1.2.3-c.d)pyrene	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dibenz(a.h)anthracene	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Benzo(ghi)perylene	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Total Organic Carbon	0.1	%	3.2	7.8	9.1	9.3
Aluminium	1	mg/kg	4700	3500	2000	1900
Antimony	2	mg/kg	< 2	< 2	< 2	< 2
Arsenic	5	mg/kg	12	7.1	< 5	5.4
Cadmium	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Chromium	1	mg/kg	40	26	17	17
Copper	1	mg/kg	15	9.1	6.7	8.4
Lead	1	mg/kg	6.2	3.7	2.8	3.4
Manganese	1	mg/kg	150	110	78	91
Mercury	0.02	mg/kg	< 0.02	< 0.02	< 0.02	< 0.02
Nickel	1	mg/kg	11	7.6	4.8	5.5
Silver	1	mg/kg	< 1	< 1	< 1	< 1
Zinc	1	mg/kg	21	11	7.4	6.9
Organotins			See attached	See attached	See attached	See attached
Particle Size Distribution			See attached	See attached	See attached	See attached
Sample Properties						
% Moisture	1	%	28	42	34	37

Client Sample ID			S5	Dup
Sample Matrix			Soil	Soil
Eurofins Sample No.			L23-Ap0059980	L23-Ap0059981
Date Sampled			Not Provided[I12]	Not Provided[I12]
Test/Reference	LOR	Unit		
TRH C6-C9	20	mg/kg	< 20	< 20
BTEX				
Benzene	0.1	mg/kg	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3
BTEX				
4-Bromofluorobenzene (surr.)	1	%	72	71

Client Sample ID			S5	Dup
Sample Matrix			Soil	Soil
Eurofins Sample No.			L23-Ap0059980	L23-Ap0059981
Date Sampled			Not Provided[I12]	Not Provided[I12]
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				
TRH C10-C14	20	mg/kg	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
TRH >C10-C16	50	mg/kg	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100
PAH in Soil/Solid				
Naphthalene	0.1	mg/kg	< 0.1	< 0.1
2-Methylnaphthalene	0.1	mg/kg	< 0.1	< 0.1
Acenaphthylene	0.1	mg/kg	< 0.1	< 0.1
Acenaphthene	0.1	mg/kg	< 0.1	< 0.1
Fluorene	0.1	mg/kg	< 0.1	< 0.1
Phenanthrene	0.1	mg/kg	< 0.1	< 0.1
Anthracene	0.1	mg/kg	< 0.1	< 0.1
Fluoranthene	0.1	mg/kg	< 0.1	< 0.1
Pyrene	0.1	mg/kg	< 0.1	< 0.1
Benz(a)anthracene	0.2	mg/kg	< 0.2	< 0.2
Chrysene	0.2	mg/kg	< 0.2	< 0.2
Benzo(b)fluoranthene	0.2	mg/kg	< 0.2	< 0.2
Benzo(k)fluoranthene	0.2	mg/kg	< 0.2	< 0.2
Benzo(a)pyrene	0.2	mg/kg	< 0.2	< 0.2
Indeno(1.2.3-c.d)pyrene	0.2	mg/kg	< 0.2	< 0.2
Dibenz(a.h)anthracene	0.2	mg/kg	< 0.2	< 0.2
Benzo(ghi)perylene	0.2	mg/kg	< 0.2	< 0.2
Total Organic Carbon	0.1	%	3.7	2.7
Aluminium	1	mg/kg	4600	4100
Antimony	2	mg/kg	< 2	< 2
Arsenic	5	mg/kg	9.8	11
Cadmium	0.1	mg/kg	< 0.1	< 0.1
Chromium	1	mg/kg	37	38
Copper	1	mg/kg	11	11
Lead	1	mg/kg	4.5	5.0
Manganese	1	mg/kg	160	160
Mercury	0.02	mg/kg	< 0.02	< 0.02
Nickel	1	mg/kg	10	9.2
Silver	1	mg/kg	< 1	< 1
Zinc	1	mg/kg	16	16
Organotins			See attached	See attached
Particle Size Distribution			See attached	See attached

Client Sample ID			S5	Dup
Sample Matrix			Soil	Soil
Eurofins Sample No.			L23-Ap0059980	L23-Ap0059981
Date Sampled			Not Provided[I12]	Not Provided[I12]
Test/Reference	LOR	Unit		
Sample Properties				
% Moisture	1	%	38	35

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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

Description	Testing Site	Extracted	Holding Time
BTEX	Welshpool	May 05, 2023	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	May 05, 2023	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Welshpool	Apr 28, 2023	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	May 05, 2023	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
PAH in Soil/Solid	Welshpool	May 05, 2023	14 Days
- Method: ARL006 - Polycyclic Aromatic Hydrocarbons in Soil			
Total Organic Carbon	Melbourne	May 02, 2023	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
Aluminium	Welshpool	May 05, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Antimony	Welshpool	May 05, 2023	180 Day
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Manganese	Welshpool	May 05, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Silver	Welshpool	May 05, 2023	180 Days
- Method: ARL030 - Metals in Soil and Sediment by AAS			
Arsenic	Welshpool	May 05, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Cadmium	Welshpool	May 05, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Chromium	Welshpool	May 05, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Copper	Welshpool	May 05, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Lead	Welshpool	May 05, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Mercury	Welshpool	May 05, 2023	28 Days
- Method: ARL No. 406 - Mercury by Cold Vapour Atomic Absorption Spectrophotometry			
Nickel	Welshpool	May 05, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Zinc	Welshpool	May 05, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
% Moisture	Welshpool	Apr 28, 2023	14 Days
- Method: ARL135 Moisture in Solids			

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898
Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521
Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

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

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954
Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 45 51
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: 0800 856 450
IANZ# 1290

Company Name: O2 Marine
Address: Suite 2, 4B Mews Rd
Fremantle
WA 6160

Project Name: BCI MARDIE PROJECT
Project ID: 23ENV143

Order No.:
Report #: 984682
Phone:
Fax:

Received: Apr 26, 2023 11:23 AM
Due: May 5, 2023
Priority: 7 Day
Contact Name: Josh Abbott

Eurofins Analytical Services Manager : Andrew Harvey

Sample Detail						Aluminium	Antimony	Manganese	Particle Size Distribution	Silver	Total Organic Carbon	Moisture Set	Eurofins Suite B4	Organotins	Metals M8 Soil
Perth Laboratory - NATA # 2377 Site # 2370						X	X	X		X		X	X		X
Melbourne Laboratory - NATA # 1261 Site # 1254											X			X	
External Laboratory									X						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	S1	Not Provided		Soil	L23-Ap0059976	X	X	X	X	X	X	X	X	X	X
2	S2	Not Provided		Soil	L23-Ap0059977	X	X	X	X	X	X	X	X	X	X
3	S3	Not Provided		Soil	L23-Ap0059978	X	X	X	X	X	X	X	X	X	X
4	S4	Not Provided		Soil	L23-Ap0059979	X	X	X	X	X	X	X	X	X	X
5	S5	Not Provided		Soil	L23-Ap0059980	X	X	X	X	X	X	X	X	X	X
6	Dup	Not Provided		Soil	L23-Ap0059981	X	X	X	X	X	X	X	X	X	X
Test Counts						6	6	6	6	6	6	6	6	6	6

eurofins | Environment Testing

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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

Results <10 times the LOR: No Limit

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

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

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
TRH C6-C9	mg/kg	< 20			20	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total*	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
PAH in Soil/Solid							
Naphthalene	mg/kg	< 0.1			0.1	Pass	
2-Methylnaphthalene	mg/kg	< 0.1			0.1	Pass	
Acenaphthylene	mg/kg	< 0.1			0.1	Pass	
Acenaphthene	mg/kg	< 0.1			0.1	Pass	
Fluorene	mg/kg	< 0.1			0.1	Pass	
Phenanthrene	mg/kg	< 0.1			0.1	Pass	
Anthracene	mg/kg	< 0.1			0.1	Pass	
Fluoranthene	mg/kg	< 0.1			0.1	Pass	
Pyrene	mg/kg	< 0.1			0.1	Pass	
Benz(a)anthracene	mg/kg	< 0.2			0.2	Pass	
Chrysene	mg/kg	< 0.2			0.2	Pass	
Benzo(b)fluoranthene	mg/kg	< 0.2			0.2	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.2			0.2	Pass	
Benzo(a)pyrene	mg/kg	< 0.2			0.2	Pass	
Indeno(1.2.3-c.d)pyrene	mg/kg	< 0.2			0.2	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.2			0.2	Pass	
Benzo(ghi)perylene	mg/kg	< 0.2			0.2	Pass	
Method Blank							
Total Organic Carbon	%	< 0.1			0.1	Pass	
Aluminium	mg/kg	< 1			1	Pass	
Antimony	mg/kg	< 2			2	Pass	
Arsenic	mg/kg	< 5			5	Pass	
Cadmium	mg/kg	< 0.1			0.1	Pass	
Chromium	mg/kg	< 1			1	Pass	
Copper	mg/kg	< 1			1	Pass	
Lead	mg/kg	< 1			1	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Manganese	mg/kg	< 1			1	Pass	
Mercury	mg/kg	< 0.02			0.02	Pass	
Nickel	mg/kg	< 1			1	Pass	
Silver	mg/kg	< 1			1	Pass	
Zinc	mg/kg	< 1			1	Pass	
LCS - % Recovery							
TRH C6-C9	%	105			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	105			70-130	Pass	
Toluene	%	104			70-130	Pass	
Ethylbenzene	%	103			70-130	Pass	
m&p-Xylenes	%	108			70-130	Pass	
o-Xylene	%	106			70-130	Pass	
Xylenes - Total*	%	108			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	102			70-130	Pass	
TRH C6-C10	%	84			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C10-C14	%	106			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	97			70-130	Pass	
LCS - % Recovery							
PAH in Soil/Solid							
Naphthalene	%	66			60-120	Pass	
Acenaphthene	%	65			60-120	Pass	
Phenanthrene	%	74			60-120	Pass	
Pyrene	%	104			60-120	Pass	
Chrysene	%	61			60-120	Pass	
LCS - % Recovery							
Total Organic Carbon	%	98			70-130	Pass	
Aluminium	%	108			80-120	Pass	
Antimony	%	110			80-120	Pass	
Arsenic	%	114			80-120	Pass	
Cadmium	%	102			80-120	Pass	
Chromium	%	103			80-120	Pass	
Copper	%	96			80-120	Pass	
Lead	%	103			80-120	Pass	
Manganese	%	95			80-120	Pass	
Mercury	%	83			60-120	Pass	
Nickel	%	104			80-120	Pass	
Silver	%	99			80-120	Pass	
Zinc	%	101			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
TRH C6-C9	L23-My0011531	NCP	%	108			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	L23-My0011531	NCP	%	100			70-130	Pass	
Toluene	L23-My0011531	NCP	%	99			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Ethylbenzene	L23-My0011531	NCP	%	99			70-130	Pass	
m&p-Xylenes	L23-My0011531	NCP	%	106			70-130	Pass	
o-Xylene	L23-My0011531	NCP	%	104			70-130	Pass	
Xylenes - Total*	L23-My0011531	NCP	%	105			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	L23-My0011531	NCP	%	107			70-130	Pass	
TRH C6-C10	L23-My0011531	NCP	%	175			70-130	Fail	Q08
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	L23-My0003791	NCP	%	99			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	L23-My0003791	NCP	%	91			70-130	Pass	
Spike - % Recovery									
				Result 1					
Arsenic	L23-Ap0057041	NCP	%	82			80-120	Pass	
Cadmium	L23-My0001219	NCP	%	78			80-120	Fail	Q08
Chromium	L23-Ap0057041	NCP	%	101			80-120	Pass	
Copper	L23-Ap0057041	NCP	%	91			80-120	Pass	
Lead	L23-Ap0057041	NCP	%	134			80-120	Fail	Q08
Mercury	L23-My0001219	NCP	%	84			80-120	Pass	
Nickel	L23-Ap0057041	NCP	%	95			80-120	Pass	
Zinc	L23-Ap0057041	NCP	%	91			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
TRH C6-C9	L23-My0001766	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	L23-My0001766	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	L23-My0001766	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	L23-My0001766	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	L23-My0001766	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	L23-My0001766	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	L23-My0001766	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	L23-My0001766	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	L23-My0001766	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	L23-My0011177	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	L23-My0011177	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	L23-My0011177	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	L23-My0011177	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	L23-My0011177	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	L23-My0011177	NCP	mg/kg	< 100	< 100	<1	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
Aluminium	L23-My0001769	NCP	mg/kg	2100	2200	1.8	20%	Pass	
Antimony	L23-My0001769	NCP	mg/kg	< 2	< 2	<1	20%	Pass	Q15
Arsenic	L23-My0001769	NCP	mg/kg	11	9.1	21	20%	Fail	
Cadmium	L23-My0001769	NCP	mg/kg	< 0.1	< 0.1	<1	20%	Pass	
Chromium	L23-My0001769	NCP	mg/kg	25	25	1.9	20%	Pass	
Copper	L23-My0001769	NCP	mg/kg	6.2	6.0	2.8	20%	Pass	
Lead	L23-My0001769	NCP	mg/kg	3.4	3.1	8.4	20%	Pass	
Manganese	L23-My0001769	NCP	mg/kg	40	41	1.5	20%	Pass	
Mercury	L23-My0001769	NCP	mg/kg	< 0.02	< 0.02	<1	30%	Pass	
Nickel	L23-My0001769	NCP	mg/kg	9.1	8.9	2.7	20%	Pass	
Silver	L23-My0001769	NCP	mg/kg	< 1	< 1	<1	20%	Pass	
Zinc	L23-My0001769	NCP	mg/kg	5.2	5.3	1.2	20%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	L23-Ja0011346	NCP	%	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Organic Carbon	L23-Ap0059979	CP	%	9.3	9.2	<1	30%	Pass	

Comments

Analysis of organotins has been completed by Envirolabs MPL, NATA Accreditation Number 2901, report reference PEE0460

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Kim Rodgers	Analytical Services Manager
Sean Sangster	Senior Analyst-Metal
Sean Sangster	Senior Analyst-Sample Properties
John Horwood	Senior Analyst-Volatile
Mary Makarios	Senior Analyst-Inorganic
Paul Nottle	Senior Analyst-Organic
Patrick Patfield	Senior Analyst-Volatile
Patrick Patfield	Senior Analyst-Organic

Kim Rodgers
Business Unit Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request

Envirolab Services (WA) Pty Ltd trading as MPL Laboratories
ABN 53 140 099 207
16-18 Hayden Court Myaree WA 6154
ph +61 8 9317 2505 fax +61 8 9317 4163
lab@mpl.com.au
www.mpl.com.au

Certificate of Analysis PEF0492

Client Details

Client	Eurofins ARL Pty Ltd
Contact	Reports
Address	46-48 Banksia Rd, Welshpool, WA, 6106

Sample Details

Your Reference	996669
Number of Samples	7 Soil
Date Samples Received	08/06/2023
Date Samples Registered	08/06/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	19/06/2023
Date of Issue	16/06/2023

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Huong Patfield, Organics Chemist Todd Lee, Group Operations Manager
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEF0492

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PEF0492-01	996669 23-Jn0016006 G1	Soil	02/06/2023	08/06/2023
PEF0492-02	996669 23-Jn0016007 G2	Soil	02/06/2023	08/06/2023
PEF0492-03	996669 23-Jn0016008 G3	Soil	02/06/2023	08/06/2023
PEF0492-04	996669 23-Jn0016009 G4	Soil	02/06/2023	08/06/2023
PEF0492-05	996669 23-Jn0016010 G5	Soil	02/06/2023	08/06/2023
PEF0492-06	996669 23-Jn0016011 G6	Soil	02/06/2023	08/06/2023
PEF0492-07	996669 23-Jn0016012 DUP	Soil	02/06/2023	08/06/2023

Certificate of Analysis PEF0492

Organometallics (Soil)

Envirolab ID	Units	PQL	PEF0492-01	PEF0492-02	PEF0492-03	PEF0492-04	PEF0492-05
Your Reference			996669 23-Jn0016006 G1	996669 23-Jn0016007 G2	996669 23-Jn0016008 G3	996669 23-Jn0016009 G4	996669 23-Jn0016010 G5
Date Sampled			02/06/2023	02/06/2023	02/06/2023	02/06/2023	02/06/2023
Monobutyltin as Sn	µg/kg	20	<20	<20	<40 [2]	<20	<20
Dibutyltin as Sn	µg/kg	0.50	<0.50	<0.50	<1.0 [2]	<0.50	<0.50
Tributyltin as Sn	µg/kg	0.50	<0.50	<0.50	<1.0 [2]	<0.50	<0.50
Surrogate Triphenyltin	%		*103*	*114*	*109*	*104*	*114*

Envirolab ID	Units	PQL	PEF0492-06	PEF0492-07
Your Reference			996669 23-Jn0016011 G6	996669 23-Jn0016012 DUP
Date Sampled			02/06/2023	02/06/2023
Monobutyltin as Sn	µg/kg	20	<20	<20
Dibutyltin as Sn	µg/kg	0.50	<0.50	<0.50
Tributyltin as Sn	µg/kg	0.50	<0.50	<0.50
Surrogate Triphenyltin	%		*89.4*	*102*

Certificate of Analysis PEF0492

Inorganics - Moisture (Soil)

Envirolab ID	Units	PQL	PEF0492-01	PEF0492-02	PEF0492-03	PEF0492-04	PEF0492-05
Your Reference			996669 23-Jn0016006 G1	996669 23-Jn0016007 G2	996669 23-Jn0016008 G3	996669 23-Jn0016009 G4	996669 23-Jn0016010 G5
Date Sampled			02/06/2023	02/06/2023	02/06/2023	02/06/2023	02/06/2023
Moisture	%	0.10	33	27	43	24	29

Envirolab ID	Units	PQL	PEF0492-06	PEF0492-07
Your Reference			996669 23-Jn0016011 G6	996669 23-Jn0016012 DUP
Date Sampled			02/06/2023	02/06/2023
Moisture	%	0.10	29	24

Result Comments

Identifier	Description
[2]	PQL(s) has/have been raised due to the high moisture content in the sample, resulting in a higher effective dilution factor.

Method Summary

Method ID	Methodology Summary
INORG-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
ORG-025_TBT_S	Determination of Organometallic Compounds by derivatisation and analysis by GC-MS-MS.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PEF0492

Client Details

Client	Eurofins ARL Pty Ltd
Your Reference	996669
Date Issued	16/06/2023

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	No	Matrix Spike Outliers Exist - See detailed list below
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEF0492

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Organotins | Soil	1-7	02/06/2023	13/06/2023	15/06/2023	Yes
Moisture | Soil	1-7	02/06/2023	13/06/2023	14/06/2023	Yes

Outliers: Matrix Spike

ORG-025_TBT_S\|Organometallics (Soil)\| Batch BEF1343

Sample ID	Analyte	% Limits	% Recovery
PEF0492-02	Tributyltin	60 - 140	41.7[1]

Quality Control PEF0492

ORG-025_TBT_S|Organometallics (Soil) | Batch BEF1343

Analyte	Units	PQL	Blank	DUP1 PEF0492-01 Samp | QC | RPD %	LCS %	Spike % PEF0492-02
Monobutyltin	µg/kg	20		<20 | <20 | [NA]	[NA]	[NA]
Monobutyltin as Sn	µg/kg	20	<20	<20 | <20 | [NA]	[NA]	[NA]
Dibutyltin	µg/kg	0.5		<0.50 | <0.50 | [NA]	93.4	84.9
Dibutyltin as Sn	µg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	[NA]	[NA]
Tributyltin	µg/kg	0.5		<0.50 | <0.50 | [NA]	128	41.7[1]
Tributyltin as Sn	µg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	[NA]	[NA]
Surrogate Triphenyltin	*%*		*102*	*103 | 105*	*102*	*111*

INORG-008|Inorganics - Moisture (Soil) | Batch BEF1342

Analyte	Units	PQL	Blank	DUP1 PEF0492-01 Samp | QC | RPD %	LCS %
Moisture	%	0.1		33.5 | 34.4 | 2.83	[NA]

QC Comments

Identifier	Description
[1]	Spike recovery is outside routine acceptance criteria (60-140%). Where recoveries of <20% and >200% are attributable to matrix interference effects, there will be a high uncertainty associated with the parent result.

O2 Marine
Suite 2, 4B Mews Rd
Fremantle
WA 6160

Attention: **Josh Abbott**

Report **996669-S**
Project name BCI MARDIE PROJECT
Project ID 23ENV143
Received Date Jun 06, 2023

Client Sample ID			**G1**	**G2**	**G3**	**G4**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**L23-Jn0016006**	**L23-Jn0016007**	**L23-Jn0016008**	**L23-Jn0016009**
Date Sampled			**Jun 02, 2023**	**Jun 02, 2023**	**Jun 02, 2023**	**Jun 02, 2023**
Test/Reference	LOR	Unit				
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
BTEX						
4-Bromofluorobenzene (surr.)	1	%	87	94	67	64
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C10-C14	20	mg/kg	29	< 20	< 20	24
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			G1	G2	G3	G4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			L23-Jn0016006	L23-Jn0016007	L23-Jn0016008	L23-Jn0016009
Date Sampled			Jun 02, 2023	Jun 02, 2023	Jun 02, 2023	Jun 02, 2023
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	61	93	85	84
p-Terphenyl-d14 (surr.)	1	%	80	109	100	95
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	< 100
Total Organic Carbon	0.1	%	5.6	1.3	0.5	3.2
Aluminium	1	mg/kg	2200	1800	2800	1900
Antimony	2	mg/kg	< 2	< 2	< 2	< 2
Arsenic	5	mg/kg	< 5	< 5	5.2	< 5
Cadmium	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Chromium	1	mg/kg	4.9	3.3	9.5	1.4
Copper	1	mg/kg	< 1	< 1	1.8	< 1
Lead	1	mg/kg	1.0	< 1	1.8	< 1
Manganese	1	mg/kg	52	49	79	32
Mercury	0.02	mg/kg	< 0.02	< 0.02	< 0.02	< 0.02
Nickel	1	mg/kg	1.9	1.3	3.6	< 1
Silver	1	mg/kg	< 1	< 1	< 1	< 1
Zinc	1	mg/kg	1.6	< 1	3.5	< 1
Organotins			See attached	See attached	See attached	See attached
Sample Properties						
% Moisture	1	%	34	26	40	23

Client Sample ID			G5	G6	DUP
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			L23-Jn0016010	L23-Jn0016011	L23-Jn0016012
Date Sampled			Jun 02, 2023	Jun 02, 2023	Jun 02, 2023
Test/Reference	LOR	Unit			
TRH C6-C9	20	mg/kg	< 20	< 20	< 20
BTEX					
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3
BTEX					
4-Bromofluorobenzene (surr.)	1	%	79	65	64

Client Sample ID			G5	G6	DUP
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			L23-Jn0016010	L23-Jn0016011	L23-Jn0016012
Date Sampled			Jun 02, 2023	Jun 02, 2023	Jun 02, 2023
Test/Reference	LOR	Unit			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20
Total Recoverable Hydrocarbons - 1999 NEPM Fractions					
TRH C10-C14	20	mg/kg	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50	< 50
Polycyclic Aromatic Hydrocarbons					
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	92	86	92
p-Terphenyl-d14 (surr.)	1	%	114	114	105
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100
Total Organic Carbon	0.1	%	< 0.1	4.3	< 0.1
Aluminium	1	mg/kg	1800	1300	1700
Antimony	2	mg/kg	< 2	< 2	< 2
Arsenic	5	mg/kg	< 5	< 5	< 5
Cadmium	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Chromium	1	mg/kg	1.9	1.3	1.8
Copper	1	mg/kg	< 1	< 1	< 1
Lead	1	mg/kg	< 1	< 1	< 1
Manganese	1	mg/kg	43	44	47
Mercury	0.02	mg/kg	< 0.02	< 0.02	< 0.02
Nickel	1	mg/kg	< 1	< 1	< 1

Client Sample ID			G5	G6	DUP
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**L23-Jn0016010**	**L23-Jn0016011**	**L23-Jn0016012**
Date Sampled			**Jun 02, 2023**	**Jun 02, 2023**	**Jun 02, 2023**
Test/Reference	LOR	Unit			
Silver	1	mg/kg	< 1	< 1	< 1
Zinc	1	mg/kg	< 1	< 1	< 1
Organotins			See attached	See attached	See attached
Sample Properties					
% Moisture	1	%	27	24	23

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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

Description	Testing Site	Extracted	Holding Time
BTEX	Welshpool	Jun 09, 2023	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	Jun 09, 2023	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Welshpool	Jun 07, 2023	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Welshpool	Jun 09, 2023	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	Jun 09, 2023	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Organic Carbon	Melbourne	Jun 13, 2023	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
Aluminium	Welshpool	Jun 09, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Antimony	Welshpool	Jun 09, 2023	180 Day
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Manganese	Welshpool	Jun 09, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Silver	Welshpool	Jun 09, 2023	180 Days
- Method: ARL030 - Metals in Soil and Sediment by AAS			
Arsenic	Welshpool	Jun 09, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Cadmium	Welshpool	Jun 09, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Chromium	Welshpool	Jun 09, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Copper	Welshpool	Jun 09, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Lead	Welshpool	Jun 09, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Mercury	Welshpool	Jun 09, 2023	28 Days
- Method: ARL No. 406 - Mercury by Cold Vapour Atomic Absorption Spectrophotometry			
Nickel	Welshpool	Jun 09, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
Zinc	Welshpool	Jun 09, 2023	180 Days
- Method: ARL401/403 - Metals in Soil and Sediment by ICPOES/MS			
% Moisture	Welshpool	Jun 07, 2023	14 Days
- Method: ARL135 Moisture in Solids			

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898
Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521
Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

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

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954
Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 4551
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: +64 3 343 5201
IANZ# 1290

Company Name: O2 Marine
Address: Suite 2, 4B Mews Rd
Fremantle
WA 6160

Project Name: BCI MARDIE PROJECT
Project ID: 23ENV143

Order No.:
Report #: 996669
Phone:
Fax:

Received: Jun 6, 2023 4:15 PM
Due: Jun 15, 2023
Priority: 7 Day
Contact Name: Josh Abbott

Eurofins Analytical Services Manager : Andrew Harvey

Sample Detail						Aluminium	Antimony	Manganese	Organotins	Silver	Total Organic Carbon	Moisture Set	Eurofins Suite B4	Metals M8 Soil
Perth Laboratory - NATA # 2377 Site # 2370						X	X	X		X		X	X	X
Melbourne Laboratory - NATA # 1261 Site # 1254											X			
External Laboratory									X					
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**									
1	G1	Jun 02, 2023		Soil	L23-Jn0016006	X	X	X	X	X	X	X	X	X
2	G2	Jun 02, 2023		Soil	L23-Jn0016007	X	X	X	X	X	X	X	X	X
3	G3	Jun 02, 2023		Soil	L23-Jn0016008	X	X	X	X	X	X	X	X	X
4	G4	Jun 02, 2023		Soil	L23-Jn0016009	X	X	X	X	X	X	X	X	X
5	G5	Jun 02, 2023		Soil	L23-Jn0016010	X	X	X	X	X	X	X	X	X
6	G6	Jun 02, 2023		Soil	L23-Jn0016011	X	X	X	X	X	X	X	X	X
7	DUP	Jun 02, 2023		Soil	L23-Jn0016012	X	X	X	X	X	X	X	X	X
Test Counts						7	7	7	7	7	7	7	7	7

eurofins | Environment Testing

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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

Results <10 times the LOR: No Limit

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

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

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

eurofins | ARL

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
TRH C6-C9	mg/kg	< 20			20	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total*	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Total Organic Carbon	%	< 0.1			0.1	Pass	
Aluminium	mg/kg	< 1			1	Pass	
Antimony	mg/kg	< 2			2	Pass	
Arsenic	mg/kg	< 5			5	Pass	
Cadmium	mg/kg	< 0.1			0.1	Pass	
Chromium	mg/kg	< 1			1	Pass	
Copper	mg/kg	< 1			1	Pass	
Lead	mg/kg	< 1			1	Pass	
Manganese	mg/kg	< 1			1	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Mercury	mg/kg	< 0.02			0.02	Pass	
Nickel	mg/kg	< 1			1	Pass	
Silver	mg/kg	< 1			1	Pass	
Zinc	mg/kg	< 1			1	Pass	
LCS - % Recovery							
TRH C6-C9	%	112			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	92			70-130	Pass	
Toluene	%	115			70-130	Pass	
Ethylbenzene	%	105			70-130	Pass	
m&p-Xylenes	%	106			70-130	Pass	
o-Xylene	%	106			70-130	Pass	
Xylenes - Total*	%	106			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	88			70-130	Pass	
TRH C6-C10	%	100			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C10-C14	%	104			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	105			70-130	Pass	
Acenaphthylene	%	109			70-130	Pass	
Anthracene	%	94			70-130	Pass	
Benz(a)anthracene	%	93			70-130	Pass	
Benzo(a)pyrene	%	105			70-130	Pass	
Benzo(b&j)fluoranthene	%	112			70-130	Pass	
Benzo(g.h.i)perylene	%	104			70-130	Pass	
Benzo(k)fluoranthene	%	116			70-130	Pass	
Chrysene	%	93			70-130	Pass	
Dibenz(a.h)anthracene	%	103			70-130	Pass	
Fluoranthene	%	93			70-130	Pass	
Fluorene	%	99			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	85			70-130	Pass	
Naphthalene	%	106			70-130	Pass	
Phenanthrene	%	94			70-130	Pass	
Pyrene	%	93			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	94			70-130	Pass	
LCS - % Recovery							
Total Organic Carbon	%	98			70-130	Pass	
Aluminium	%	84			80-120	Pass	
Antimony	%	112			80-120	Pass	
Arsenic	%	120			80-120	Pass	
Cadmium	%	111			80-120	Pass	
Chromium	%	105			80-120	Pass	
Copper	%	104			80-120	Pass	
Lead	%	114			80-120	Pass	
Manganese	%	91			80-120	Pass	
Mercury	%	117			60-120	Pass	
Nickel	%	103			80-120	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Silver	%	100			80-120	Pass	
Zinc	%	120			80-120	Pass	
CRM - % Recovery							
TRH C6-C9	%	95			70-130	Pass	
CRM - % Recovery							
BTEX							
Benzene	%	93			70-130	Pass	
Toluene	%	104			70-130	Pass	
Ethylbenzene	%	102			70-130	Pass	
m&p-Xylenes	%	109			70-130	Pass	
o-Xylene	%	105			70-130	Pass	
Xylenes - Total*	%	108			70-130	Pass	
CRM - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	97			70-130	Pass	
TRH C6-C10	%	87			70-130	Pass	
CRM - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	92			70-130	Pass	
TRH >C34-C40	%	100			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
TRH C6-C9	L23-My0067460	NCP	%	118			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	L23-My0067460	NCP	%	96			70-130	Pass	
Toluene	L23-My0067460	NCP	%	99			70-130	Pass	
Ethylbenzene	L23-My0067460	NCP	%	101			70-130	Pass	
m&p-Xylenes	L23-My0067460	NCP	%	105			70-130	Pass	
o-Xylene	L23-My0067460	NCP	%	98			70-130	Pass	
Xylenes - Total*	L23-My0067460	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	L23-My0067460	NCP	%	96			70-130	Pass	
TRH C6-C10	L23-My0067460	NCP	%	88			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	L23-My0067463	NCP	%	107			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	L23-My0067463	NCP	%	100			70-130	Pass	
Acenaphthylene	L23-My0067463	NCP	%	106			70-130	Pass	
Anthracene	L23-My0067463	NCP	%	91			70-130	Pass	
Benz(a)anthracene	L23-My0067463	NCP	%	92			70-130	Pass	
Benzo(a)pyrene	L23-My0067463	NCP	%	91			70-130	Pass	
Benzo(b&j)fluoranthene	L23-My0067463	NCP	%	93			70-130	Pass	
Benzo(g.h.i)perylene	L23-My0067463	NCP	%	52			70-130	Fail	Q08
Benzo(k)fluoranthene	L23-My0067463	NCP	%	92			70-130	Pass	
Chrysene	L23-My0067463	NCP	%	92			70-130	Pass	
Dibenz(a.h)anthracene	L23-My0067463	NCP	%	54			70-130	Fail	Q08
Fluoranthene	L23-My0067463	NCP	%	94			70-130	Pass	
Fluorene	L23-My0067463	NCP	%	97			70-130	Pass	
Indeno(1.2.3-cd)pyrene	L23-My0067463	NCP	%	103			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Naphthalene	L23-My0067463	NCP	%	99			70-130	Pass	
Phenanthrene	L23-My0067463	NCP	%	95			70-130	Pass	
Pyrene	L23-My0067463	NCP	%	93			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	L23-My0067463	NCP	%	106			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
TRH C6-C9	L23-My0067469	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	L23-My0067469	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	L23-My0067469	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	L23-My0067469	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	L23-My0067469	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	L23-My0067469	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	L23-My0067469	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	L23-My0067469	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	L23-My0067469	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	L23-Jn0016006	CP	mg/kg	29	< 20	<1	30%	Pass	
TRH C15-C28	L23-Jn0016006	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	L23-Jn0016006	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	L23-My0067467	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	L23-Jn0016006	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	L23-Jn0016006	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	L23-Jn0016006	CP	mg/kg	< 100	< 100	<1	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
Total Organic Carbon	M23-Jn0014645	NCP	%	8.0	4.5	56	30%	Fail	Q15
Aluminium	L23-My0067437	NCP	mg/kg	2000	2000	1.0	20%	Pass	
Antimony	L23-My0067437	NCP	mg/kg	< 2	< 2	<1	20%	Pass	
Arsenic	L23-My0067437	NCP	mg/kg	< 5	< 5	<1	20%	Pass	
Cadmium	L23-My0067437	NCP	mg/kg	< 0.1	< 0.1	<1	20%	Pass	
Chromium	L23-My0067437	NCP	mg/kg	150	170	6.5	20%	Pass	
Copper	L23-My0067437	NCP	mg/kg	12	14	12	20%	Pass	
Lead	L23-My0067437	NCP	mg/kg	< 1	1.1	9.3	20%	Pass	
Manganese	L23-My0067437	NCP	mg/kg	690	750	8.6	20%	Pass	
Mercury	L23-My0067437	NCP	mg/kg	< 0.02	< 0.02	<1	30%	Pass	
Nickel	L23-My0067437	NCP	mg/kg	12	13	4.1	20%	Pass	
Silver	L23-My0067437	NCP	mg/kg	< 1	< 1	<1	20%	Pass	
Zinc	L23-My0067437	NCP	mg/kg	7.1	7.9	9.7	20%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	L23-Jn0015694	NCP	%	16	17	5.8	30%	Pass	

Comments

Analysis of organotins has been completed by MPL, NATA Accreditation Number 2901, report reference PEF0492 (See attached)

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	N/A
Samples received within HoldingTime	Yes
Some samples have been subcontracted	Yes

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Andrew Harvey	Analytical Services Manager
Douglas Todd	Senior Analyst-Sample Properties
Mary Makarios	Senior Analyst-Inorganic
Patrick Patfield	Senior Analyst-Organic
Patrick Patfield	Senior Analyst-Volatile
Sean Sangster	Senior Analyst-Metal

Kim Rodgers
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request

CERTIFICATE OF ANALYSIS

Work Order	: **EP2305439**	Page	: 1 of 6
Client	: **WA MARINE PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: JOSH ABBOTT	Contact	: Lauren Ockwell
Address	: SUITE 5, 5/18 GRIFFON DRIVE PO BOX 1370 DUNSBOROUGH, PERTH WA, AUSTRALIA 6281	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: 08 9406 1308
Project	: 23ENV143 BCI Mardie Project	Date Samples Received	: 27-Apr-2023 13:00
Order number	: ----	Date Analysis Commenced	: 01-May-2023
C-O-C number	: ----	Issue Date	: 08-May-2023 14:39
Sampler	: ADAM GARTNER		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- 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*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Morgan Lennox	Senior Organic Chemist	Brisbane Organics, Stafford, QLD
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA
Vincent Emerton-Bell	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW

General Comments

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

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

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

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

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

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

- TOC and TBT conducted by ALS Brisbane, NATA Site No. 818.
- PSD conducted by ALS Newcastle, NATA accreditation no. 825, site no 1656.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	Trip	----	----	----	----
			Sampling date / time	24-Apr-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2305439-001	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**38.5**	----	----	----	----
EA150: Particle Sizing								
+75µm	----	1	%	**65**	----	----	----	----
+150µm	----	1	%	**31**	----	----	----	----
+300µm	----	1	%	**22**	----	----	----	----
+425µm	----	1	%	**18**	----	----	----	----
+600µm	----	1	%	**14**	----	----	----	----
+1180µm	----	1	%	**10**	----	----	----	----
+2.36mm	----	1	%	**6**	----	----	----	----
+4.75mm	----	1	%	<1	----	----	----	----
+9.5mm	----	1	%	<1	----	----	----	----
+19.0mm	----	1	%	<1	----	----	----	----
+37.5mm	----	1	%	<1	----	----	----	----
+75.0mm	----	1	%	<1	----	----	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	**12**	----	----	----	----
Silt (2-60 µm)	----	1	%	**21**	----	----	----	----
Sand (0.06-2.00 mm)	----	1	%	**60**	----	----	----	----
Gravel (>2mm)	----	1	%	**7**	----	----	----	----
Cobbles (>6cm)	----	1	%	<1	----	----	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	**2.54**	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**2630**	----	----	----	----
Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----
Manganese	7439-96-5	5	mg/kg	**102**	----	----	----	----
Silver	7440-22-4	2	mg/kg	<2	----	----	----	----
Arsenic	7440-38-2	5	mg/kg	**5**	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**19**	----	----	----	----
Copper	7440-50-8	5	mg/kg	<5	----	----	----	----
Lead	7439-92-1	5	mg/kg	<5	----	----	----	----
Nickel	7440-02-0	2	mg/kg	**7**	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**8**	----	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	Trip	----	----	----	----
			Sampling date / time	24-Apr-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2305439-001	--------	--------	--------	--------
				Result	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**0.33**	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	Trip	----	----	----	----
				Sampling date / time	24-Apr-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2305439-001	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**67.2**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**100**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**96.4**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**107**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**106**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		**84.7**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**68.4**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		**70.7**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		**67.8**	----	----	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		**99.6**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	57	119
2-Chlorophenol-D4	93951-73-6	52	130
2.4.6-Tribromophenol	118-79-6	40	132
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	53	139
Anthracene-d10	1719-06-8	68	124
4-Terphenyl-d14	1718-51-0	66	132
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	63	132
Toluene-D8	2037-26-5	66	125
4-Bromofluorobenzene	460-00-4	60	124
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EP003: Total Organic Carbon (TOC) in Soil

(SOIL) EP090: Organotin Compounds

(SOIL) EP090S: Organotin Surrogate

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA150: Soil Classification based on Particle Size

(SOIL) EA150: Particle Sizing

(SOIL) EA152: Soil Particle Density

Certificate of Analysis

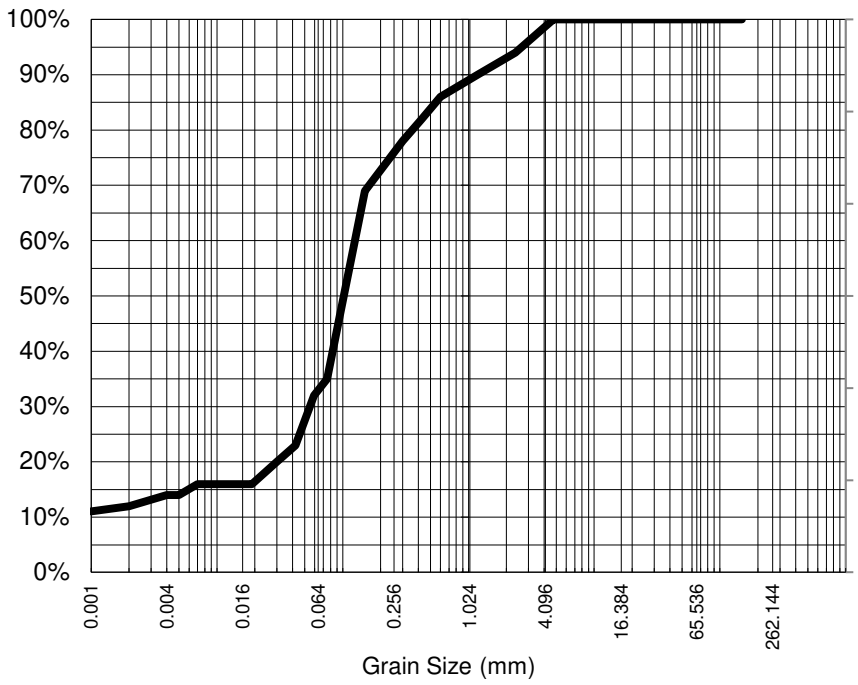
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	JOSH ABBOTT	**DATE REPORTED:**	5-May-2023
COMPANY:	WA MARINE PTY LTD	**DATE RECEIVED:**	27-Apr-2023
ADDRESS:	Suite 5, 5/18 Griffon Drive Po Box 1370 Dunsborough, Perth Wa, Australia	**REPORT NO:**	EP2305439-001 / PSD
PROJECT:	23ENV143 BCI Mardie Project	**SAMPLE ID:**	Trip

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	94%
1.18	90%
0.600	86%
0.425	82%
0.300	78%
0.150	69%
0.075	35%
Particle Size (microns)	
42	23%
30	20%
19	16%
14	16%
10	16%
7	16%
5	14%
4	14%
1	11%

Median Particle Size (mm)*	0.108

Analysis Notes

Samples analysed as received.

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

Sample Comments:

Analysed: 2-May-23

Loss on Pretreatment NA

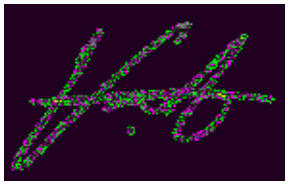
Limit of Reporting: 1%

Sample Description: SAND, FINES, GRAVEL

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.54



NATA Accreditation: 825 Site: Newcastle
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA
WORLD RECOGNISED ACCREDITATION

Vincent Emerton-Bell
Laboratory Analyst
Authorised Signatory

CERTIFICATE OF ANALYSIS

Work Order	: **EP2307704**	Page	: 1 of 6
Client	: **WA MARINE PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: JOSH ABBOTT	Contact	: Lauren Ockwell
Address	: SUITE 5, 5/18 GRIFFON DRIVE PO BOX 1370 DUNSBOROUGH, PERTH WA, AUSTRALIA 6281	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: 08 9406 1308
Project	: 23ENV143 BCI Mardie Project	Date Samples Received	: 06-Jun-2023 16:15
Order number	: ----	Date Analysis Commenced	: 13-Jun-2023
C-O-C number	: ----	Issue Date	: 21-Jun-2023 16:57
Sampler	: JOSH ABBOTT		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- 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*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA
Timothy Creagh	Senior Chemist - Organics	Brisbane Organics, Stafford, QLD
Vincent Emerton-Bell	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW

General Comments

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

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

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

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

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

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

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	T1	----	----	----	----
			Sampling date / time	02-Jun-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2307704-001	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**23.8**	----	----	----	----
EA150: Particle Sizing								
+75µm	----	1	%	**88**	----	----	----	----
+150µm	----	1	%	**85**	----	----	----	----
+300µm	----	1	%	**82**	----	----	----	----
+425µm	----	1	%	**78**	----	----	----	----
+600µm	----	1	%	**73**	----	----	----	----
+1180µm	----	1	%	**51**	----	----	----	----
+2.36mm	----	1	%	**22**	----	----	----	----
+4.75mm	----	1	%	**2**	----	----	----	----
+9.5mm	----	1	%	<1	----	----	----	----
+19.0mm	----	1	%	<1	----	----	----	----
+37.5mm	----	1	%	<1	----	----	----	----
+75.0mm	----	1	%	<1	----	----	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	**6**	----	----	----	----
Silt (2-60 µm)	----	1	%	**6**	----	----	----	----
Sand (0.06-2.00 mm)	----	1	%	**57**	----	----	----	----
Gravel (>2mm)	----	1	%	**31**	----	----	----	----
Cobbles (>6cm)	----	1	%	<1	----	----	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	**2.55**	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**4460**	----	----	----	----
Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----
Manganese	7439-96-5	5	mg/kg	**636**	----	----	----	----
Silver	7440-22-4	2	mg/kg	<2	----	----	----	----
Arsenic	7440-38-2	5	mg/kg	**42**	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**22**	----	----	----	----
Copper	7440-50-8	5	mg/kg	**8**	----	----	----	----
Lead	7439-92-1	5	mg/kg	<5	----	----	----	----
Nickel	7440-02-0	2	mg/kg	**10**	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**12**	----	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	T1	----	----	----	----
			Sampling date / time	02-Jun-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2307704-001	--------	--------	--------	--------
				Result	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**0.22**	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	T1	----	----	----	----
				Sampling date / time	02-Jun-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2307704-001	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		117	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		117	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		125	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		127	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		118	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		128	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		75.6	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		66.2	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		77.7	----	----	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		105	----	----	----	----

Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	57	119
2-Chlorophenol-D4	93951-73-6	52	130
2.4.6-Tribromophenol	118-79-6	40	132
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	53	139
Anthracene-d10	1719-06-8	68	124
4-Terphenyl-d14	1718-51-0	66	132
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	63	132
Toluene-D8	2037-26-5	66	125
4-Bromofluorobenzene	460-00-4	60	124
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EP090: Organotin Compounds

(SOIL) EP090S: Organotin Surrogate

(SOIL) EP003: Total Organic Carbon (TOC) in Soil

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA150: Soil Classification based on Particle Size

(SOIL) EA150: Particle Sizing

(SOIL) EA152: Soil Particle Density