

<b>Subject</b>	Onslow Recreational Jetty Sediment Sampling Report		
<b>Date</b>	05/08/2024	<b>Reference</b>	23ENV236 / T240190
<b>To</b>	Drew Brentnall	<b>Email</b>	dbrentnall@burburyconsulting.com.au
<b>From</b>	Sean Webb-Martin	<b>Email</b>	sean.webbmartin@o2marine.com.au

## 1. Introduction

### 1.1. Project Description

The Shire of Ashburton propose to build the new Onslow Recreational Jetty (the Project) at Beadon Point, northwest of the main township of Onslow, Western Australia (WA). The regional location, sediment sampling area and an indicative Development Envelope (DE) is shown in Figure 1. The proposed jetty will be a pedestrian accessible fixed jetty design, intended to provide access for deeper water fishing at low tide, with usage limited to walking and recreational fishing with no vehicle or vessel access (except for ad-hoc maintenance vehicles/vessels).

### 1.2. Purpose

O2 Marine were engaged by Burbury Consulting Pty Ltd (Burbury) to conduct marine sediment sampling to support the Projects approvals/EIA process and to assess potential contaminant levels of sediment that may be disturbed as a result of piling and jetty construction. The purpose of this document is to present results derived from the sediment sampling investigation completed between 8 and 9 June 2024.

## 2. Methods

### 2.1. Site Locations and Sample Collection

A total of 7 randomly positioned sediment samples were collected during the field survey, along with a further 2 samples collected for quality assurance and control within the proposed DE. Samples were collected using a Van Veen sediment grab (vessel-based) or via shore-based scrape. They were then labelled, stored and delivered to a NATA accredited laboratory in accordance with sample collection procedures established within the National Assessment Guidelines for Dredging (NAGD, 2009). Sampling site co-ordinates, dates and methods can be in Table 1 and sampling locations are presented in Figure 1.

Table 1: Sediment site co-ordinates (Datum: GDA94)

Site	Date	Method	Latitude (GDA94)	Longitude (GDA94)
01	09/06/2024	Vessel-based Van Veen Grab	21.62897° S	115.10877° E
02	08/06/2024	Shore-based Sediment Scrape	21.62894° S	115.10842° E
03	09/06/2024	Vessel-based Van Veen Grab	21.62913° S	115.10825° E
04	09/06/2024	Vessel-based Van Veen Grab	21.62908° S	115.10843° E
05	09/06/2024	Vessel-based Van Veen Grab	21.63118° S	115.10921° E
06	08/06/2024	Shore-based Sediment Scrape	21.63098° S	115.10876° E
07	08/06/2024	Shore-based Sediment Scrape	21.63071° S	115.10925° E

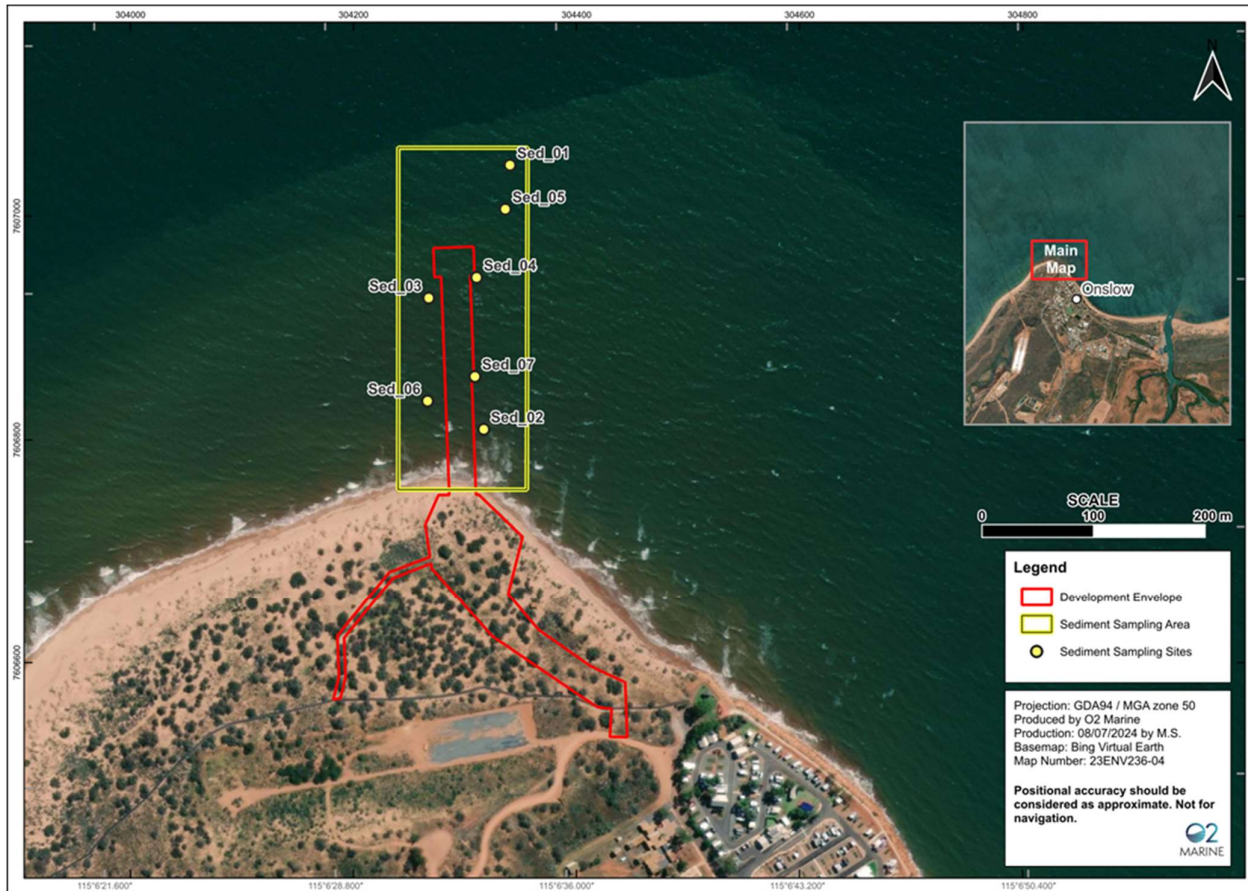


Figure 1: Project Area

## 2.2. Sample Analysis

Samples were transported to laboratory ALS (NATA Accreditation No. 825) for analysis. Samples were packaged and transported with a Chain of Custody (CoC) identifying sample details and analysis (Appendix A). All samples were analysed for the following analytes:

- Metals (Al, As, Cd, Cr (III/VI), Co, Cu, Fe, Hg, Pb, Mn, Ni);
- Particle Size Distribution (PSD)
- Total Organic Carbon (TOC)
- Moisture Content
- Potential Acid Sulphate Soils (PASS)

Laboratory certificates of analysis and quality control reports are presented in Appendix B and field sheets are presented in Appendix C.

## 2.3. Data Analysis

### 2.3.1. Metals

The metals results were compared to the Default Guideline Values (DGVs) defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018), which align with the recommended interim sediment quality guidelines (ISQG) screening levels in the NAGD (2009). Where DGVs do not exist, results were compared to available baseline concentrations.

### 2.3.2. PASS

PASS were determined by utilising the guidelines established in DER (2015), where three combining factors are considered in determining whether the sediment sample is characterised as having a 'positive field sulphide identification'. These three factors are described below:

1. A reaction with hydrogen peroxide as classified in DER (2015) – this reaction should be rated e.g. L = low reaction, M = medium reaction, H = high reaction, X = extreme reaction, V = volcanic reaction. The strength of the reaction with peroxide is a useful indicator but cannot be used alone.
2. The actual value of  $pH_{FOX}$ . If the  $pH_{FOX} < 3$ , and a significant reaction occurred, then it strongly indicates PASS.
3. A much lower  $pH_{FOX}$  than field  $pH_F$ . The lower the final  $pH_{FOX}$  value and the greater the difference between the  $pH_{FOX}$  compared to the  $pH_F$ , the more indicative of the presence of PASS.

Of these three factors, the final  $pH_{FOX}$  value is the most conclusive indicator, and the lower the final  $pH_{FOX}$ , the more confident one can be that PASS may be present.

## 2.4. Quality Assurance and Quality Control (QA/QC)

### 2.4.1. QA/QC Assessment

One field split comprised a thoroughly mixed sample split into three subsamples. Two of the samples were used to test intra-laboratory variation as per NAGD (2009) requirements as follows:

The precision of the sediment analyses were determined by quantifying the differences between the concentrations of analytes in the QA/QC samples using the method outlined in NAGD (2009) detailed below. The relative percent difference (RPD) is used to measure the representativeness and precision of duplicate/split sample results, and shall be calculated for analyte concentrations in the sample splits (both inter-laboratory and intra-laboratory splits) and field replicates as follows:

$$\frac{(\textit{difference between sample splits}) \times 100}{(\textit{average of sample splits})}$$

The RPD between split/duplicate samples should be less than  $\pm 35\%$

### 3. Results

#### 3.1. Metals

Metal concentrations in sediment samples extracted from the DE are presented in Table 2. Sample concentrations exceeding the ISQG-low/DGVs are highlighted in orange. Except for arsenic, all metals reported below the ISQG-low/DGVs (Table 2). Arsenic concentrations exceeded the ISQG-low/DGV screening level at all 7 sites.

Table 2: Metals in sediments

Element	Unit	LoR	DGV	GV-HIGH	S01	S02	S03	S04	S05	S06	S07
Aluminium*	mg/kg	50	-	-	7,020	3,800	8,340	7,100	7,650	3,520	4,360
Arsenic	mg/kg	1	20	70	24.5	21.6	25.8	24	23.4	20.5	24.6
Cadmium	mg/kg	0.1	1.5	10	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Chromium	mg/kg	1	80	370	39.6	28.1	44.6	41.6	40.8	28.1	36.6
Chromium (III)	mg/kg	1	80	370	40	28	45	42	41	28	37
Chromium (VI)	mg/kg	1	80	370	2.5	0.5	0.5	0.5	0.5	0.5	0.5
Cobalt*	mg/kg	0.5	-	-	11.5	7.6	13.1	11.6	11.7	7.3	8.9
Copper	mg/kg	1	65	270	10.4	5.2	13	10.9	11.6	5	6.4
Iron*	mg/kg	50	-	-	34,000	24,400	36,900	34,500	34,900	23,000	32,100
Lead	mg/kg	1	50	220	5.7	3.3	7.1	5.8	6.1	3.3	4.3
Manganese*	mg/kg	10	-	-	638	454	691	611	605	429	483
Mercury	mg/kg	0.01	0.15	1	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nickel	mg/kg	1	21	52	14.7	9.6	17.5	15.2	15.3	9.5	11.7
Silver	mg/kg	0.1	1	4	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Note: \* denotes that no DGV (ISQ-low trigger) or GV-High trigger exists

### 3.2. Metals QA/QC

No intra-laboratory split sample exceeded the recommended RPD of 35%. As such, the analysis indicates that there is low variability in results for metals when split samples are analysed at the same NATA accredited laboratory.

### 3.3. Particle Size Distribution

PSD results indicated low homogeneity in grain size within sampled sediments, being predominantly sand with some silt and clay (Figure 2). The mean composition across all samples was 85.7% sand, 8.3% clay, 5.7% silt, and 0.3% gravel.

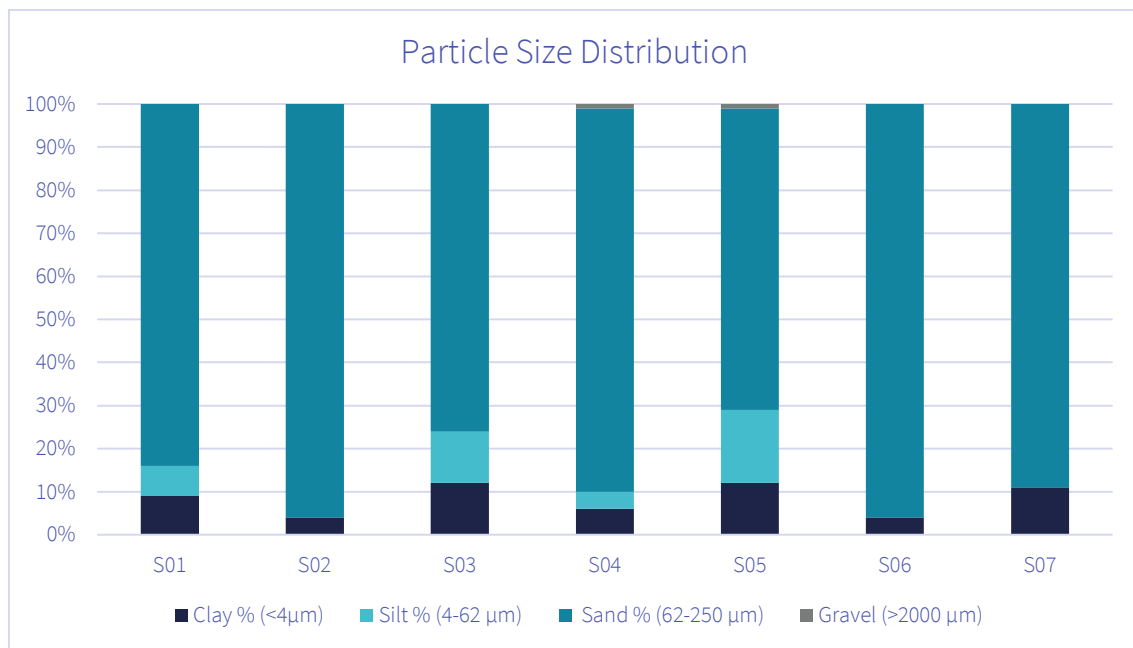


Figure 2: PSD present within sediment samples

### 3.4. Moisture Content and Total Organic Carbon

The moisture content of the samples had low variability, ranging from 23.5% (S02) to 29.1% (S03). The TOC concentration ranged from 0.08% (S02) to 0.34% (S05). TOC concentrations were slightly lower but comparable to ambient TOC concentrations found in the Onslow region (DEC 2006). Moisture content and TOC can be viewed in Table 3.

Table 3: Moisture Content and TOC

Analyte	S01	S02	S03	S04	S05	S06	S07
Moisture Content (%)	28.2	23.5	29.1	28.5	27	23.8	25.1
TOC (%)	0.19	0.08	0.28	0.25	0.34	0.1	0.1

### 3.5. Acid Sulphate Soils

#### 3.5.1. PASS

Results obtained from field screening tests are shown in Table 4 which presents the results of the three combining factors considered in arriving at a ‘positive field sulphide identification’.

The screening acidity ( $pH_F$ ) of the samples ranged from 8.0 to 8.3, which is typical of marine sediments. The oxidised screening test ( $pH_{FOX}$ ) ranged from 6.6 to 6.9. The maximum change between  $pH_F$  and  $pH_{FOX}$  was 1.6 at site S05. These findings indicate that PASS is unlikely to be present. Several samples showed a ‘High’ reaction to oxidation with 30% peroxide however, the rate of reaction is often more vigorous due to the presence of organics, some metalloid compounds and other oxides which may be unrelated to presence of PASS.

In summary, no sites presented a ‘positive field sulphide identification’ and therefore were not subjected to further Chromium Reducible Sulphur suite (CRS) testing to indicate acid sulphate soils are present within sediments in the DE.

Table 4: PASS results

Criteria	S01	S02	S03	S04	S05	S06	S07
$pH_F$	8	8.1	8.1	8.1	8.3	8.1	8.2
$pH_{FOX}$	6.7	6.6	6.7	6.6	6.7	6.8	6.9
Reaction Rate	High	Low	High	High	High	Medium	Medium
$\Delta pH_F$	1.3	1.5	1.4	1.5	1.6	1.3	1.3

## 4. Discussion and Conclusion

### 4.1. Sediment Properties

Sediments in this study generally comprised fractions dominated by sediments  $>63\mu\text{m}$  ( $X^- = 86\%$ ). These results indicated presence of more coarse sediment proportions than those reported in DEC (2006) for several areas along the Pilbara coast (i.e., Onslow, Dampier Archipelago, Port Hedland, and Dampier Port). Coarser sediments are generally indicative of lower concentrations of metals in sediments, notably aluminium which is considered a good predictor of the fine component of sediments for the nearshore Pilbara region and can be used to normalise concentrations of other metal analytes (Stoddart et al. 2019).

### 4.2. Metals

All metals were found below the ISQG-low/DGV trigger levels with exception of arsenic. When comparing reported arsenic concentrations to concentrations previously reported (natural ambient baseline levels) in DEC (2006) (21 mg/kg and 34 mg/kg for Onslow), it can be concluded that concentrations found in this study (maximum of 25.8 mg/kg and median of 23.4 mg/kg) are similar to ambient concentrations in the Pilbara and were generally less than those concentrations typically found in the Onslow region. Similarly, Stoddart et al (2019) found that arsenic is naturally elevated in Pilbara nearshore surface sediments and are consistent with an organic origin.

Aluminium and iron are not considered toxic contaminants for the purpose of NAGD (2009) however, DEC (2006) provides Onslow sediment guideline values (SGVs) for metals aluminium (12,600 mg/kg), iron (36,800 mg/kg) and cobalt (8.8 mg/kg). All three elements (aluminium, iron and cobalt) had comparable results to DEC (2006) SGV's from the survey with a median of 4,360 mg/kg, 32,100 mg/kg and 8.9 mg/kg, respectively. No background concentrations are provided for manganese, however, manganese is not considered a toxic metal of concern in marine sediments (Simpson et al 2013).

### 4.3. Acid Sulphate Soils

Acid sulphate soils are naturally occurring in sediment that contain iron sulphides which upon disturbance by piling and/or dredging and exposing it to oxygen through onshore disposal has the potential to cause significant environmental and economic impacts. Although the Project does not require any onshore disposal of sediment from the DE, a conservative approach was taken when designing the sampling program and this data will assist in providing ambient soil data for the presence of acid sulphate soils. No sites sampled presented a 'positive field sulphide identification' and therefore if disturbed during piling and jetty construction pose no risk to the surrounding environment.

### 4.4. Suitability for Potential Disturbance

Geochemical assessment of the sediment for identified contaminants, including metals indicated one metal (As) exceeded ISQG/DGV screening levels however, when compared to ambient concentrations

determined by previous studies in the Pilbara these metals were considered to naturally occur at elevated concentrations. The PSD and TOC of sediments sampled were typical for Pilbara nearshore sediments in the Onslow region. No sites presented a 'positive field sulphide identification', hence, PASS is unlikely to be present. Therefore, any disturbance of sediments associated with the jetty construction is considered unlikely to result in adverse effects to marine living resources, human health, and terrestrial living resources.

## 5. References

- ANZG (Australian and New Zealand Guidelines for Fresh and Marine Water Quality) (2018) Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at [www.waterquality.gov.au/anz-guidelines](http://www.waterquality.gov.au/anz-guidelines)
- DEC (Department of Environment and Conservation) (2006) Background quality of the marine sediments of the Pilbara coast. Department of Environment and Conservation, Marine Technical Report Series, No. MTR 1.
- DER (Department of Environment Regulation) (2015) Identification and investigation of acid sulfate soils and acidic landscapes. Department of Environmental Regulation, Government of Western Australia
- EPA (Environmental Protection Authority) (2016) Technical Guidance – Protecting the Quality of Western Australia’s Marine Environment. Environmental Protection Authority, December 2016
- NAGD (National Assessment Guidelines for Dredging) (2009) Department of the Environment, Water, Heritage and the Arts, Commonwealth of Australia.
- O2Marine (2024) Preliminary Environmental Impact Assessment – Onslow Recreational Jetty. Report No. R220492
- Simpson SL., Batley GE. and Chariton AA (2013) Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines. Report: CSIRO Land and Water Science Report 08/07, CSIRO.
- Stoddart et al (2019) Stoddart, J. A., Welsh, J. Q., & Stoddart, C. W. Concentrations of some metals in the nearshore marine sediments of Western Australia’s Pilbara Region. Environmental monitoring and assessment, 191(7), 476.

## Appendix A. Chain of Custody

<b>Project:</b> Onslow Public Jetty BCH and MEQ Investigation				<b>Laboratory:</b> ALS				<b>Address:</b> 26 Rigali Way, Wangara, 6065				<b>Please Note:</b> Please sign copy on receipt of samples and email signed copy of CoC record to O2M Project Manager.  Email laboratory analysis results to O2M Project Manager.			
<b>Client:</b> Burbury Consulting		<b>Job No.:</b> 23ENV236		<b>Lab. Contact:</b> Helena Brolin											
<b>Lab Reference No.:</b> 23ENV236		<b>Turnaround Time:</b> Standard		<b>Sample Matrix</b> S-Soil / SL-Sludge / W-Water / A-Air	<b>Container</b>			<b>Analyses</b>							<b>Marine Sediment</b>
<b>O2M Project Manager (Ph. Number):</b> Nadene Claydon		<b>Email Address:</b> Sean.webbmartin@o2marine.com.au			<b>Type</b>	<b>Preservative</b>	<b>No. of Samples</b>	<b>Total Volume (mL)</b>	<b>B-Hexavalent Chromium (As, Ag, As, Cd, Cr(VI), Cu, Fe, Pb, Mn, Hg, Ni)</b>	<b>PSD</b>	<b>TOC</b>	<b>Moisture Content</b>	<b>PASS-ClC</b>		
<b>O2M Sample ID</b>	<b>Laboratory Sample ID</b>	<b>Date</b>	<b>Time</b>		<b>S-Soil / SL-Sludge / W-Water / A-Air</b>	<b>B-Bottle / J-Jar / V-Vial / G-Glass / P-Plastic</b>	<b>Unpreserved / HCL / H<sub>2</sub>SO<sub>4</sub> / HNO<sub>3</sub> / Other</b>								
1	S1	Sed 01	9/6/24	08:00	S	J/P	4	4	x	x	x	x	x		
2	S2	Sed 02	6/6/24	16:30	S	J/P	1	4	x	x	x	x	x		
3	S3	Sed 03	9/6/24	08:15	S	J/P		4	x	x	x	x	x		
4	S4	Sed 04	9/6/24	08:30	S	J/P		4	x	x	x	x	x		
5	S5	Sed 05	9/6/24	08:45	S	J/P		4	x	x	x	x	x		
6	S6	Sed 06	6/6/24	16:45	S	J/P		4	x	x	x	x	x		
7	S7	Sed 07	6/6/24	17:00	S	J/P		4	x	x	x	x	x		
<b>Sampled By:</b> D. Gell				<b>Date/Time:</b> JUNE 2024				<b>Relinquished By:</b> D. Gell				<b>Date/Time:</b> 12/06/24			
<b>Received By Lab:</b> D. Gell				<b>Date/Time:</b> 12/6/24				<b>Courier:</b>							
<b>Sample Cold (Yes/No):</b>				<b>Sample Container Sealed (Yes/No):</b>											

Metal Detection Levels (mg/L):  
 As, Pb, Ni - 0.001  
 Al, Fe, Mn - 0.01  
 V - 0.005  
 Hg - 0.0001  
 Cd - 0.0002  
 Cu - 0.0003  
 Cr - 0.002

1  
2  
3  
4  
5  
6  
7

8	Split 1	6/6/24	17:30	S	J/P	3	x	x	x	x
9	Split 2	6/6/24	17:30	S	J/P	3	x	x	x	x

Environmental Division  
 Perth  
 Work Order Reference  
**EP2408208**



## Appendix B. Laboratory Certificate of Analysis



## CERTIFICATE OF ANALYSIS

**Work Order** : EP2408208  
**Client** : WA MARINE PTY LTD  
**Contact** : SEAN WEBB-MARTIN  
**Address** : SUITE 5, 5/18 GRIFFON DRIVE PO BOX 1370  
DUNSBOROUGH, PERTH WA, AUSTRALIA 6281  
**Telephone** : ----  
**Project** : 23ENV236 Onslow Public Jetty BCH and MEQ Investigation  
**Order number** : ----  
**C-O-C number** : ----  
**Sampler** : DAVE GULL  
**Site** : ----  
**Quote number** : EN/222  
**No. of samples received** : 9  
**No. of samples analysed** : 9

**Page** : 1 of 6  
**Laboratory** : Environmental Division Perth  
**Contact** : Georgina Nearygrant  
**Address** : 26 Rigali Way Wangara WA Australia 6065  
**Telephone** : +61-8-9406 1301  
**Date Samples Received** : 12-Jun-2024 12:00  
**Date Analysis Commenced** : 17-Jun-2024  
**Issue Date** : 25-Jun-2024 14:45



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, WA
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



## General Comments

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

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

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

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

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

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

- EG048G (Hexavalent Chromium by Alkaline Digestion and DA Finish): LOR for sample EP2408208-001 raised due to possible matrix interference.
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.



## Analytical Results

Sub-Matrix: MARINE SEDIMENT  
 (Matrix: SOIL)

Sample ID

				S1 Sed 01	S2 Sed 02	S3 Sed 03	S4 Sed 04	S5 Sed 05
Sampling date / time				09-Jun-2024 08:00	06-Jun-2024 16:30	09-Jun-2024 08:15	09-Jun-2024 08:30	09-Jun-2024 08:45
Compound	CAS Number	LOR	Unit	EP2408208-001	EP2408208-002	EP2408208-003	EP2408208-004	EP2408208-005
				Result	Result	Result	Result	Result
<b>EA037: Ass Field Screening Analysis</b>								
ø pH (F)	----	0.1	pH Unit	8.0	8.1	8.1	8.1	8.3
ø pH (Fox)	----	0.1	pH Unit	6.7	6.6	6.7	6.6	6.7
ø Reaction Rate	----	1	-	Strong	Slight	Strong	Strong	Strong
<b>EA055: Moisture Content (Dried @ 105-110°C)</b>								
Moisture Content	----	0.1	%	28.2	23.5	29.1	28.5	27.0
<b>EA150: Particle Sizing</b>								
+75µm	----	1	%	82	96	70	88	70
+150µm	----	1	%	18	8	5	18	10
+300µm	----	1	%	5	<1	2	5	4
+425µm	----	1	%	3	<1	1	3	3
+600µm	----	1	%	1	<1	<1	2	2
+1180µm	----	1	%	<1	<1	<1	1	2
+2.36mm	----	1	%	<1	<1	<1	<1	1
+4.75mm	----	1	%	<1	<1	<1	<1	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
<b>EA150: Soil Classification based on Particle Size</b>								
Clay (<2 µm)	----	1	%	9	4	12	6	12
Silt (2-60 µm)	----	1	%	7	<1	12	4	17
Sand (0.06-2.00 mm)	----	1	%	84	96	76	89	70
Gravel (>2mm)	----	1	%	<1	<1	<1	1	1
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
<b>EA152: Soil Particle Density</b>								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.66	2.67	2.67	2.58	2.64
<b>EG005(ED093)-SD: Total Metals in Sediments by ICP-AES</b>								



## Analytical Results

Sub-Matrix: MARINE SEDIMENT  
 (Matrix: SOIL)

Sample ID

				S1 Sed 01	S2 Sed 02	S3 Sed 03	S4 Sed 04	S5 Sed 05
Sampling date / time				09-Jun-2024 08:00	06-Jun-2024 16:30	09-Jun-2024 08:15	09-Jun-2024 08:30	09-Jun-2024 08:45
Compound	CAS Number	LOR	Unit	EP2408208-001	EP2408208-002	EP2408208-003	EP2408208-004	EP2408208-005
				Result	Result	Result	Result	Result
<b>EG005(ED093)-SD: Total Metals in Sediments by ICP-AES - Continued</b>								
Aluminium	7429-90-5	50	mg/kg	7020	3800	8340	7100	7650
Iron	7439-89-6	50	mg/kg	34000	24400	36900	34500	34900
<b>EG020-SD: Total Metals in Sediments by ICPMS</b>								
Arsenic	7440-38-2	1.00	mg/kg	24.5	21.6	25.8	24.0	23.4
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	7440-47-3	1.0	mg/kg	39.6	28.1	44.6	41.6	40.8
Copper	7440-50-8	1.0	mg/kg	10.4	5.2	13.0	10.9	11.6
Cobalt	7440-48-4	0.5	mg/kg	11.5	7.6	13.1	11.6	11.7
Lead	7439-92-1	1.0	mg/kg	5.7	3.3	7.1	5.8	6.1
Manganese	7439-96-5	10	mg/kg	638	454	691	611	605
Nickel	7440-02-0	1.0	mg/kg	14.7	9.6	17.5	15.2	15.3
Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<b>EG035T: Total Recoverable Mercury by FIMS</b>								
Mercury	7439-97-6	0.01	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
<b>EG048: Hexavalent Chromium (Alkaline Digest)</b>								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	<2.5	<0.5	<0.5	<0.5	<0.5
<b>EG049: Trivalent Chromium</b>								
Trivalent Chromium	16065-83-1	1	mg/kg	40	28	45	42	41
<b>EP003: Total Organic Carbon (TOC) in Soil</b>								
Total Organic Carbon	----	0.02	%	0.19	0.08	0.29	0.25	0.34



## Analytical Results

Sub-Matrix: MARINE SEDIMENT  
 (Matrix: SOIL)

Sample ID

				S6 Sed 06	S7 Sed 07	Split 1	Split 2	----
Sampling date / time				06-Jun-2024 16:45	06-Jun-2024 17:00	06-Jun-2024 17:30	06-Jun-2024 17:30	----
Compound	CAS Number	LOR	Unit	EP2408208-006	EP2408208-007	EP2408208-008	EP2408208-009	-----
				Result	Result	Result	Result	----
<b>EA037: Ass Field Screening Analysis</b>								
ø pH (F)	----	0.1	pH Unit	<b>8.1</b>	<b>8.2</b>	<b>8.3</b>	<b>8.2</b>	----
ø pH (Fox)	----	0.1	pH Unit	<b>6.8</b>	<b>6.9</b>	<b>6.6</b>	<b>6.7</b>	----
ø Reaction Rate	----	1	-	<b>Moderate</b>	<b>Moderate</b>	<b>Slight</b>	<b>Slight</b>	----
<b>EA055: Moisture Content (Dried @ 105-110°C)</b>								
Moisture Content	----	0.1	%	<b>23.8</b>	<b>25.1</b>	<b>22.2</b>	<b>23.1</b>	----
<b>EA150: Particle Sizing</b>								
+75µm	----	1	%	<b>96</b>	<b>81</b>	----	----	----
+150µm	----	1	%	<b>30</b>	<b>8</b>	----	----	----
+300µm	----	1	%	<b>2</b>	<b>2</b>	----	----	----
+425µm	----	1	%	<b>&lt;1</b>	<b>1</b>	----	----	----
+600µm	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
+1180µm	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
+2.36mm	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
+4.75mm	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
+9.5mm	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
+19.0mm	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
+37.5mm	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
+75.0mm	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
<b>EA150: Soil Classification based on Particle Size</b>								
Clay (<2 µm)	----	1	%	<b>4</b>	<b>11</b>	----	----	----
Silt (2-60 µm)	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
Sand (0.06-2.00 mm)	----	1	%	<b>96</b>	<b>89</b>	----	----	----
Gravel (>2mm)	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
Cobbles (>6cm)	----	1	%	<b>&lt;1</b>	<b>&lt;1</b>	----	----	----
<b>EA152: Soil Particle Density</b>								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	<b>2.69</b>	<b>2.68</b>	----	----	----
<b>EG005(ED093)-SD: Total Metals in Sediments by ICP-AES</b>								



## Analytical Results

Sub-Matrix: MARINE SEDIMENT  
 (Matrix: SOIL)

				Sample ID	S6 Sed 06	S7 Sed 07	Split 1	Split 2	----
Sampling date / time					06-Jun-2024 16:45	06-Jun-2024 17:00	06-Jun-2024 17:30	06-Jun-2024 17:30	----
Compound	CAS Number	LOR	Unit		EP2408208-006	EP2408208-007	EP2408208-008	EP2408208-009	-----
					Result	Result	Result	Result	----
<b>EG005(ED093)-SD: Total Metals in Sediments by ICP-AES - Continued</b>									
Aluminium	7429-90-5	50	mg/kg		3520	4360	3890	3760	----
Iron	7439-89-6	50	mg/kg		23000	32100	27800	27600	----
<b>EG020-SD: Total Metals in Sediments by ICPMS</b>									
Arsenic	7440-38-2	1.00	mg/kg		20.5	24.6	22.1	21.5	----
Cadmium	7440-43-9	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	----
Chromium	7440-47-3	1.0	mg/kg		28.1	36.6	31.9	31.2	----
Copper	7440-50-8	1.0	mg/kg		5.0	6.4	5.6	5.4	----
Cobalt	7440-48-4	0.5	mg/kg		7.3	8.9	8.0	7.7	----
Lead	7439-92-1	1.0	mg/kg		3.3	4.3	3.7	3.6	----
Manganese	7439-96-5	10	mg/kg		429	483	441	424	----
Nickel	7440-02-0	1.0	mg/kg		9.5	11.7	10.6	10.1	----
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	----
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.01	mg/kg		<0.01	<0.01	<0.01	<0.01	----
<b>EG048: Hexavalent Chromium (Alkaline Digest)</b>									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
<b>EG049: Trivalent Chromium</b>									
Trivalent Chromium	16065-83-1	1	mg/kg		28	37	32	31	----
<b>EP003: Total Organic Carbon (TOC) in Soil</b>									
Total Organic Carbon	----	0.02	%		0.10	0.10	0.10	0.12	----

## 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

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

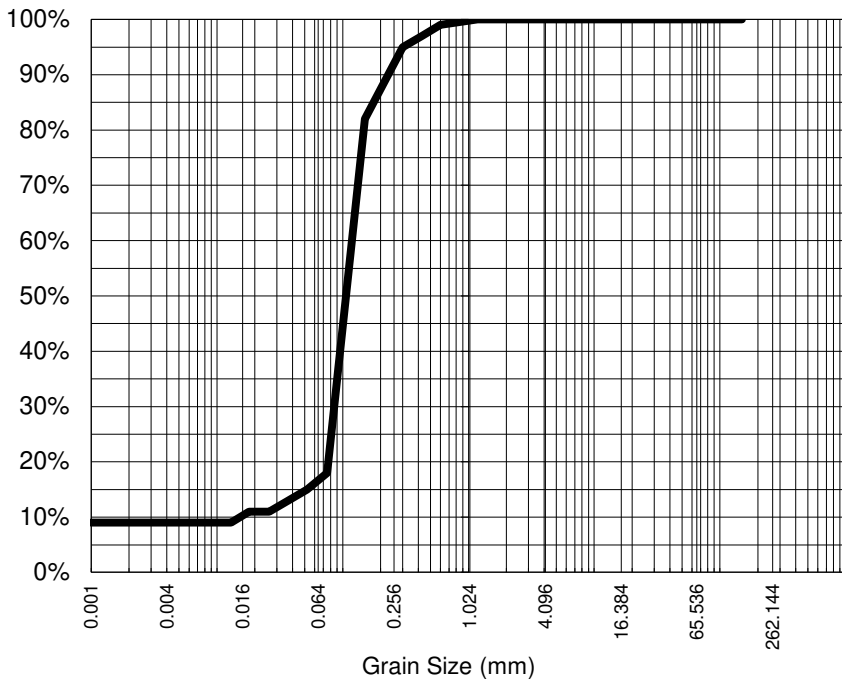
ALS Laboratory Group Pty Ltd  
 5/585 Maitland Road  
 Mayfield West, NSW 2304  
 pH 02 4014 2500  
 fax 02 4968 0349  
 samples.newcastle@alsenviro.com

ALS Environmental  
 Newcastle, NSW



**CLIENT:** SEAN WEBB-MARTIN      **DATE REPORTED:** 25-Jun-2024  
**COMPANY:** WA MARINE PTY LTD      **DATE RECEIVED:** 12-Jun-2024  
**ADDRESS:** Suite 5, 5/18 Griffon Drive      **REPORT NO:** EP2408208-001 / PSD  
 Po Box 1370  
 Dunsborough, Perth Wa, Australia  
**PROJECT:** 23ENV236 Onslow Public Jetty      **SAMPLE ID:** S1  
 BCH and MEQ Investigation

## Particle Size Distribution



Particle Size (mm)	% Passing
1.18	100%
0.600	99%
0.425	97%
0.300	95%
0.150	82%
0.075	18%
Particle Size (microns)	
37	13%
26	11%
18	11%
13	9%
9	9%
7	9%
5	9%
3	9%
1	9%

Median Particle Size (mm)*	0.113
----------------------------	-------

## Analysis Notes

Samples analysed as received.

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

## Sample Comments:

**Loss on Pretreatment** NA

**Sample Description:** SAND, FINES

**Test Method:** AS1289.3.6.1/AS1289.3.6.3

**Soil Particle Density (<2.36mm)** 2.66

**Analysed:** 18-Jun-24

**Limit of Reporting:** 1%

**Dispersion Method** Shaker

**Aleksandar Vujkovic**  
 Laboratory Supervisor  
**Authorised Signatory**



**NATA Accreditation: 825 Site: Newcastle**  
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# Certificate of Analysis

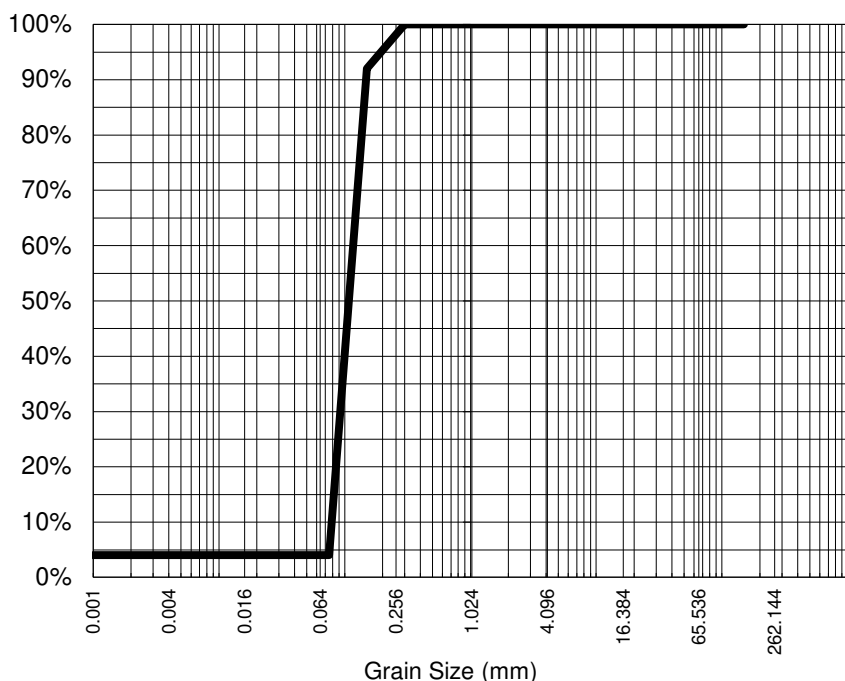


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Newcastle, NSW

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**COMPANY:** WA MARINE PTY LTD      **DATE RECEIVED:** 12-Jun-2024  
**ADDRESS:** Suite 5, 5/18 Griffon Drive      **REPORT NO:** EP2408208-002 / PSD  
Po Box 1370  
Dunsborough, Perth Wa, Australia  
**PROJECT:** 23ENV236 Onslow Public Jetty      **SAMPLE ID:** S2  
BCH and MEQ Investigation

## Particle Size Distribution



Particle Size (mm)	% Passing
0.300	100%
0.150	92%
0.075	4%
Particle Size (microns)	
37	4%
26	4%
18	4%
13	4%
9	4%
7	4%
5	4%
3	4%
1	4%

Median Particle Size (mm)*	0.114
----------------------------	-------

## Analysis Notes

Samples analysed as received.

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

**Sample Comments:** AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

**Loss on Pretreatment** NA

**Sample Description:** SAND, FINES

**Test Method:** AS1289.3.6.1/AS1289.3.6.3

**Soil Particle Density (<2.36mm)** 2.67

**Analysed:** 18-Jun-24

**Limit of Reporting:** 1%

**Dispersion Method** Shaker

**NATA Accreditation: 825 Site: Newcastle**  
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Laboratory Supervisor  
**Authorised Signatory**

# Certificate of Analysis

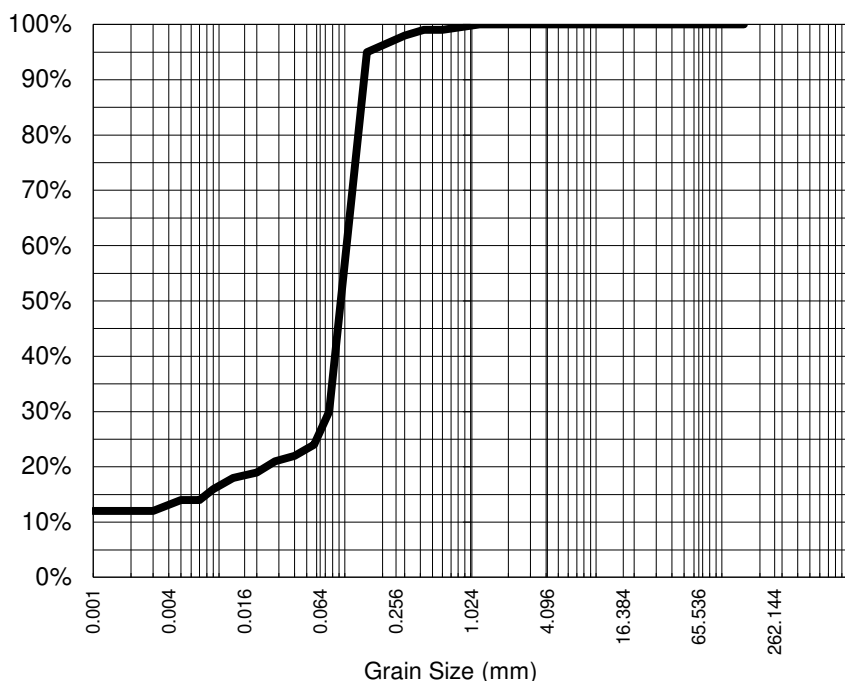
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Mayfield West, NSW 2304  
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fax 02 4968 0349  
samples.newcastle@alsenviro.com

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Newcastle, NSW



**CLIENT:** SEAN WEBB-MARTIN      **DATE REPORTED:** 25-Jun-2024  
**COMPANY:** WA MARINE PTY LTD      **DATE RECEIVED:** 12-Jun-2024  
**ADDRESS:** Suite 5, 5/18 Griffon Drive      **REPORT NO:** EP2408208-003 / PSD  
 Po Box 1370  
 Dunsborough, Perth Wa, Australia  
**PROJECT:** 23ENV236 Onslow Public Jetty      **SAMPLE ID:** S3  
 BCH and MEQ Investigation

## Particle Size Distribution



Particle Size (mm)	% Passing
1.18	100%
0.600	99%
0.425	99%
0.300	98%
0.150	95%
0.075	30%
Particle Size (microns)	
40	22%
28	21%
20	19%
13	18%
9	16%
7	14%
5	14%
3	12%
1	12%

Median Particle Size (mm)*	0.098
----------------------------	-------

## Analysis Notes

Samples analysed as received.

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

## Sample Comments:

**Loss on Pretreatment** NA

**Sample Description:** SAND, FINES

**Test Method:** AS1289.3.6.1/AS1289.3.6.3

**Soil Particle Density (<2.36mm)** 2.67

**Analysed:** 18-Jun-24

**Limit of Reporting:** 1%

**Dispersion Method** Shaker

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samples.newcastle@alsenviro.com

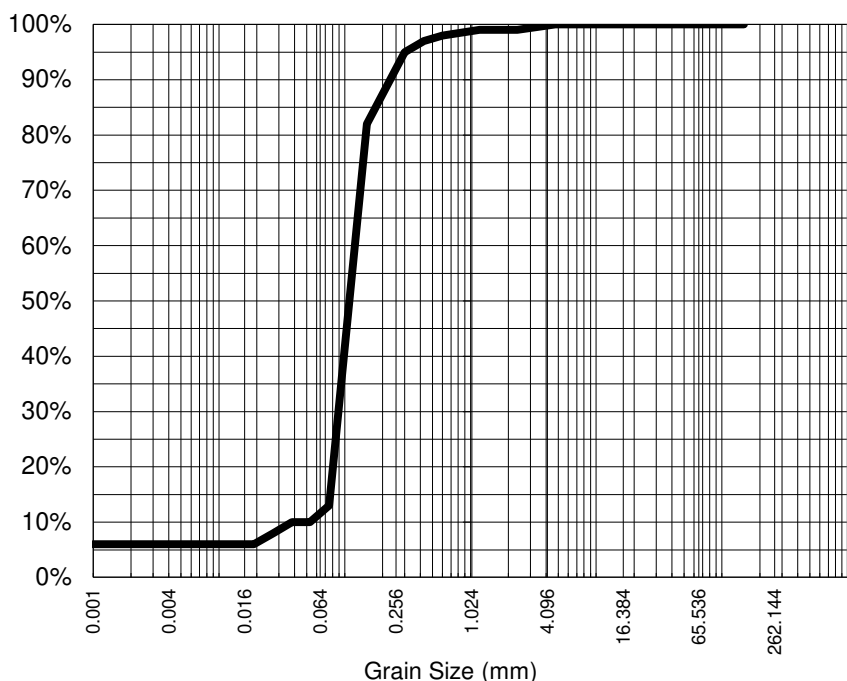
ALS Environmental

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**COMPANY:** WA MARINE PTY LTD      **DATE RECEIVED:** 12-Jun-2024  
**ADDRESS:** Suite 5, 5/18 Griffon Drive      **REPORT NO:** EP2408208-004 / PSD  
Po Box 1370  
Dunsborough, Perth Wa, Australia  
**PROJECT:** 23ENV236 Onslow Public Jetty      **SAMPLE ID:** S4  
BCH and MEQ Investigation

## Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	99%
0.600	98%
0.425	97%
0.300	95%
0.150	82%
0.075	13%
Particle Size (microns)	
38	10%
27	8%
19	6%
13	6%
10	6%
7	6%
5	6%
3	6%
1	6%

Median Particle Size (mm)*	0.115
----------------------------	-------

## Analysis Notes

Samples analysed as received.

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

## Sample Comments:

**Loss on Pretreatment** NA

**Sample Description:** SAND, FINES

**Test Method:** AS1289.3.6.1/AS1289.3.6.3

**Soil Particle Density (<2.36mm)** 2.58

**Analysed:** 18-Jun-24

**Limit of Reporting:** 1%

**Dispersion Method** Shaker

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Laboratory Supervisor  
**Authorised Signatory**

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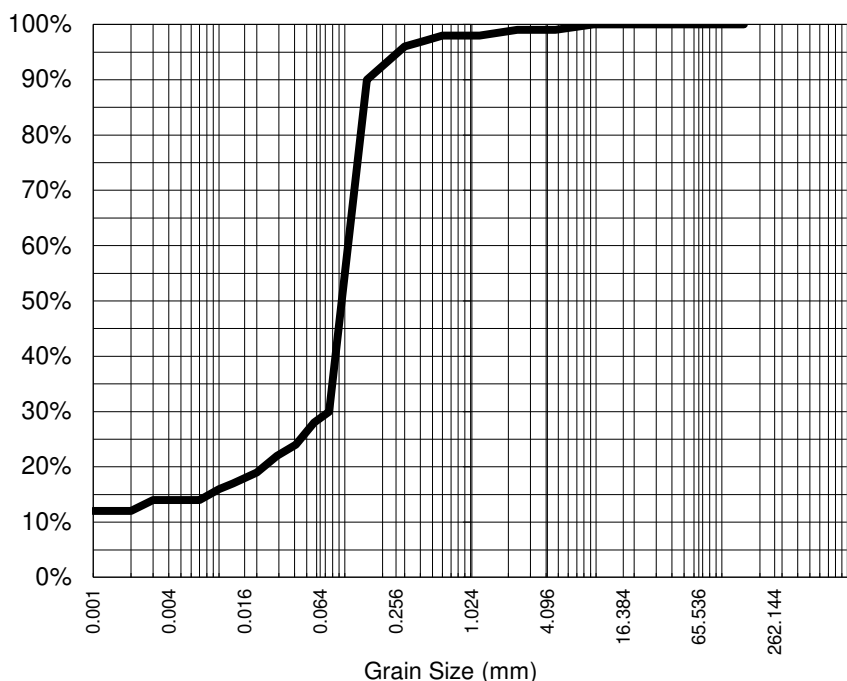
ALS Environmental

Newcastle, NSW



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**COMPANY:** WA MARINE PTY LTD      **DATE RECEIVED:** 12-Jun-2024  
**ADDRESS:** Suite 5, 5/18 Griffon Drive      **REPORT NO:** EP2408208-005 / PSD  
Po Box 1370  
Dunsborough, Perth Wa, Australia  
**PROJECT:** 23ENV236 Onslow Public Jetty      **SAMPLE ID:** S5  
BCH and MEQ Investigation

## Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	99%
2.36	99%
1.18	98%
0.600	98%
0.425	97%
0.300	96%
0.150	90%
0.075	30%
Particle Size (microns)	
41	24%
29	22%
20	19%
13	17%
10	16%
7	14%
5	14%
3	14%
1	12%

Median Particle Size (mm)*	0.100
----------------------------	-------

## Analysis Notes

Samples analysed as received.

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

## Sample Comments:

**Loss on Pretreatment** NA

**Sample Description:** SAND, FINES

**Test Method:** AS1289.3.6.1/AS1289.3.6.3

**Soil Particle Density (<2.36mm)** 2.64

**Analysed:** 18-Jun-24

**Limit of Reporting:** 1%

**Dispersion Method** Shaker

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Laboratory Supervisor  
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# Certificate of Analysis

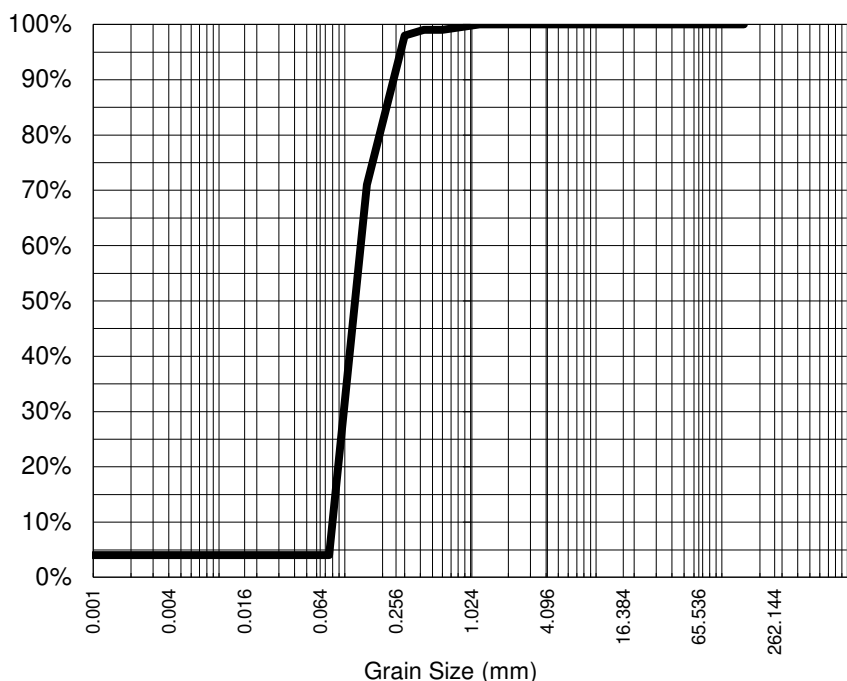
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Mayfield West, NSW 2304  
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fax 02 4968 0349  
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**COMPANY:** WA MARINE PTY LTD      **DATE RECEIVED:** 12-Jun-2024  
**ADDRESS:** Suite 5, 5/18 Griffon Drive      **REPORT NO:** EP2408208-006 / PSD  
Po Box 1370  
Dunsborough, Perth Wa, Australia  
**PROJECT:** 23ENV236 Onslow Public Jetty      **SAMPLE ID:** S6  
BCH and MEQ Investigation

## Particle Size Distribution



Particle Size (mm)	% Passing
1.18	100%
0.600	99%
0.425	99%
0.300	98%
0.150	71%
0.075	4%
Particle Size (microns)	
37	4%
26	4%
18	4%
13	4%
9	4%
7	4%
5	4%
3	4%
1	4%

Median Particle Size (mm)*	0.126
----------------------------	-------

## Analysis Notes

Samples analysed as received.

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

**Sample Comments:** AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

**Loss on Pretreatment** NA

**Sample Description:** SAND, FINES

**Test Method:** AS1289.3.6.1/AS1289.3.6.3

**Soil Particle Density (<2.36mm)** 2.69

**Analysed:** 18-Jun-24

**Limit of Reporting:** 1%

**Dispersion Method** Shaker

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Laboratory Supervisor  
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# Certificate of Analysis

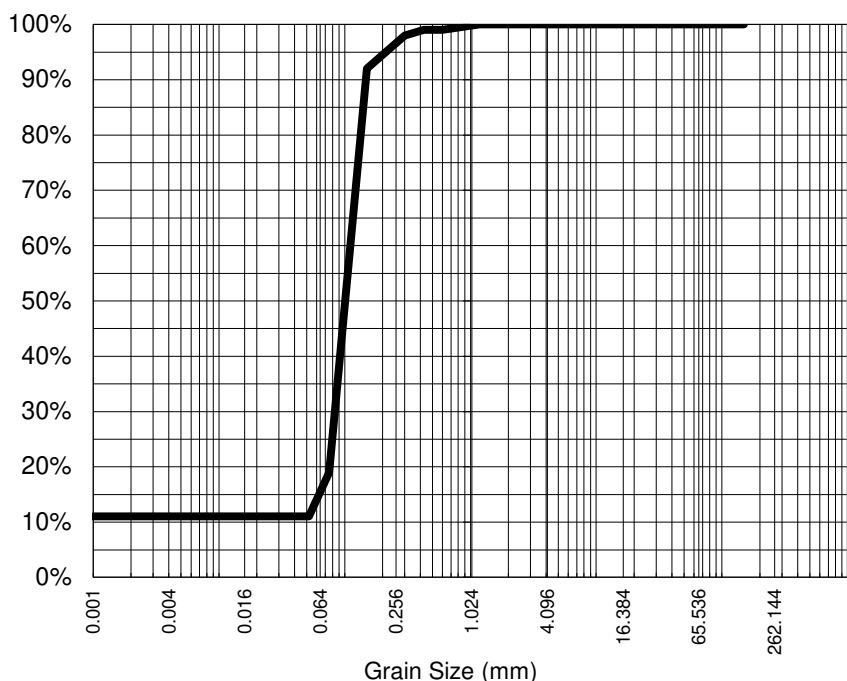
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 Mayfield West, NSW 2304  
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 fax 02 4968 0349  
 samples.newcastle@alsenviro.com

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 Newcastle, NSW



**CLIENT:** SEAN WEBB-MARTIN      **DATE REPORTED:** 25-Jun-2024  
**COMPANY:** WA MARINE PTY LTD      **DATE RECEIVED:** 12-Jun-2024  
**ADDRESS:** Suite 5, 5/18 Griffon Drive      **REPORT NO:** EP2408208-007 / PSD  
 Po Box 1370  
 Dunsborough, Perth Wa, Australia  
**PROJECT:** 23ENV236 Onslow Public Jetty      **SAMPLE ID:** S7  
 BCH and MEQ Investigation

## Particle Size Distribution



Particle Size (mm)	% Passing
1.18	100%
0.600	99%
0.425	99%
0.300	98%
0.150	92%
0.075	19%
Particle Size (microns)	
37	11%
26	11%
18	11%
13	11%
9	11%
7	11%
5	11%
3	11%
1	11%

Median Particle Size (mm)*	0.107
----------------------------	-------

## Analysis Notes

Samples analysed as received.

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

## Sample Comments:

**Loss on Pretreatment** NA

**Sample Description:** SAND, FINES

**Test Method:** AS1289.3.6.1/AS1289.3.6.3

**Soil Particle Density (<2.36mm)** 2.68

**Analysed:** 18-Jun-24

**Limit of Reporting:** 1%

**Dispersion Method** Shaker

**NATA Accreditation: 825 Site: Newcastle**  
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 Laboratory Supervisor  
**Authorised Signatory**



## QUALITY CONTROL REPORT

Work Order	: EP2408208	Page	: 1 of 5
Client	: WA MARINE PTY LTD	Laboratory	: Environmental Division Perth
Contact	: SEAN WEBB-MARTIN	Contact	: Georgina Nearygrant
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	: +61-8-9406 1301
Project	: 23ENV236 Onslow Public Jetty BCH and MEQ Investigation	Date Samples Received	: 12-Jun-2024
Order number	: ----	Date Analysis Commenced	: 17-Jun-2024
C-O-C number	: ----	Issue Date	: 25-Jun-2024
Sampler	: DAVE GULL		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 9		
No. of samples analysed	: 9		



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 Quality Control Report contains the following information:

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

### Signatories

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

Signatories	Position	Accreditation Category
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, WA
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



## General Comments

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

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

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

Key :  
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot  
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.  
 LOR = Limit of reporting  
 RPD = Relative Percentage Difference  
 # = Indicates failed QC  
 \* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

## Laboratory Duplicate (DUP) Report

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

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
<b>EG005(ED093)-SD: Total Metals in Sediments by ICP-AES (QC Lot: 5868501)</b>									
EP2408208-001	S1 Sed 01	EG005-SD: Aluminium	7429-90-5	50	mg/kg	7020	6560	6.9	0% - 20%
		EG005-SD: Iron	7439-89-6	50	mg/kg	34000	32800	3.7	0% - 20%
<b>EG035T: Total Recoverable Mercury by FIMS (Low Level) (QC Lot: 5868499)</b>									
EP2408208-001	S1 Sed 01	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
<b>EA037: Ass Field Screening Analysis (QC Lot: 5878935)</b>									
EP2408208-001	S1 Sed 01	EA037: pH (F)	----	0.1	pH Unit	8.0	8.0	0.0	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	6.7	6.7	0.0	0% - 20%
<b>EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5866703)</b>									
EP2408208-001	S1 Sed 01	EA055: Moisture Content	----	0.1	%	28.2	25.4	10.4	0% - 20%
<b>EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 5868500)</b>									
EP2408208-001	S1 Sed 01	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	11.5	11.1	3.4	0% - 20%
		EG020-SD: Arsenic	7440-38-2	1	mg/kg	24.5	24.5	0.2	0% - 20%
		EG020-SD: Chromium	7440-47-3	1	mg/kg	39.6	37.8	4.6	0% - 20%
		EG020-SD: Copper	7440-50-8	1	mg/kg	10.4	9.5	9.0	0% - 50%
		EG020-SD: Lead	7439-92-1	1	mg/kg	5.7	5.5	4.2	No Limit
		EG020-SD: Nickel	7440-02-0	1	mg/kg	14.7	13.9	5.2	0% - 50%
EG020-SD: Manganese	7439-96-5	10	mg/kg	638	648	1.5	0% - 20%		
<b>EG048: Hexavalent Chromium (Alkaline Digest) (QC Lot: 5864963)</b>									

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 Work Order : EP2408208  
 Client : WA MARINE PTY LTD  
 Project : 23ENV236 Onslow Public Jetty BCH and MEQ Investigation



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
<b>EG048: Hexavalent Chromium (Alkaline Digest) (QC Lot: 5864963) - continued</b>									
EP2408208-001	S1 Sed 01	EG048G: Hexavalent Chromium	18540-29-9	0.5 (2.5)*	mg/kg	<2.5	<2.5	0.0	No Limit
EP2408294-002	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
<b>EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 5862102)</b>									
EM2409676-021	Anonymous	EP003: Total Organic Carbon	----	0.02	%	3.58	3.41	4.9	0% - 20%
EP2408208-007	S7 Sed 07	EP003: Total Organic Carbon	----	0.02	%	0.10	0.14	26.9	No Limit



### Method Blank (MB) and Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
<b>EG005(ED093)-SD: Total Metals in Sediments by ICP-AES (QCLot: 5868501)</b>								
EG005-SD: Aluminium	7429-90-5	50	mg/kg	<50	13480 mg/kg	108	70.0	130
EG005-SD: Iron	7439-89-6	50	mg/kg	<50	31165 mg/kg	100	70.0	130
<b>EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 5868499)</b>								
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.098 mg/kg	90.7	70.0	130
<b>EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 5868500)</b>								
EG020-SD: Arsenic	7440-38-2	1	mg/kg	<1.00	77.39 mg/kg	101	70.0	130
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	1.93 mg/kg	84.3	70.0	130
EG020-SD: Chromium	7440-47-3	1	mg/kg	<1.0	18.67 mg/kg	107	70.0	130
EG020-SD: Copper	7440-50-8	1	mg/kg	<1.0	46.13 mg/kg	93.5	70.0	130
EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	<0.5	10.47 mg/kg	104	70.0	130
EG020-SD: Lead	7439-92-1	1	mg/kg	<1.0	58.42 mg/kg	106	70.0	130
EG020-SD: Manganese	7439-96-5	10	mg/kg	<10	531.08 mg/kg	104	70.0	130
EG020-SD: Nickel	7440-02-0	1	mg/kg	<1.0	14.48 mg/kg	112	70.0	130
EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	2.82 mg/kg	94.9	70.0	130
<b>EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 5864963)</b>								
EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	40 mg/kg	79.2	70.0	120
				<0.5	20 mg/kg	104	70.0	120
<b>EP003: Total Organic Carbon (TOC) in Soil (QCLot: 5862102)</b>								
EP003: Total Organic Carbon	----	0.02	%	<0.02	0.55 %	107	80.0	120
				<0.02	32.3 %	98.8	80.0	120

### Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%) MS	Acceptable Limits (%) Low High		
<b>EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 5868499)</b>								
EP2408208-002	S2 Sed 02	EG035T-LL: Mercury	7439-97-6	1 mg/kg	83.9	70.0	130	
<b>EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 5868500)</b>								



Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
<b>EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 5868500) - continued</b>							
EP2408208-002	S2 Sed 02	EG020-SD: Arsenic	7440-38-2	50 mg/kg	98.4	70.0	130
		EG020-SD: Cadmium	7440-43-9	12.5 mg/kg	97.6	70.0	130
		EG020-SD: Chromium	7440-47-3	50 mg/kg	97.7	70.0	130
		EG020-SD: Copper	7440-50-8	50 mg/kg	96.3	70.0	130
		EG020-SD: Cobalt	7440-48-4	50 mg/kg	97.9	70.0	130
		EG020-SD: Lead	7439-92-1	50 mg/kg	96.4	70.0	130
		EG020-SD: Manganese	7439-96-5	50 mg/kg	# Not Determined	70.0	130
		EG020-SD: Nickel	7440-02-0	50 mg/kg	102	70.0	130
<b>EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 5864963)</b>							
EP2408208-001	S1 Sed 01	EG048G: Hexavalent Chromium	18540-29-9	40 mg/kg	72.6	70.0	130
EP2408208-001	S1 Sed 01	EG048G: Hexavalent Chromium	18540-29-9	20 mg/kg	75.1	70.0	130



## QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2408208	Page	: 1 of 7
Client	: WA MARINE PTY LTD	Laboratory	: Environmental Division Perth
Contact	: SEAN WEBB-MARTIN	Telephone	: +61-8-9406 1301
Project	: 23ENV236 Onslow Public Jetty BCH and MEQ Investigation	Date Samples Received	: 12-Jun-2024
Site	: ----	Issue Date	: 25-Jun-2024
Sampler	: DAVE GULL	No. of samples received	: 9
Order number	: ----	No. of samples analysed	: 9

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

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

### Summary of Outliers

#### Outliers : Quality Control Samples

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

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

#### Outliers : Analysis Holding Time Compliance

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

#### Outliers : Frequency of Quality Control Samples

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



**Outliers : Quality Control Samples**

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
<b>Matrix Spike (MS) Recoveries</b>							
EG020-SD: Total Metals in Sediments by ICPMS	EP2408208--002	S2 Sed 02	Manganese	7439-96-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

**Outliers : Frequency of Quality Control Samples**

Matrix: **SOIL**

Quality Control Sample Type	Method	Count		Rate (%)		Quality Control Specification
		QC	Regular	Actual	Expected	
<b>Matrix Spikes (MS)</b>						
Total Fe and Al in Sediments by ICPAES	EG005-SD	0	9	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

**Analysis Holding Time Compliance**

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

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

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

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

Matrix: **SOIL**

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
<b>EA037: Ass Field Screening Analysis</b>								
<b>Snap Lock Bag - frozen (EA037)</b> S2 - Sed 02, S7 - Sed 07, Split 2	S6 - Sed 06, Split 1,	06-Jun-2024	19-Jun-2024	03-Dec-2024	✓	19-Jun-2024	03-Dec-2024	✓
<b>Snap Lock Bag - frozen (EA037)</b> S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	19-Jun-2024	06-Dec-2024	✓	19-Jun-2024	06-Dec-2024	✓
<b>EA055: Moisture Content (Dried @ 105-110°C)</b>								
<b>Soil Glass Jar - Unpreserved (EA055)</b> S2 - Sed 02, S7 - Sed 07, Split 2	S6 - Sed 06, Split 1,	06-Jun-2024	----	----	----	19-Jun-2024	20-Jun-2024	✓
<b>Soil Glass Jar - Unpreserved (EA055)</b> S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	----	----	----	19-Jun-2024	23-Jun-2024	✓



Matrix: SOIL

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
<b>EA150: Particle Sizing</b>								
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H) S2 - Sed 02, S7 - Sed 07	S6 - Sed 06,	06-Jun-2024	----	----	----	25-Jun-2024	03-Dec-2024	✔
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H) S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	----	----	----	25-Jun-2024	06-Dec-2024	✔
<b>EA150: Soil Classification based on Particle Size</b>								
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H) S2 - Sed 02, S7 - Sed 07	S6 - Sed 06,	06-Jun-2024	----	----	----	25-Jun-2024	03-Dec-2024	✔
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H) S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	----	----	----	25-Jun-2024	06-Dec-2024	✔
<b>EA152: Soil Particle Density</b>								
Snap Lock Bag - Friable Asbestos/PSD Bag (EA152) S2 - Sed 02, S7 - Sed 07	S6 - Sed 06,	06-Jun-2024	----	----	----	21-Jun-2024	03-Dec-2024	✔
Snap Lock Bag - Friable Asbestos/PSD Bag (EA152) S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	----	----	----	21-Jun-2024	06-Dec-2024	✔
<b>EG005(ED093)-SD: Total Metals in Sediments by ICP-AES</b>								
Soil Glass Jar - Unpreserved (EG005-SD) S2 - Sed 02, S7 - Sed 07, Split 2	S6 - Sed 06, Split 1,	06-Jun-2024	21-Jun-2024	03-Dec-2024	✔	24-Jun-2024	03-Dec-2024	✔
Soil Glass Jar - Unpreserved (EG005-SD) S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	21-Jun-2024	06-Dec-2024	✔	24-Jun-2024	06-Dec-2024	✔
<b>EG020-SD: Total Metals in Sediments by ICPMS</b>								
Soil Glass Jar - Unpreserved (EG020-SD) S2 - Sed 02, S7 - Sed 07, Split 2	S6 - Sed 06, Split 1,	06-Jun-2024	21-Jun-2024	03-Dec-2024	✔	21-Jun-2024	03-Dec-2024	✔
Soil Glass Jar - Unpreserved (EG020-SD) S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	21-Jun-2024	06-Dec-2024	✔	21-Jun-2024	06-Dec-2024	✔



Matrix: SOIL

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
<b>EG035T: Total Recoverable Mercury by FIMS</b>								
<b>Soil Glass Jar - Unpreserved (EG035T-LL)</b> S2 - Sed 02, S7 - Sed 07, Split 2	S6 - Sed 06, Split 1,	06-Jun-2024	21-Jun-2024	04-Jul-2024	✓	21-Jun-2024	04-Jul-2024	✓
<b>Soil Glass Jar - Unpreserved (EG035T-LL)</b> S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	21-Jun-2024	07-Jul-2024	✓	21-Jun-2024	07-Jul-2024	✓
<b>EG048: Hexavalent Chromium (Alkaline Digest)</b>								
<b>Soil Glass Jar - Unpreserved (EG048G)</b> S2 - Sed 02, S7 - Sed 07, Split 2	S6 - Sed 06, Split 1,	06-Jun-2024	20-Jun-2024	04-Jul-2024	✓	21-Jun-2024	27-Jun-2024	✓
<b>Soil Glass Jar - Unpreserved (EG048G)</b> S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	20-Jun-2024	07-Jul-2024	✓	21-Jun-2024	27-Jun-2024	✓
<b>EP003: Total Organic Carbon (TOC) in Soil</b>								
<b>Pulp Bag (EP003)</b> S2 - Sed 02, S7 - Sed 07, Split 2	S6 - Sed 06, Split 1,	06-Jun-2024	17-Jun-2024	04-Jul-2024	✓	17-Jun-2024	04-Jul-2024	✓
<b>Pulp Bag (EP003)</b> S1 - Sed 01, S4 - Sed 04,	S3 - Sed 03, S5 - Sed 05	09-Jun-2024	17-Jun-2024	07-Jul-2024	✓	17-Jun-2024	07-Jul-2024	✓



## Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reular	Actual	Expected	Evaluation	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
ASS Field Screening Analysis	EA037	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	13	15.38	10.00	✔	NEPM 2013 B3 & ALS QC Standard
<b>Laboratory Control Samples (LCS)</b>							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	13	15.38	10.00	✔	NEPM 2013 B3 & ALS QC Standard
<b>Method Blanks (MB)</b>							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	13	7.69	5.00	✔	NEPM 2013 B3 & ALS QC Standard
<b>Matrix Spikes (MS)</b>							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Fe and Al in Sediments by ICPAES	EG005-SD	0	9	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard



## Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
ASS Field Screening Analysis	* EA037	SOIL	In house: Referenced to Acid Sulfate Soils Laboratory Methods Guidelines. As received samples are tested for pH field and pH fox and assessed for a reaction rating.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3
Soil Particle Density	EA152	SOIL	Soil Particle Density by AS 1289.3.5.1: Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Total Fe and Al in Sediments by ICPAES	EG005-SD	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3). LORs per NODG
Total Metals in Sediments by ICPMS	EG020-SD	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. Analyte list and LORs per NODG.
Total Mercury by FIMS (Low Level)	EG035T-LL	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl <sub>2</sub> )(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl <sub>2</sub> which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	SOIL	In house: Referenced to USEPA SW846, Method 3060. Hexavalent chromium is extracted by alkaline digestion. The digest is determined by photometrically by automatic discrete analyser, following pH adjustment. The instrument uses colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM Schedule B(3)
Trivalent Chromium in Sediments by Alkaline Digestion	EG049G-AIk-SD	SOIL	In house: Referenced to APHA 3500 Cr-A&B & 3125 and USEPA USEPA SW846, Method 3060. The difference between Total and Hexavalent Chromium. The total Chromium is determined by ICPMS and the Hexavalent chromium is extracted by alkaline digestion and the digest is determined by photometrically by automatic discrete analyser. The instrument uses colour development using dephenylcarbazide. This method is compliant with NEPM Schedule B(3)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO <sub>2</sub> ) is automatically measured by infra-red detector.

Preparation Methods	Method	Matrix	Method Descriptions
Alkaline digestion for Hexavalent Chromium	EG048PR	SOIL	In house: Referenced to USEPA SW846, Method 3060A.
Drying only	EN020D	SOIL	In house

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

## Appendix C. Field Sheets

Location: ONSLOW - OFFSHORE  
 Project: 23ENV236

Sediment Sampling Field Sheet



Karma. BJ/DG/JM

Date	Time	Sample ID	Field Conditions	Sampling Method	Depth	Photo taken	Gore Depth	SAMPLE TIME	Comments on sample (smell, texture, colour, etc.)
09.06.24	0722	SD05	CLEAR DAY BLU SKY	VV/PD	4				427 S 21.62897, 115.10877
"	0732	SD04	"	"	4.5				428 21.62894, 115.10842
"	0740	SD01	"	"	4				429 21.62913, 115.10825
"	0751	SD03	"	"	4				430 21.62908, 115.10843
09.06.24					<del>4</del>				
"	1600	SD02	"	Scrape	0	-			305 21.63118, 115.10921
"	1610	SD06	"	"	0	-			306 21.63098, 115.10876
"	1615	SD07	"	"	0	-			307 21.63071, 115.10925
"									

\* SD02 split 1 & 2 from same site for Jars & CRS (PASS) not PSD

