DMPA4 - Benthic Communities and Habitats Report

ENVIRONMENT
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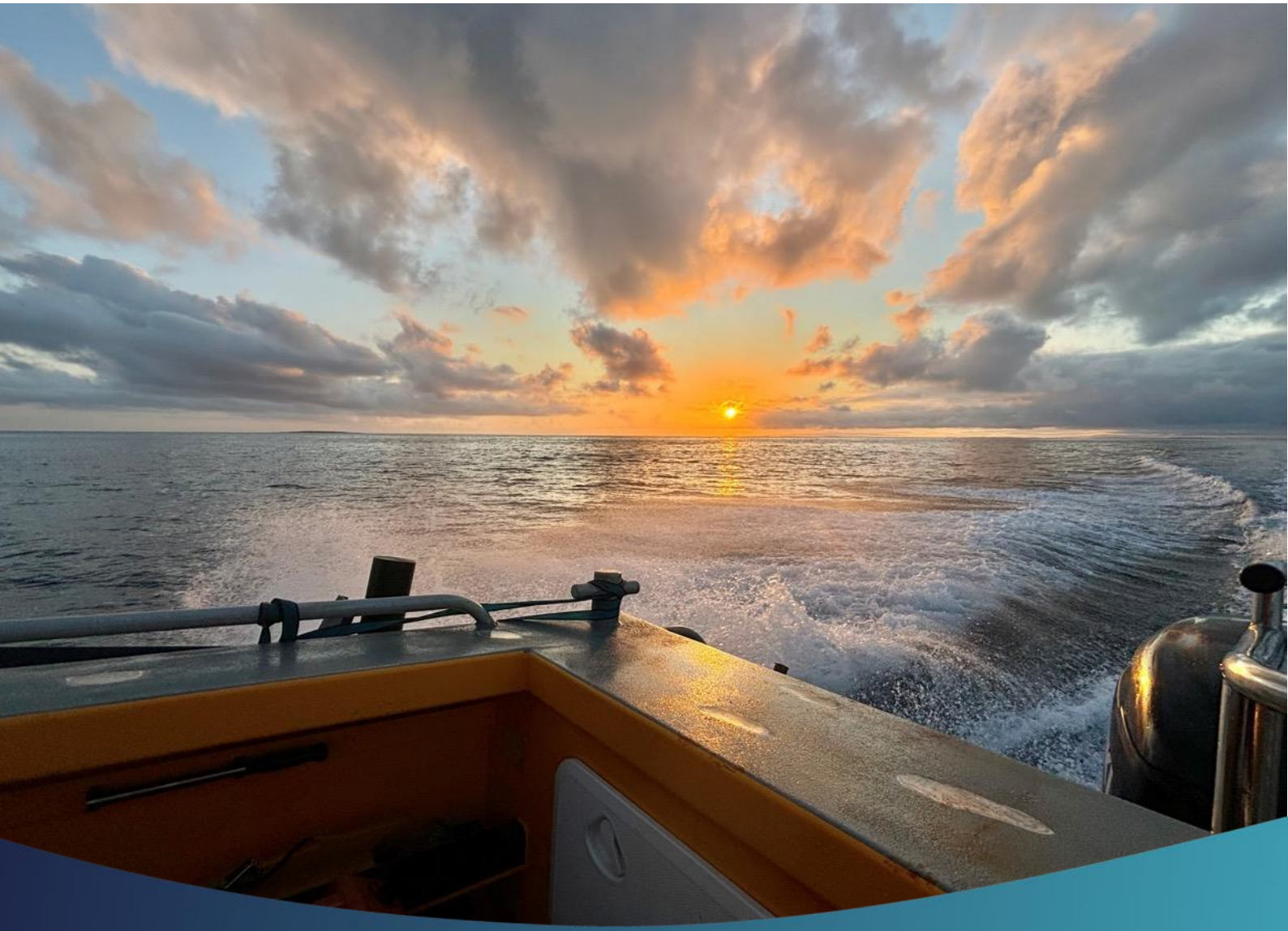

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Version Register

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Draft	B	M. Stacey	Karen Frehill	Address internal comments	 30/10/2024
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Transmission Register

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Acronyms and Units

Acronyms and Abbreviations	Description
BCH	Benthic communities and habitats
BCI	BCI Minerals
CATAMI	Collaborative and Automated Tools for Analysis of Marine Imagery
DMPA	Dredge Material Placement Area
EGN	Empirical Gain Normalization
GIS	Geographic Information Systems
GNSS	Global Navigation Satellite System
GPS	Geographic Positioning System
O2M	O2 Marine Pty Ltd
PPP	Precise Point Positioning
QGIS	Quantum Geographic Information System (mapping software package)
RTK	Real-time kinematic
SSS	Side Scan Sonar
SVP	Sound Velocity Profiler
SVS	Sound Velocity Sensor
TVC	Towed Video Camera
WA	Western Australia
ZoHI	Zone of High Impact
ZoMI	Zone of Moderate Impact

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1. Introduction

1.1. Project Description

Mardie Minerals Pty Ltd (Mardie Minerals) the wholly owned subsidiary of BCI Minerals Limited (BCI, BCI Minerals) has been granted approval for the Mardie Project, a greenfields high quality salt and sulphate of potash (SoP) project and an associated export facility at Mardie, approximately 80 km south west of Karratha, in the Pilbara region of Western Australia (WA) (Figure 1).

The original Proposal was assessed by the WA Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986* (WA) (EP Act) and approved by the WA Minister for Environment via Ministerial Statement (MS) 1175 on 24 November 2021. Environmental approval was also granted by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) on 12 January 2020 via EPBC 2018/8236. Mardie Minerals has since revised the project design, referred to as the Optimised Mardie Project (Optimised Project) which was approved via MS 1211 on 19 October 2023 and via EPBC 2022/9169 on 09 September 2024. The EPBC 2018/8236 conditions were varied on 9 October 2024 to mirror the EPBC 2022/9169 approval.

The Project is an evaporative solar salt project that utilises seawater to produce raw salts as a feedstock for processing high purity salt, fertiliser grade sulphate of potash, and other commercial by-products. To meet this production, the Project includes seawater intakes and a series of evaporation and crystallisation ponds. Waste bitterns will be discharged through diffusers offshore.

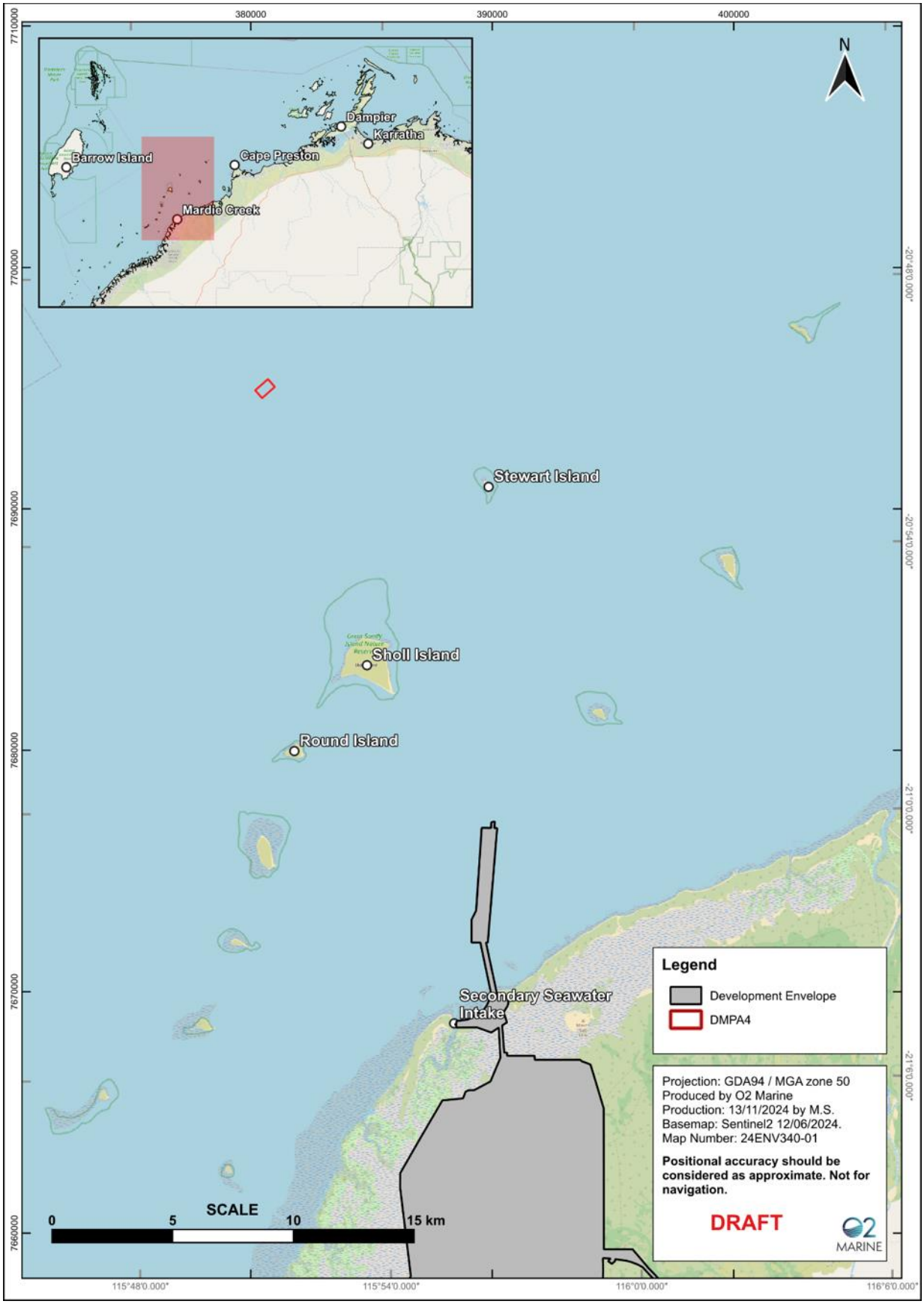

Figure 1: Regional setting of DMPA4

1.2. Scope and Objectives

1.2.1. Scope of Works

O2 Marine were engaged by Mardie Minerals to undertake a bathymetric survey, a Benthic Communities and Habitat (BCH) investigation, and sediment sampling of Dredge Material Placement Area 4 (DMPA4). DMPA4 was identified during a 2022 reconnaissance survey as a possible disposal area. Compared to other investigated disposal sites, DMPA4 is positioned further away from Sholl island and other reef systems containing key BCH receptors, therefore offering a lower risk proposition from potential effects on BCH associated with dredge spoil disposal. Characterisation of bathymetry, BCH and sediment composition is required to determine the suitability of DMPA4 as a disposal site, and in turn, inform a project Sea Dumping Permit (SDP) application. The key objectives of the DMPA4 investigation were to:

1. Undertake a Multibeam Echosounder (MBES) survey to provide bathymetric and backscatter data (Full results detailed in R240372_BCI DMPA4 Multibeam Field Survey Report)
2. Undertake a Side Scan Sonar (SSS) survey to provide backscatter data to help inform BCH classification
3. Undertake a towed video survey within DMPA4 and predicted zones of impact to identify key BCH and validate sidescan and backscatter data
4. Undertake sediment sampling within DMPA4 (results reported separately in Appendix A)
5. Report on bathymetric and BCH results (this report).

MBES, backscatter and SSS surveys were undertaken in a Detailed Study Area (1300 m x 800 m) (Figure 2) which encompasses the proposed DMPA4 area, to allow for detailed mapping of a broader area. Towed video survey was conducted across the Detailed Study Area to ground-truth the MBES, backscatter and SSS data, and additionally collected across the predicted zones of impact (Zone of Moderate Impact, Zone of High Impact (Figure 2)) to characterise benthic habitats within these areas.

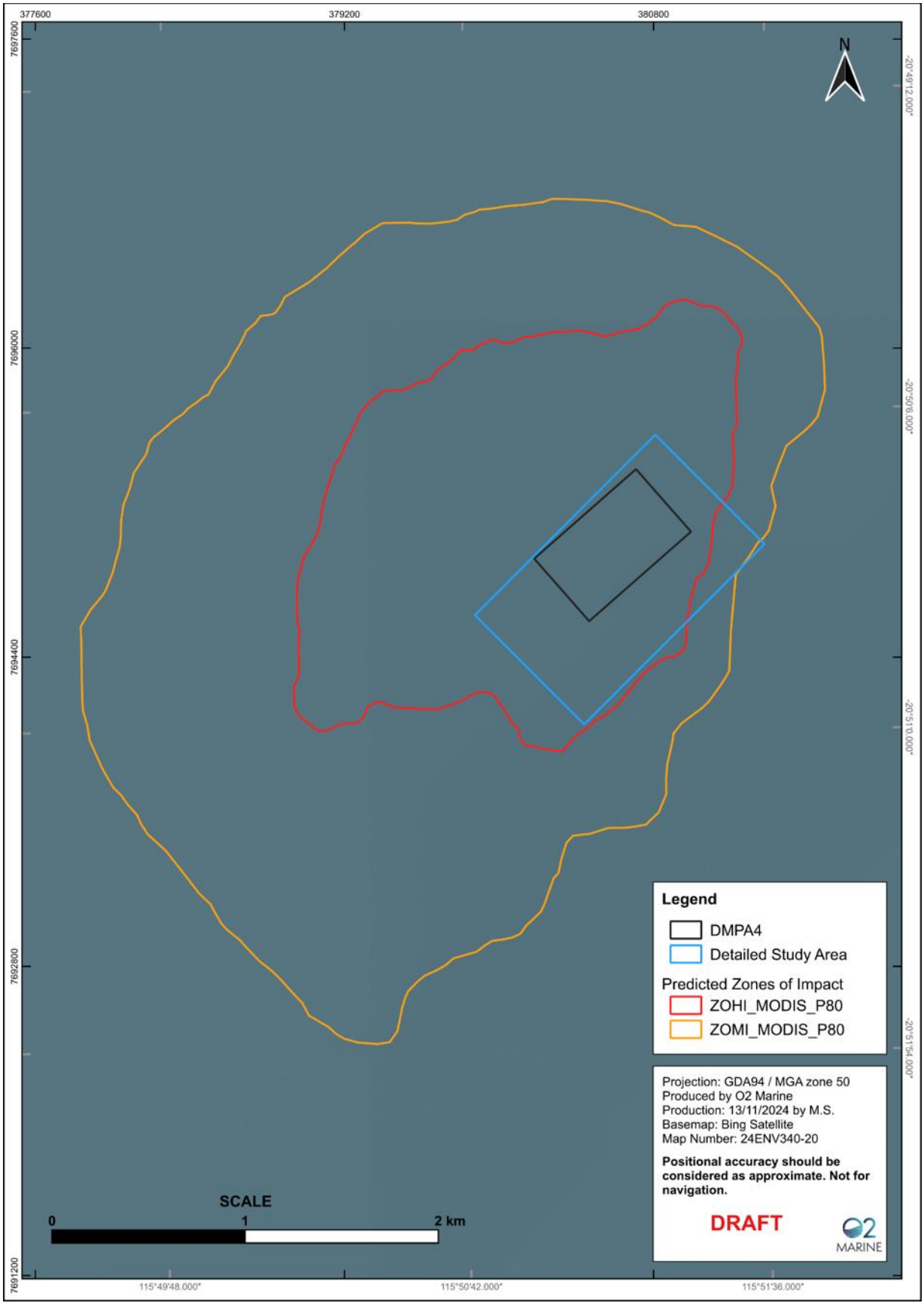

Figure 2: Overview of DMPA4, the Detailed Study Area, and the predicted zones of impact

2. Existing Environment

DMPA4 is located in the Pilbara coastal zone, approximately 11 km northwest of Sholl Island and 27 km offshore of the mainland (Figure 1). Water depths at the site are around 20 m.

The seafloor in the nearshore coastal zone (i.e. shoreward of DMPA4) is predominantly flat with the exception of numerous small islands, which form a semi-enclosed barrier. This coastal platform slopes mildly seaward with turbid waters (particularly to 10 m and deeper in the north) and increasing tidal influence from south to north. Outside of the island chain, the bathymetry deepens and waters are much less influenced by turbidity. The dominate BCH type in the DMPA4 has historically been classified as 'Subtidal reef (low relief) + Sand (Scott et al (2006) (Figure 3)), however, the DMPA4 was not ground-truthed during this mapping, meaning this BCH type has not been verified for the proposal area.

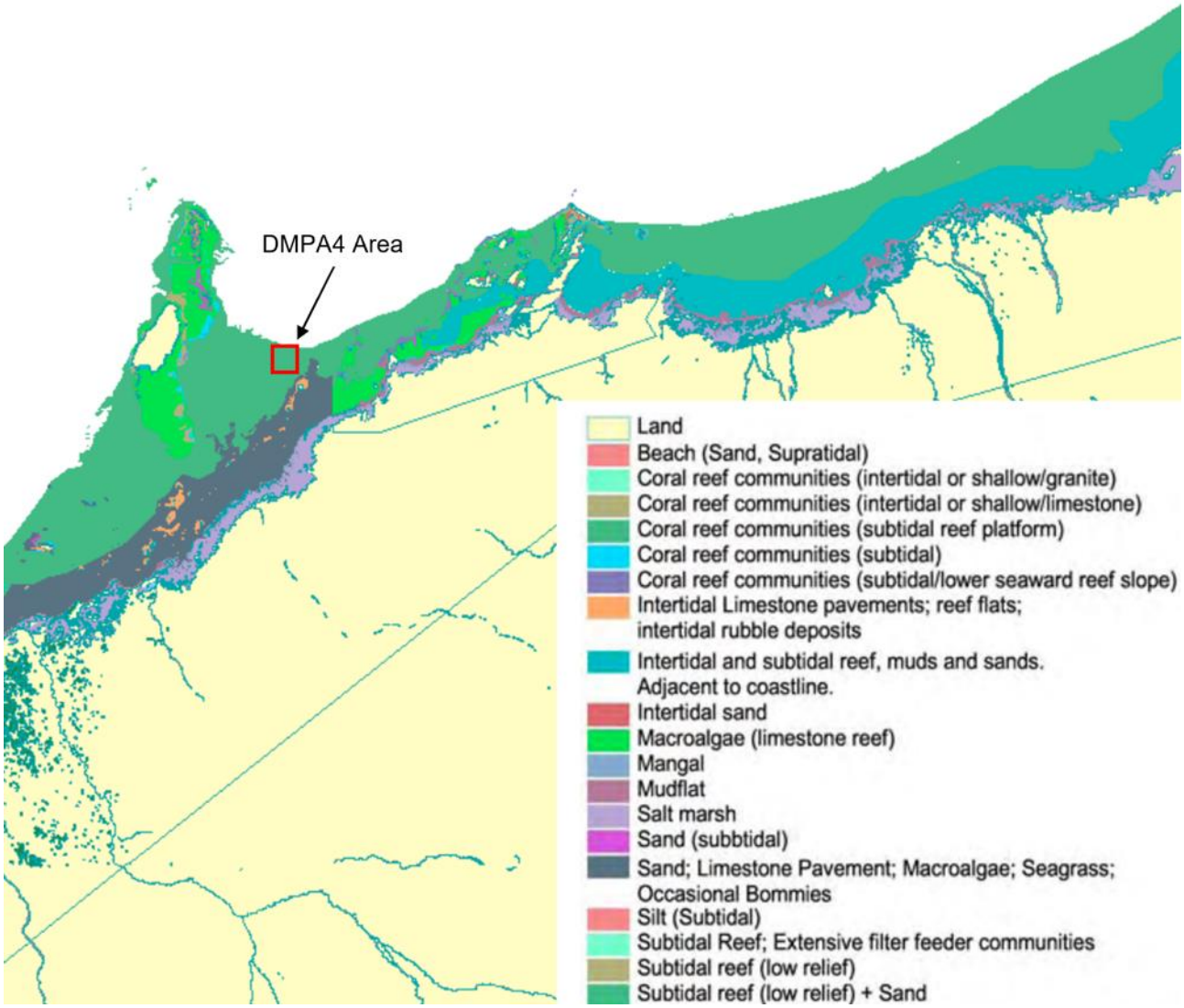

Figure 3: Broadscale BCH map of the Pilbara region, showing the location of the proposal DMPA4 disposal area (Scott et al., 2006)

3. Methodology

The BCH survey involved four stages (Figure 4):

- Pre-field/desktop tasks
- In-field tasks
- Data processing and analysis, and
- Reporting.

Methods associated with the acquisition and preparation of the habitat mapping datasets are described in Sections 3.2 to 3.3.

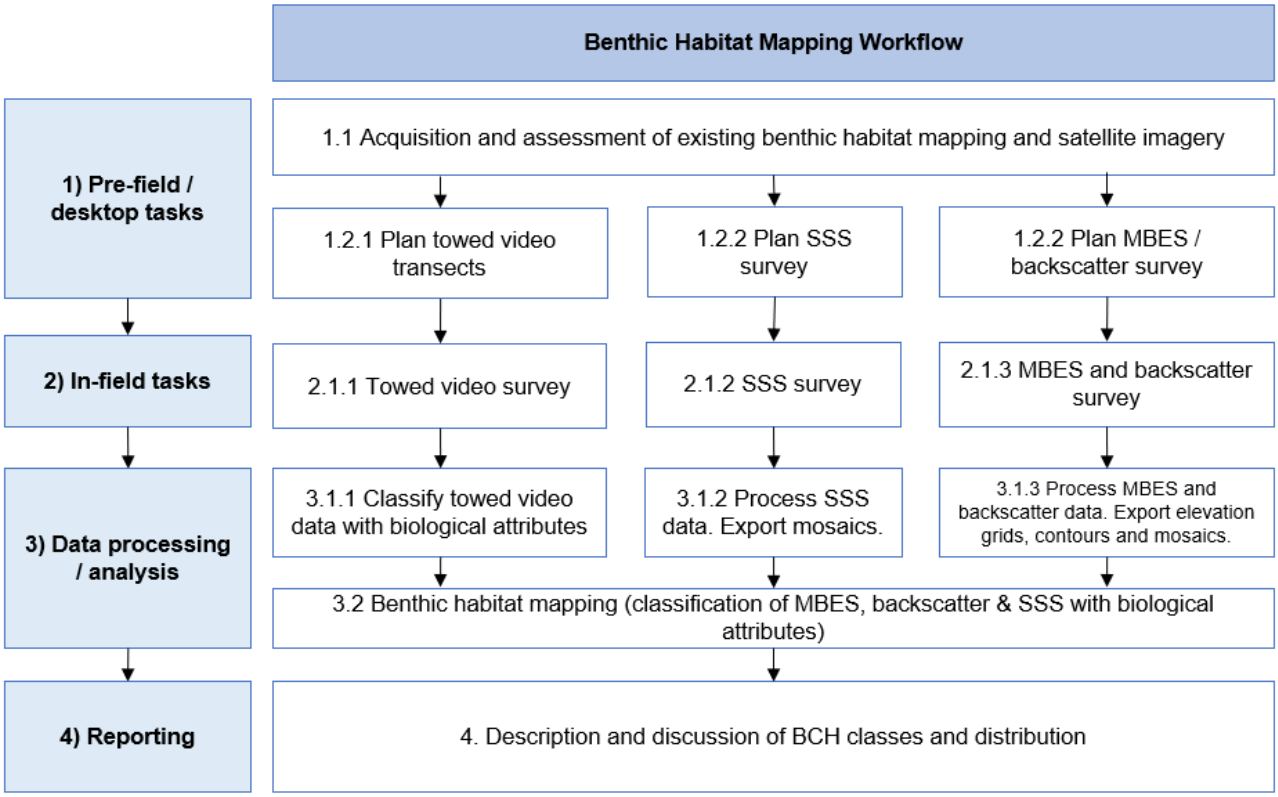

Figure 4: Breakdown of project stages and associated tasks

3.1. Pre-Field

Assessment of available satellite imagery prior to the field survey did not facilitate the identification of any benthic features of interest within DMPA4. Towed video transects were designed to cover the entire width of the mapping area in order to obtain continuous ground-truthing information across the MBES and backscatter datasets.

3.2. Field Survey

The DMPA4 investigation field survey was undertaken on O2 Marine's 8 m vessel *Geelong*, between the 20th and 26th September 2024.

3.2.1. Multibeam Echosounder

Hydrographic survey data acquisition took place on 24/09/2024. The multibeam echosounder (MBES) lines were planned to achieve a representative coverage of the study areas with crosslines conducted as a check. For a full breakdown of the MBES scope, see R240372_BCI DMPA4 Multibeam Field Survey Report.

A Norbit iWMBS multibeam echosounder was mounted on a purposely designed fixed pole on the vessel side gunnel. Bathymetry data were captured with the following instrumentation and software:

- 1 x Norbit iWBMS Multibeam with integrated Applanix POS MV WaveMaster II
- 1 x Acquisition laptop
- 1 x Valeport SWiFT sound velocity profiler (SVP)
- 1 x Emlid RS3 Global Navigation Satellite System (GNSS) and real-time kinematic (RTK) receiver.

Figure 5: MBES side-mounted survey pole with integrated GNSS antenna supports.

Details of the software and version number in use during the survey are:

- BeamworX NavAQ Version 2024.1.1.3
- BeamworX AutoClean Version 2023.3.1.0
- Valeport Datalog X2 Version 1.0.7

During the survey, the quality of the data was continuously monitored through NavAQ to ensure the acquired data met the survey specifications:

- The POS MV positioning accuracy was monitored, and where Precise Point Positioning (PPP) dropouts occurred the survey line was re-run with PPP.
- Sound velocity profiles were collected at the start in the middle and at the end of the survey checking that the Sound Velocity Sensor (SVS) / Sound Velocity Profiler (SVP) comparison was greater than 2 m/s to correct the data from the ray bending effect caused by salinity and temperature stratification/changes across the water column.
- The MBES data was monitored online to ensure optimal coverage of the Detailed Study Area.

The following multibeam settings were used throughout the project:

- Frequency 400 kHz
- Pulse length 15 µs
- Maximum angular coverage 120°
- Bottom Sampling Equidistant (beams per ping)

3.2.2. Sidescan Sonar

O2 Marine used a portable dual channel 450 kHz towed sidescan sonar (SSS) system (Tritech Starfish 452F) to collect sidescan data, that was operated through a topside control unit, using the acquisition software Scanline V2.1 (Figure 6). While immersed in the water column, the SSS unit emits and records acoustic waves (i.e. backscatter data) that are reflected by the seabed in a wide swath along the towed track. Geographic positioning of the SSS data was acquired using a non-differential GPS system (Hemisphere R120 integrated with OmniSTAR A20 receiver antenna). Online QA/QC of SSS data was undertaken at the end of all transects and data that was not deemed suitable for survey purposes were discarded and these transects were repeated.

Twelve SSS transects were run across the Detailed Study Area on 24/09/2024 (Table 1).

Table 1: Breakdown of sidescan sonar survey effort in DMPA4

Survey Date	Survey Hours	SSS Transects	Total area covered (km)
24-September-24	4	12	1.0 km

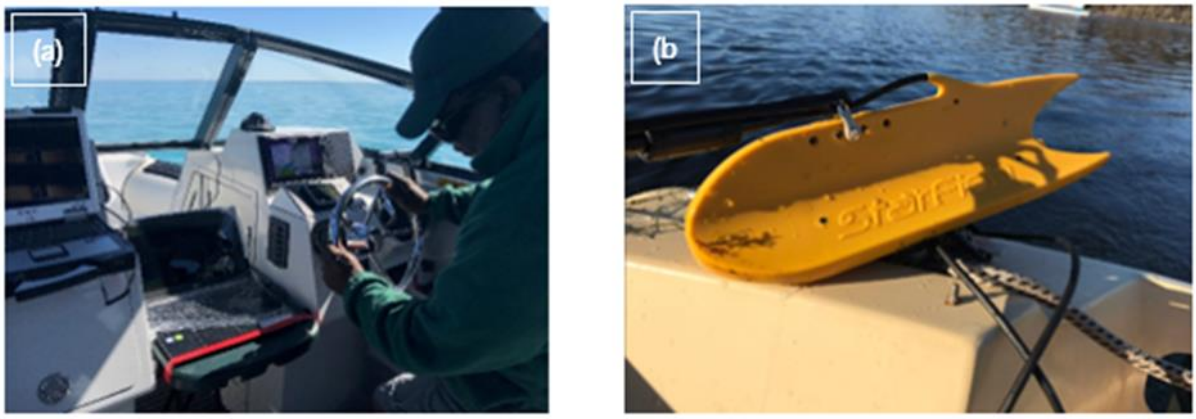

Figure 6: SSS equipment used in the field survey. a) Laptop operating Scanline V2.1 acquisition software, and b) Tritech Starfish 425F

3.2.3. Towed Video

The TVC system used for the ground truth survey was a Spot X PRO SQUID 3 real-time subsea high definition (HD) video camera (Figure 7b) with integrated GPS. A handheld GPS was used to mark waypoints for the start and end of video transects, as well as to record a backup GPS track. The TVC system was deployed from the vessel at each target location and operated by a scientist using the topside unit control box (Figure 7a). The topside unit provides live video feed for continuous quality control and allows adjustment of lights and camera settings. During the survey, the camera was flown at a depth of approximately 0.5 m above the seabed. Vessel speed ranged between 1-2 knots to allow for the recording of good-quality imagery.

The following information was recorded on field sheets at each targeted location:

- Date and time
- GPS coordinates
- Water depth (m)
- Dominant BCH type
- Comments to aid post-processing.

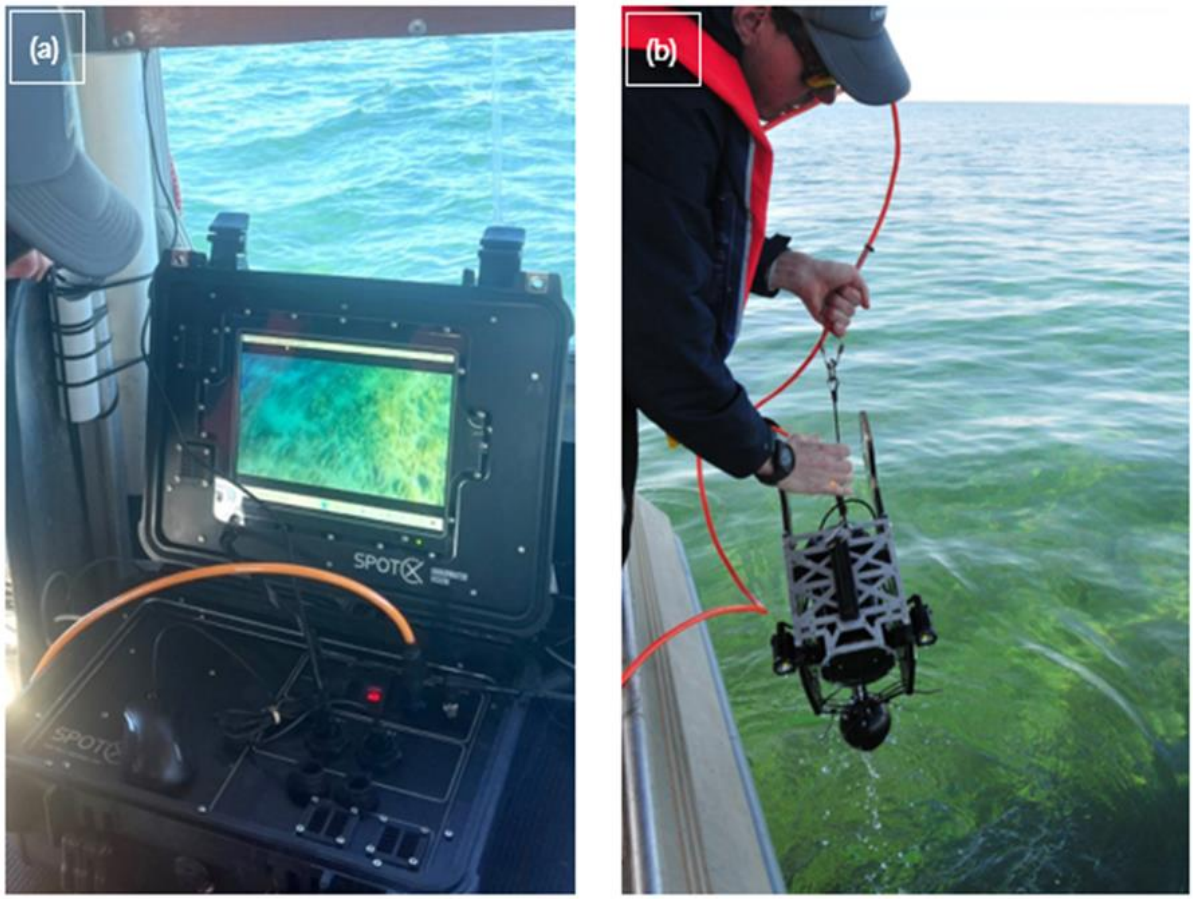

Figure 7: a) Spot X topside unit, and b) Spot X HD video camera and umbilical cable

To characterise benthic habitats within DMPA4 and ground-truth SSS, MBES and backscatter data, seven towed video transects were surveyed within the Detailed Study Area on 23rd September (Table 2). Transects ranged between 350 – 1250 m in length, equating to an overall distance of 6.3 km captured in video. Water depths at surveyed sites ranged between 18 - 21 m.

To characterise benthic habitats within the predicted zones of impact, seven transects were surveyed within the ZoMI and ZoHI on 24th September (Table 2). Transects ranged between 40 – 100 m in length, equating to an overall distance of 0.7 km captured in video. Water depths at surveyed sites ranged between 18 - 21 m.

Table 2: Breakdown of towed video survey effort in DMPA4

Survey Date	Survey Hours	TVC Transects	Total distance covered (km)
23-September-24	4	7	6.3 km
24-September-24	3	12	0.7 km

3.3. Data Processing

3.3.1. MBES Processing

Processing of the survey data was conducted using BeamworX AutoClean data processing software. The following processes were conducted on the data to obtain a high standard of data quality and to ensure that objects were not missed or deleted:

- 95% confidence assessment
- Data cleaning
- Spot soundings
- Surface generation and ASCII datasets.

3.3.2. SSS Processing

Following the field surveys, SSS data files were uploaded into processing software SonarWiz version 7.2. Processing involved determining the quality of data, bottom-tracking, navigational smoothing, and removing nadir, false artefacts, and noise generated in the data log files due to field conditions and interference. GPS offsets and cable lengths, which were recorded during the field survey, were applied to the transects to obtain the most accurate positioning of data. Empirical Gain Normalization (EGN) was applied to the dataset to optimise visualisation and correct for the decay in the backscatter level with distance from the receiver. The processed SSS mosaic of all transects was exported as 10 cm resolution Geotiffs, georeferenced to Geocentric Datum of Australia 1994 (GDA94) and presented in UTM coordinates (MGA, Zone 50).

3.3.3. Towed Video Classification

Ground truthing videos were classified by analysing footage from each TVC transect. Recordings were visually analysed by a suitably qualified marine scientist in TransectMeasure and classified into habitat classes (Table 3) following the Collaborative and Automated Tools for Analysis of Marine Imagery (CATAMI) standard classification scheme for scoring marine biota and physical characteristics from underwater imagery, which defines benthic habitats based on the physical and biological characteristics, including:

- Relief
- Substrate
- Bedforms
- Visual estimate of percent cover of benthic flora and fauna
- Dominant taxa.

A quality assurance and control check was conducted by an experienced marine scientist specialising in BCH taxonomy and habitat classifications, including verification of percent cover estimates and species identification.

The TransectMeasure data output was synced with the GPS track log, as well as the corresponding auxiliary information (time, depth), to attribute the appropriate BCH category (Table 6) at each point location. GPS

offsets and cable lengths, which were recorded during the field survey, were applied to the transects to obtain the most accurate positioning of data. Still images were also extracted from each transect at the point at which BCH type changed from one to the next.

Table 3: Classification scheme used for towed video

Substrate	Major category	Biota (minor subcategory)	Density (per frame)
Coarse sand (with shell fragments)	Bare	N / A	Low (3 - 10%) Medium (10 - 25%) High (25 - 75%) Dense (>75%)
	Seagrass	Ephemeral	
		Mixed	
	Macroalgae	Filamentous	
		Other macroalgae	
	Filter Feeders	Sponges, sea whips	
		Black & Octocorals	
		Mixed	
		Other	
	Mixed Assemblage	Filter feeders and corals	
		Filter feeders and seagrass	
		Filter feeders and macroalgae	

3.3.4. Benthic Habitat Mapping

To undertake analysis and map BCH types across the survey area, spatial data layers described in

Table 4 were compiled in QGIS 3.38. Textural and backscatter attributes of the SSS and backscatter data were assessed at the locations of the classified TVC transects (e.g. Figure 13). Due to the presence of remaining artefacts in the SSS and backscatter data, a manual digitising approach was considered the most suitable and effective method to achieve accurate classification of the Detailed Study Area. The bathymetry data was also analysed to identify seabed features and localised changes in elevation. Polygons were manually digitised where distinct signatures in the SSS data could be associated with towed video classes. Where distinct SSS signatures were observed but could not be associated with individual towed video classes, broader mapping categories were generated to classify these areas.

Table 4: Datasets used in mapping

Dataset	Description	Spatial Data Type	Resolution	Source
Sidescan sonar mosaic	Backscatter and textural characteristics to inform habitat identification.	Raster	0.25 m	O2 Marine internal dataset
Classified towed video transects	Points with attributes including substrate, relief, dominant taxa, cover, subdominant taxa, overall classification.	Vector (point)	N/A	O2 Marine internal dataset
MBES backscatter mosaic	Backscatter and textural characteristics to inform habitat identification.	Raster	0.5 m	O2 Marine internal dataset
MBES elevation grid	Provides information on depth, relief and terrain.	Raster	0.5 m	O2 Marine internal dataset
MBES hillshade	Provides information on relief and terrain.	Raster	0.5 m	O2 Marine internal dataset
MBES slope grid	Provides information on relief.	Raster	0.5 m	O2 Marine internal dataset

4. Results

4.1. Hydrographic Data

Sidescan and backscatter data indicate a largely featureless seafloor comprised of unconsolidated sediments with no visual evidence of hard substrate (Figure 8, Figure 9) suggesting an absence of any exposed reef systems in the survey area. Multibeam data (Figure 10) revealed a depth range of less than 2 m across the survey area. Subtle ridge features (<40 cm elevation) can be observed at several locations across the area. While the hydrographic data only provided limited evidence, it is probable that much area is underlain by pavement reef that is covered by a thin veneer of unconsolidated sediments.

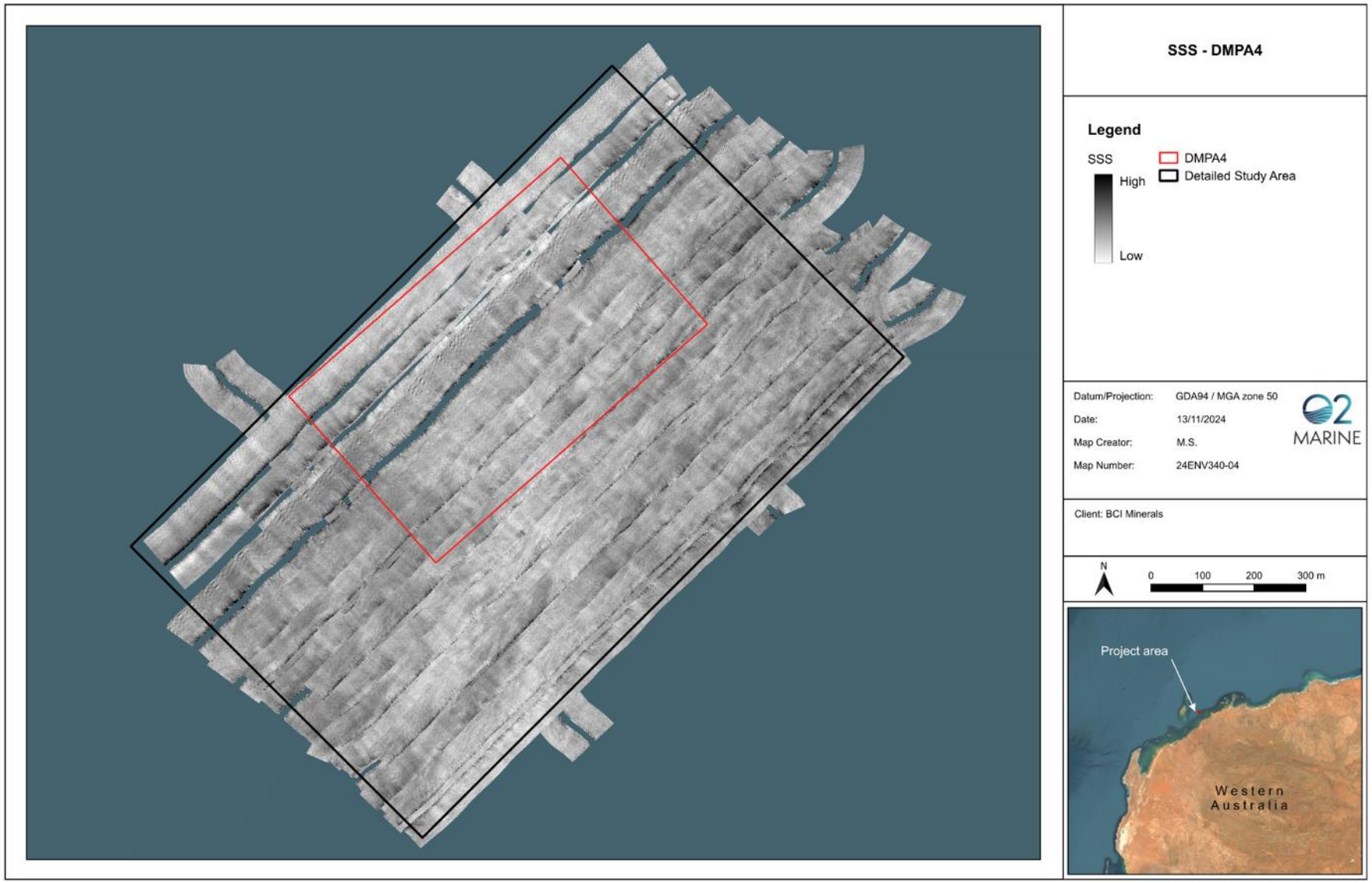

Figure 8: SSS data across DMPA4 and the Detailed Study Area

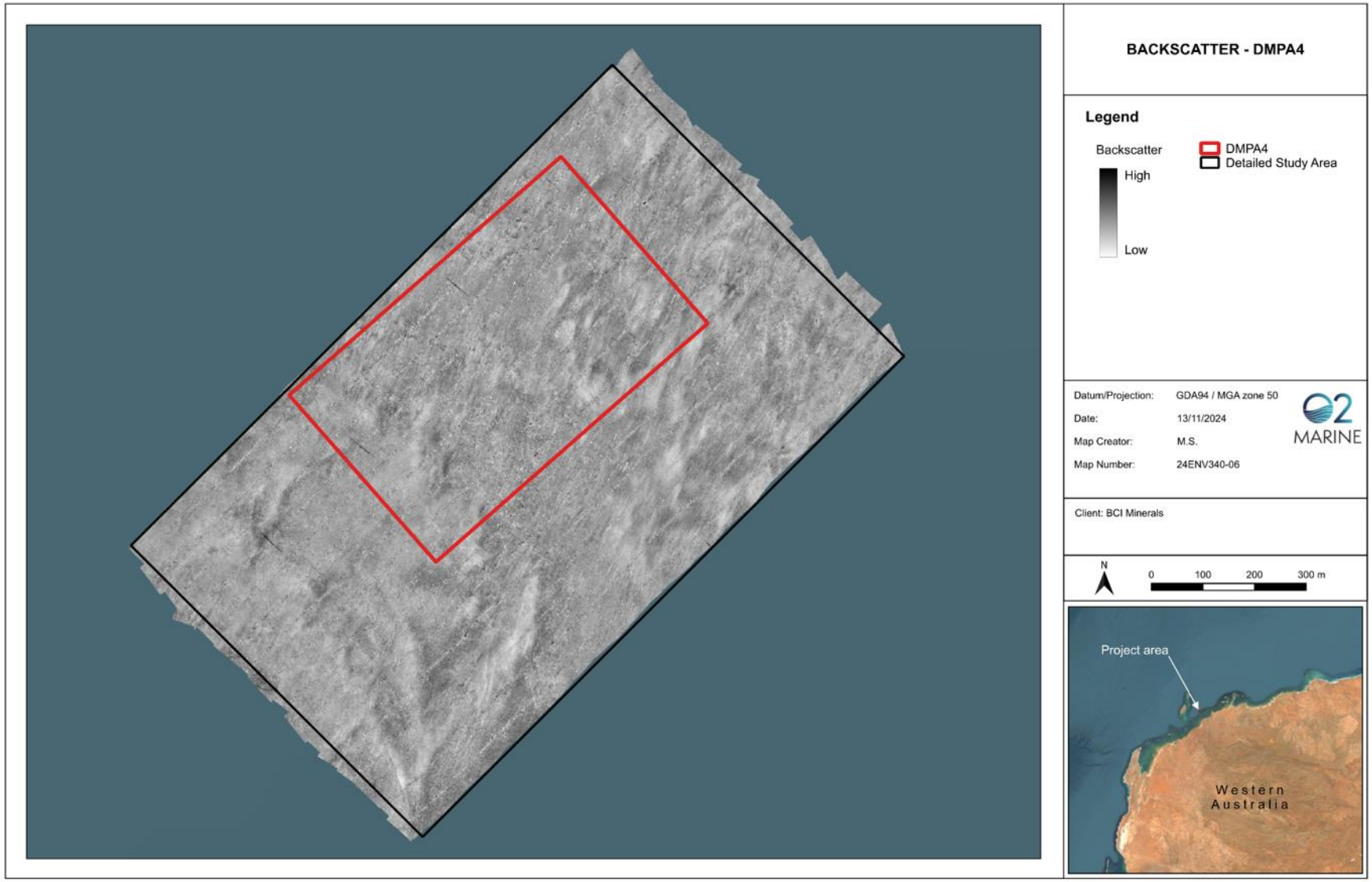

Figure 9: Backscatter data across DMPA4 and the Detailed Study Area

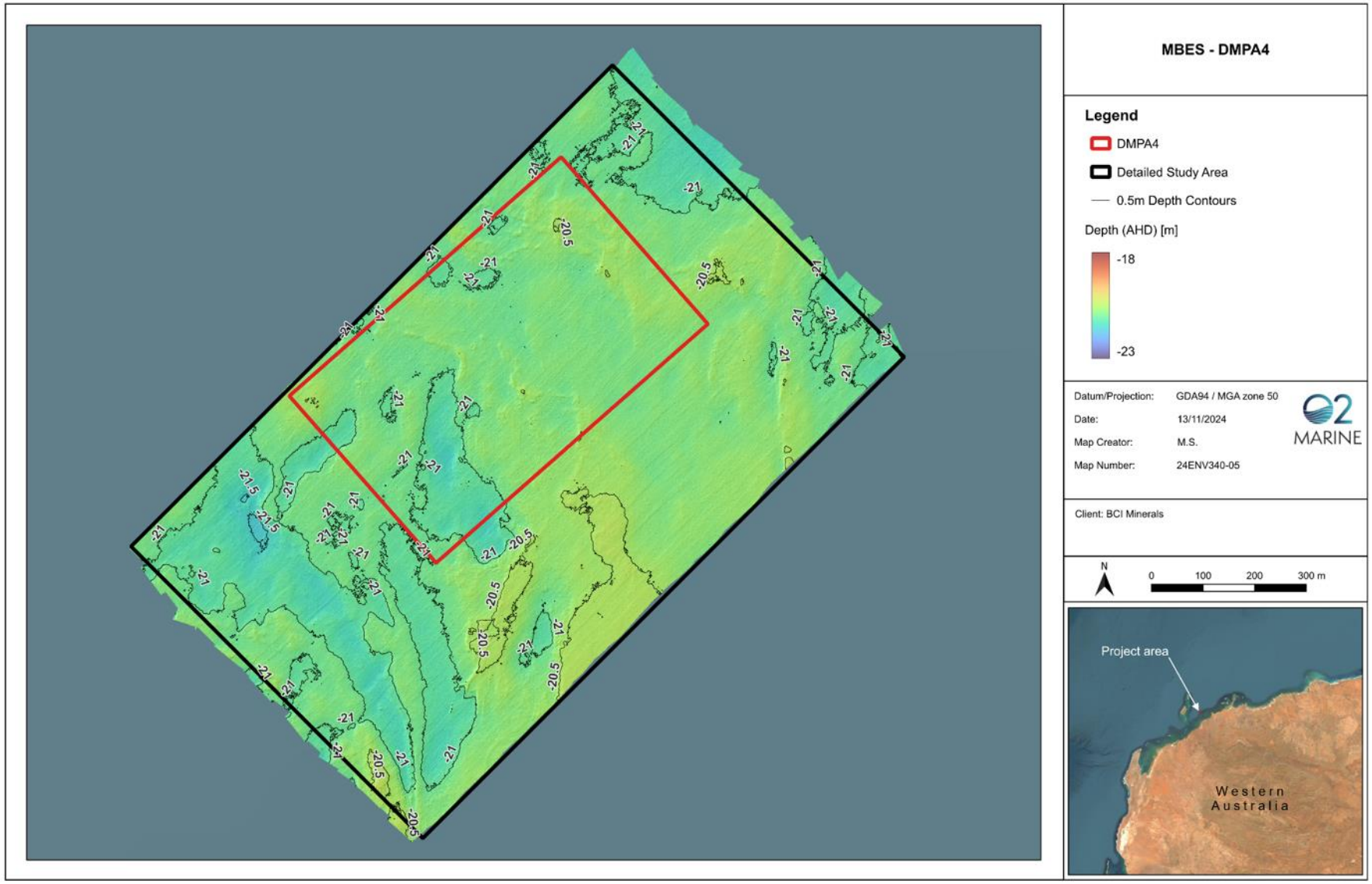

Figure 10: MBES data across DMPA4 and the Detailed Study Area

4.2. Towed Video Data

Ground truthing revealed a diversity of benthic assemblage types inhabiting sandy sediments across the proposed spoil ground DMPA4, and predicted zones of impact (Figure 11, Figure 12, Table 6). The dominant classes of BCH observed in underwater video were Sparse to Low Cover Mixed Assemblage (~49%) and Moderate Cover Mixed Assemblage (~23%; Table 5, Figure 11). Mixed Assemblage classes were filter feeder dominant, comprising of ascidians (*Polycarpa sp., Pyura sp*), sponges (species unidentified), soft (*Alcyonacea, Sinularia sp*) and hard corals, gorgonians (*Juncella fragilis*) and several unidentified species of macroalgae.

Other assemblages of BCH that were observed less frequently included High Cover Mixed Assemblage (~8.8%), Bare Sediment (~8.4%), Sparse to Low Cover Macroalgae (~7.7%). The remaining classes collectively comprised less than 5% of observations, including Sparse to Low Cover Filter Feeders (~2.3%), Moderate Cover Filter Feeders (~0.2%) and Moderate and Sparse to Low Cover Seagrass (~0.3%, <0.1%). Seagrasses were small ephemerals (*Halopola ovalis*) with low to moderate cover, as were macroalgae (e.g. *Padina*).

While BCH classes appeared clustered in areas (Figure 12), there were no obvious patterns in the distribution of any particular assemblage type in towed video data. The lack of clear patterns in BCH distribution reflects a similar lack of apparent feature in the sidescan or backscatter data (Figure 8, Figure 9), suggesting the seafloor is comprised of a homogenous substrate.

Table 5: Breakdown of towed video classifications in DMPA4

BCH Classification	Points classified	Percentage of points classified (%)
Sparse to Low Cover Mixed Assemblage	4536	49.1
Moderate Cover Mixed Assemblage	2139	23.1
High Cover Mixed Assemblage	817	8.8
Bare Sediment	777	8.4
Sparse to Low Cover Macroalgae	714	7.7
Sparse to Low Cover Filter Feeders	211	2.3
Moderate Cover Seagrass	28	0.3
Moderate Cover Filter Feeders	17	0.2
Sparse to Low Cover Seagrass	3	<0.1
Total	**7392**	**100**

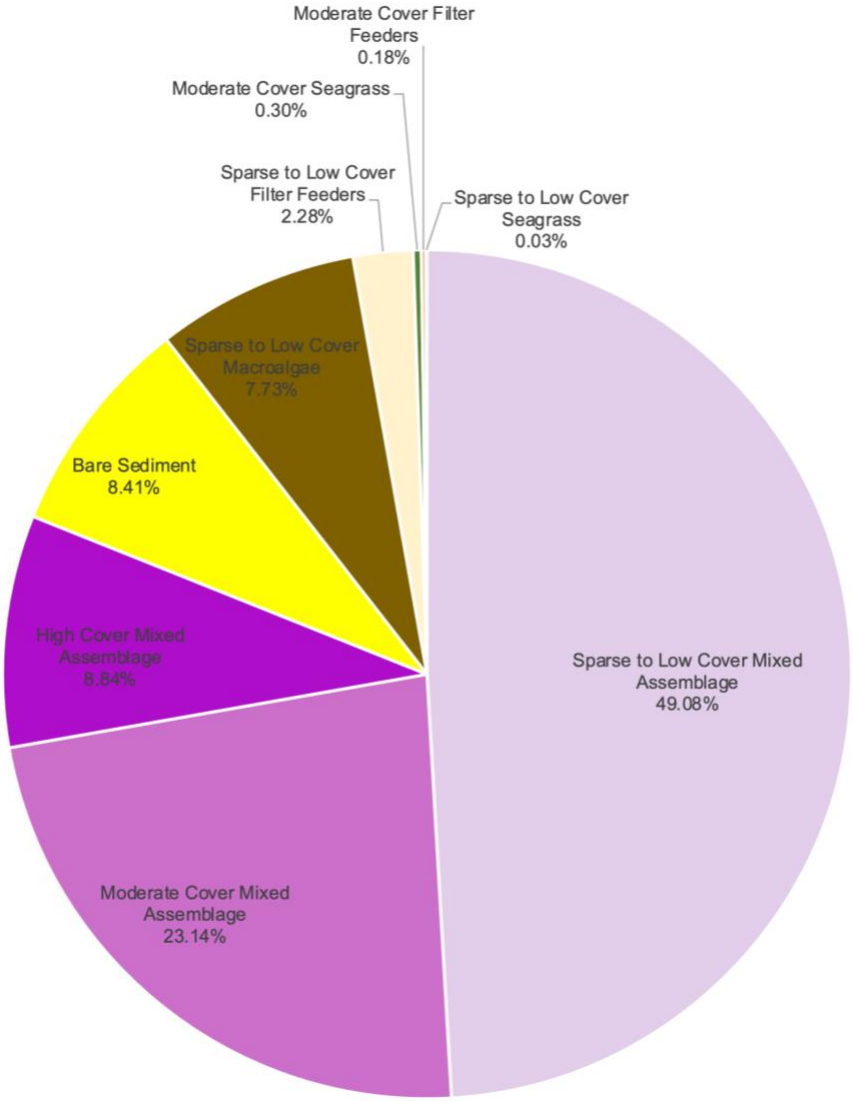

Figure 11: Towed video classifications by percentage of points classified

Table 6: BCH classifications determined from towed video footage, with a description of habitat and an example image taken during analysis

BCH Classification	Description	Example Image
Bare Sediment	Bare sediment (sand with shell fragments). No ripple features/bioturbation.	
Sparse to Low Cover Seagrass	Sparse to low coverage (3 - 10%) of ephemeral seagrass (Halophila ovalis) on sand with shell fragments.	
Moderate Cover Seagrass	Moderate coverage (10 - 25%) of ephemeral seagrass (Halophila ovalis) on sand with shell fragments.	

BCH Classification	Description	Example Image
Sparse to Low Cover Macroalgae	Sparse to low coverage (3 – 10%) of macroalgae (including *Padina sp.*) on sand with shell fragments.	
Sparse to Low Cover Filter Feeders	Sparse to low coverage (3 – 10%) of filter feeders on sand with shell fragments.	
Moderate Cover Filter Feeders	Moderate coverage (10 - 25%) of filter feeders on sand with shell fragments.	

BCH Classification	Description	Example Image
Sparse to Low Cover Mixed Assemblage	Sparse to low cover (3 – 10%) mixed assemblage on sand with shell fragments. Mixed macroalgae, filter feeders, ascidians (*Polycarpa sp.*, *Pyura sp.*) sponges, hard corals (*Sinularia sp)*, Alcyonacea, gorgonians (*Juncella fragilis*).	
Moderate Cover Mixed Assemblage	Moderate cover (10 – 25%) mixed assemblage on sand with shell fragments. Mixed macroalgae, filter feeders, ascidians (*Polycarpa sp.*, *Pyura sp.*) sponges, hard corals (*Sinularia sp)*, Alcyonacea, gorgonians (*Juncella fragilis*).	
High Cover Mixed Assemblage	High cover (25 – 75%) mixed assemblage on sand with shell fragments. Mixed macroalgae, mixed filter feeders (Ascidians (*Polycarpa sp. Pyura sp.*), Sponge, hard corals (*Sinularia sp*), Alcyonacea, *Crinoidea spp.*, gorogonians (*Juncella fragilis).*	

Figure 12: Towed video data across DMPA4 and within the predicted zones of impact (ZoMI, ZoHI)

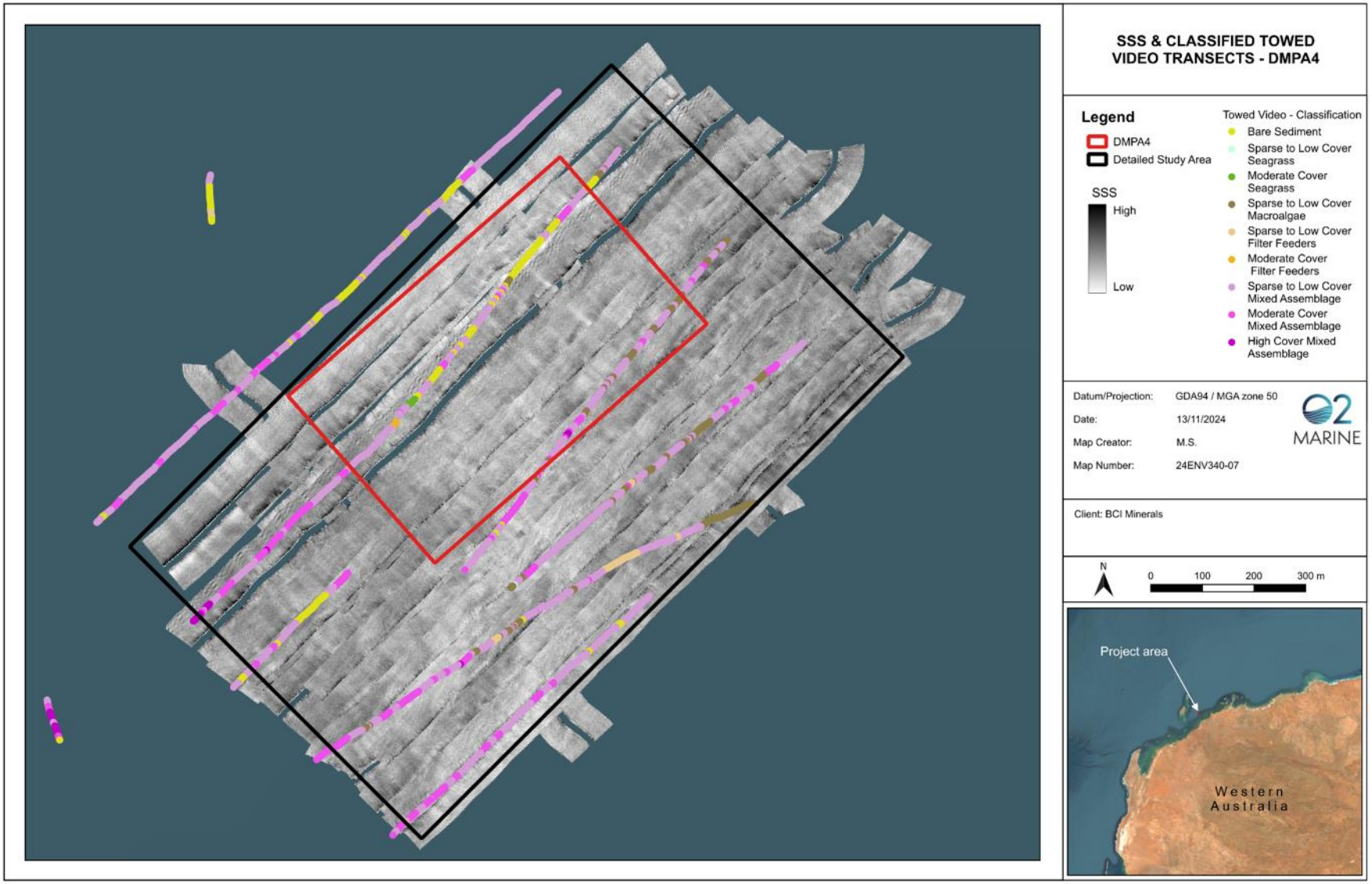

Figure 13: Classified towed video and sidescan sonar mosaic

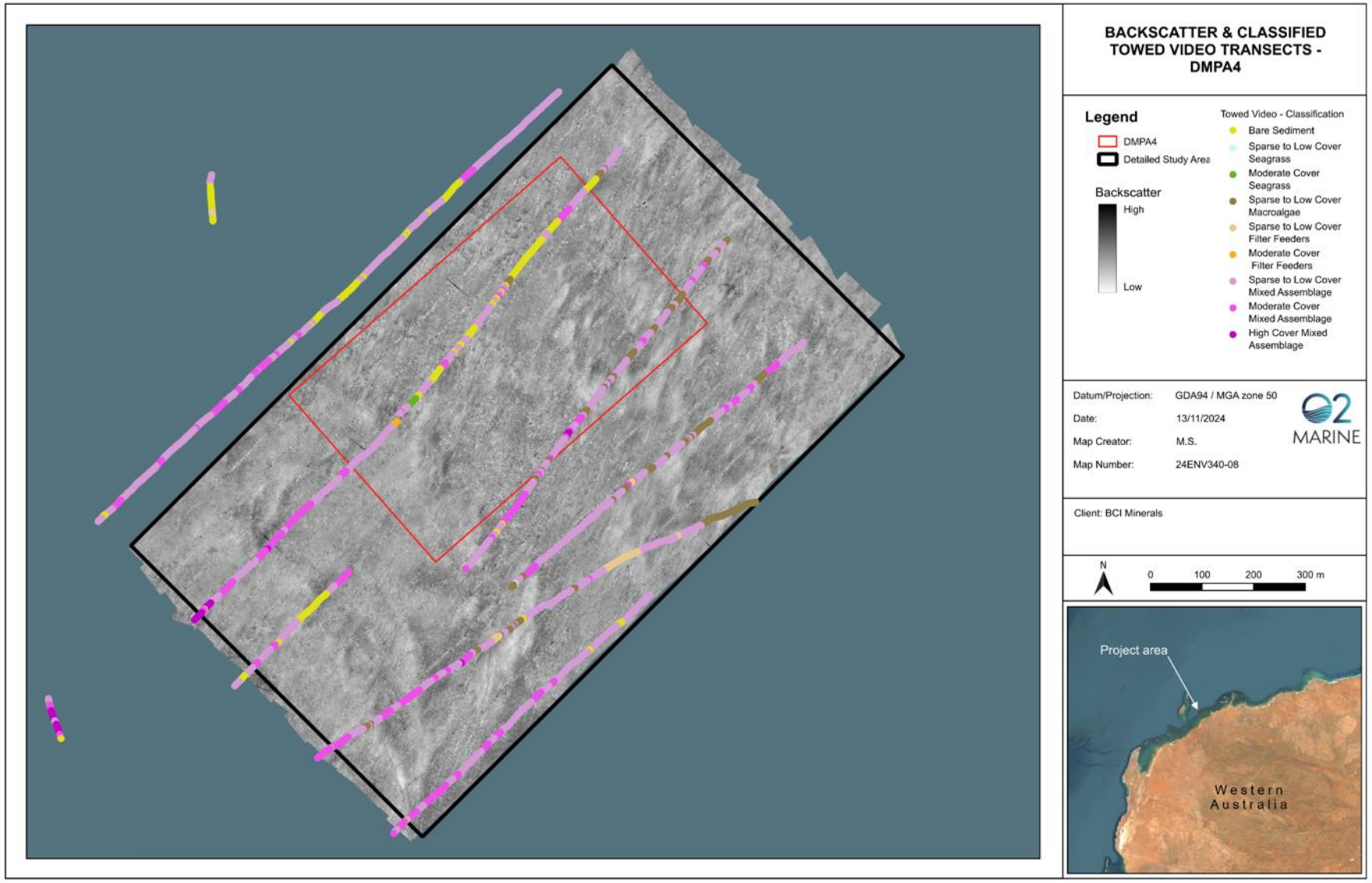

Figure 14: Classified towed video and backscatter mosaic

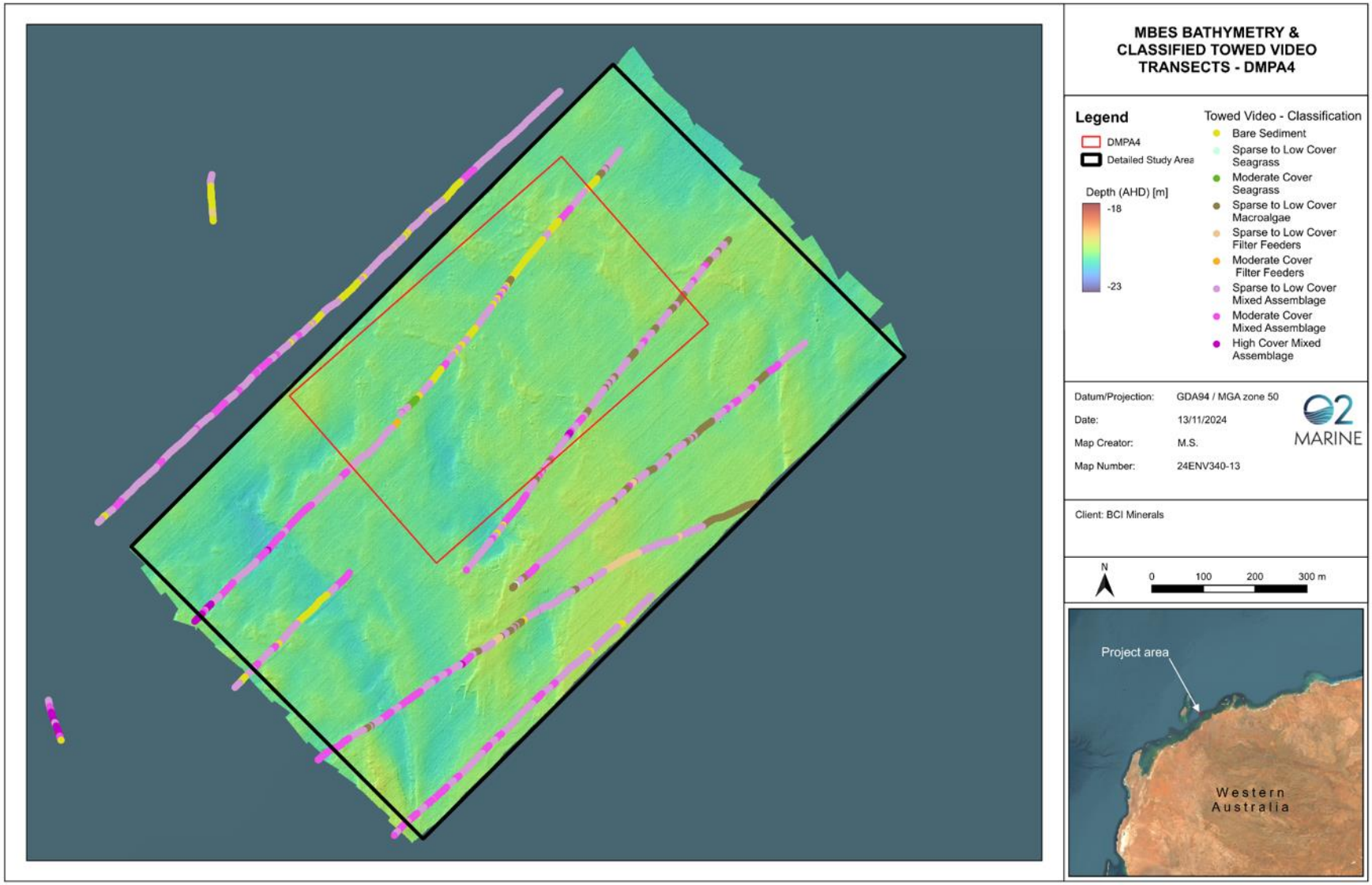

Figure 15: Classified towed video transects and MBES bathymetry

4.3. Distribution of BCH

4.3.1. DMPA4

Two mapping classifications were assigned to the 30.26 ha area of DMPA4 (Figure 16, Table 7). Overall, the towed video transects indicated a heterogenous pattern of BCH types and cover, not revealing any clear correlation with observable changes in bathymetry or substrate type (Figure 13, Figure 14, Figure 15). BCH types and levels of cover are likely to be more closely associated with minor differences in substrate form and the depth of unconsolidated sediments. Despite the observed heterogeneity of BCH types and cover across the area, filter feeders were largely dominant throughout (Section 4.2, Table 6). As such, DMPA4 can be characterized by a sparse to moderate cover mixed assemblage predominantly comprised of sessile filter feeders (including soft corals, gorgonians, sponges, hydroids, and ascidians), alongside varying covers of subdominant species such as macroalgae, hard corals, and ephemeral seagrass. While other classes and densities of BCH were noted within the survey area, it was not feasible to further refine the classification or accurately represent the level of heterogeneity. Analysis of elevation and terrain in the MBES data allows delineation of areas unconsolidated sediments (~15.2%) from areas of low-profile reef covered by a sediment veneer (~84.8%) (Table 8).

Table 7: Definition of mapping classifications assigned to DMPA4 and the Detailed Study Area

BCH Classification	Description
Sparse to Moderate Filter Feeders on Low Profile Reef with Sand Veneer	Mixed assemblage dominated by sessile filter feeders (including soft corals, gorgonians, sponges, hydroids, and ascidians) on low-profile reef with sand veneer. Predominantly sparse to moderate cover, with some isolated areas of high cover. Subdominant biota includes sparse to low covers of macroalgae, hard corals, and ephemeral seagrass.
Sparse to Moderate Filter Feeders on Unconsolidated Sediment	Mixed assemblage dominated by sessile filter feeders (including soft corals, gorgonians, sponges, hydroids, and ascidians) on unconsolidated sandy sediment. Predominantly sparse to moderate cover, with some isolated areas of high cover. Subdominant biota includes sparse to low covers of macroalgae, hard corals, and ephemeral seagrass.

Table 8: Mapping classifications by area and percentage of DMPA4 area

BCH Classification	Area (ha)	Area (km²)	Percentage of DMPA4 area (%)
Sparse to Moderate Filter Feeders on Low Profile Reef with Sand Veneer	25.65	0.257	84.8
Sparse to Moderate Filter Feeders on Unconsolidated Sediment	4.61	0.046	15.2
Total	**30.26**	**0.30**	**100**

4.3.2. Predicted Zones of Impact

Towed video transects from across the predicted zones of impact reveal a continuation of the filter feeder-dominant habitat observed within DMPA4 and the Detailed Study Area. The spatial distribution of low-profile

reef features could not be mapped with the same level of confidence as in the Detailed Study Area, however observations of similar biota and levels of cover infer a similar mix of substrate types, including unconsolidated sediment, and sand-veneered low-profile reef. As such, 'Sparse to Moderate Filter Feeders' was assigned as the classification for the zones of impact.

Table 9: Definition of mapping classifications assigned to the predicted zones of impact (ZoMI, ZoHI)

BCH Classification	Description
Sparse to Moderate Filter Feeders	Mixed assemblage dominated by sessile filter feeders (including soft corals, gorgonians, sponges, hydroids, and ascidians) on low-profile reef with sand veneer. Predominantly sparse to moderate cover, with some isolated areas of high cover. Subdominant biota includes sparse to low covers of macroalgae, hard corals, and ephemeral seagrass.

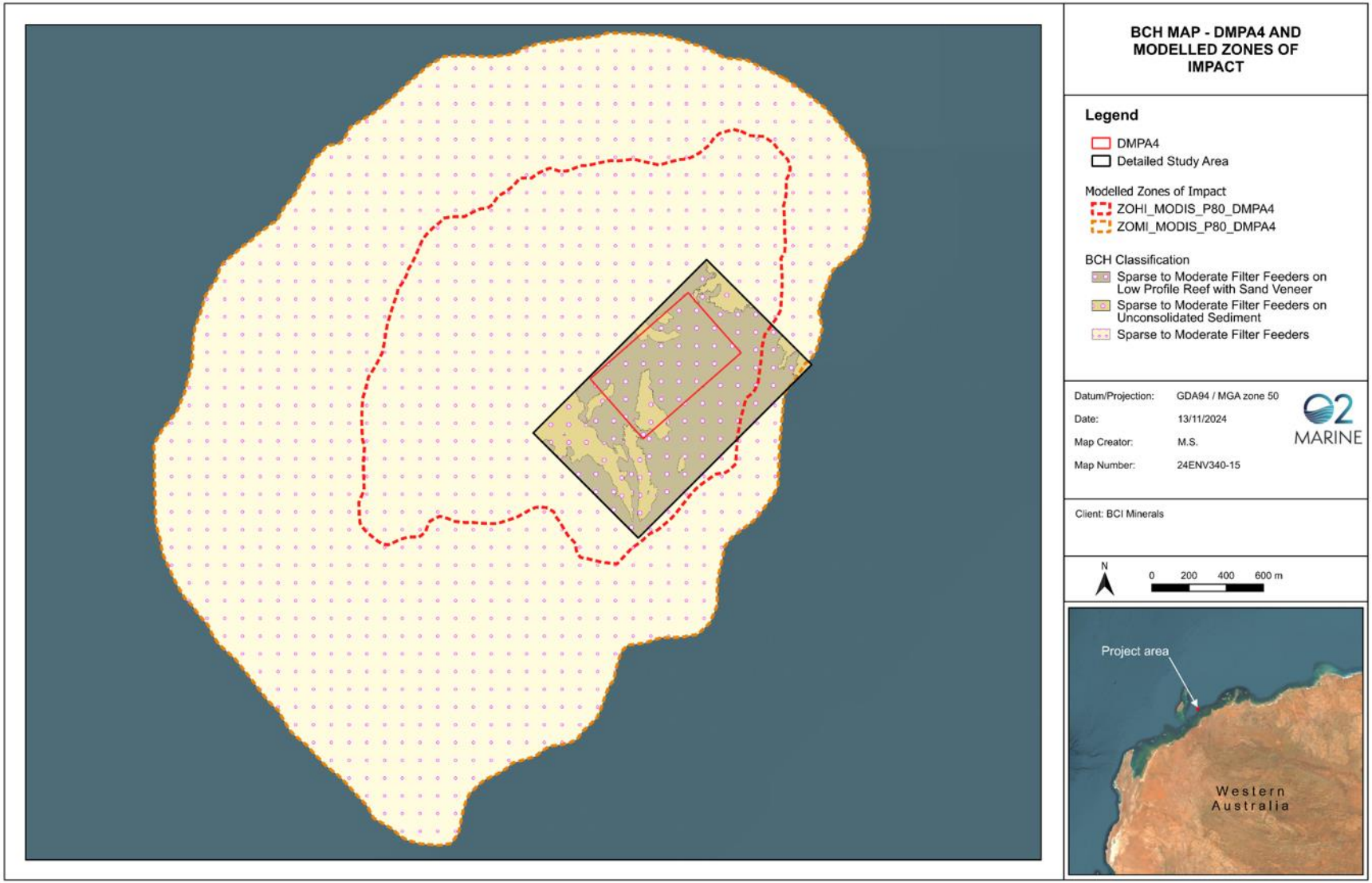

Figure 16: BCH Map of DMPA4, and predicted zones of impact

5. Discussion

This study has gathered data to describe the extent, distribution, and types of BCH within DMPA4 and the predicted zones of impact. Below, we discuss the ecological significance of the various BCH types observed and the potential factors influencing their distribution patterns.

Bathymetric data indicates minimal depth variation of less than 2 m (ranging from -20.2 m to -21.6 m) across the Detailed Study Area. Several small ridges, with approximately 0.3 m elevation changes, suggest the potential existence of low-profile reefs (limestone pavement) beneath the sandy substrate. This possibility is further supported by the presence of certain organisms which typically require hard substrates, such as hard corals and macroalgae (Hubbard & Scaturo, 2005). Low-profile reefs are recognized as significant features that support various marine organisms by providing hard substrates for filter feeders like sponges and soft corals. Surveys conducted by UWA (2009) found that sand-inundated reefs generally supported less dense sponge assemblages, aligning with the dominant observation of sparse to low cover assemblages throughout DMPA4. Since only sand was observed in the towed video transects, the presence of low-profile reefs can only be inferred. However, based on the observed terrain and existing knowledge the prevalence of this type of morphology in this region (Scott et al., 2006; UWA, 2009), this is likely accurate.

At a fine scale (meters), the BCH types and densities across towed video transects displayed a reasonably heterogenous pattern not showing any clear correlation with detectable changes in bathymetry or boundaries in assemblage extent (Figure 13, Figure 14, Figure 15), therefore BCH types and densities may be more closely associated with minor differences in substrate form and the depth of unconsolidated sediments. Overall, however, DMPA4 can be characterized as a relatively homogenous habitat, supporting a sparse to moderate cover mixed assemblage predominantly comprised of sessile filter feeders (including soft corals, gorgonians, sponges, hydroids, and ascidians), alongside varying cover of subdominant species such as macroalgae, hard corals, and ephemeral seagrass. Such sessile filter feeder assemblages are typical of sand-veneered and exposed pavements, which are prevalent on the inner North West Shelf and represent one of the most widespread benthic community types in the Pilbara region (Chevron, 2014). Whilst the spatial distribution of unconsolidated sediment and sand-veneered low-profile reef could not be mapped within the zones of impact, towed video collected across these areas reveals the continued presence of filter-feeder dominant assemblages with predominantly sparse to moderate levels of cover.

6. Conclusions

The 30-hectare area of DMPA4 was mapped for BCH distribution and cover, and two BCH categories were reported. BCH types were not distributed consistently throughout the area, however observed variations were mainly subtle changes in level of cover. DMPA4 can be broadly characterised as a filter feeder dominated habitat with a predominantly sparse to moderate level of cover. It is unlikely that the habitats at this site represent particular regional or conservation significance compared to other areas within Mardie and the Pilbara region, where higher covers and diversities are observed.

7. References

Chevron. (2014). Wheatstone Project – Trunkline Installation Environmental Monitoring and Management Plan. Document No: WS0-0000-HES-PLN-CVX-000-00059-000.

Hubbard, D. K., & Scaturo, D. J. (2005). Coral Reef Ecology: A Study of Coral Reefs and Their Relationship to the Environment. Coral Reefs. 24 (1), 1-12.

Jones R, Fisher R, Bessell-Browne P. (2019). Sediment deposition and coral smothering. PLOS ONE. 2019;14(6):e0216248. doi: 10.1371/journal.pone.0216248

Scott R., Martin M., Lyne V., Last P., Fuller M., Butler A. (2006). Ecosystem characterisation of Australia's North West Shelf. North West Shelf Join Environmental Management Study. Technical Report No. 12.

UWA. (2009). Wheatstone – Survey of Benthic Habitats near Onslow, Western Australia (15-70 Metres). Report to URS Australia Pty Ltd, Perth by the Centre for Marin

Appendix A. Technical Memorandum -Offsore Spoil Ground Sediment Assessment

Date	25/10/2024	Reference	T240370
To	Karen Frehill	Email	karen.frehill@bciminerals.com.au
From	Josh Abbott	Email	josh.abbott@o2marine.com.au
Subject	Technical Memorandum – Mardie Offshore Spoil Gorund Sediment Assessment		

1. Introduction

O2 Marine were engaged by Mardie Minerals to undertake bathymetric and environmental surveys at Dredge Material Placement Area 4 (DMPA4) for the Optimised Mardie Project (the Project). DMPA4 was identified during a 2022 reconnaissance survey as a possible disposal area for dredged material for the Project, due to its position further away from Sholl island and other reef systems containing key BCH receptors. Additional survey data was obtained from the 'study area', which encompasses and provides a buffer to DMPA4, to determine its suitability as a disposal site. The survey data collected will be used to inform the Project Sea Dumping Permit (SDP) application.

Results for the bathymetric and BCH investigations are included in the above report. This technical memorandum summarises the sediment sampling results. Sediment sampling within the study area was undertaken to provide an understanding of the baseline sediment conditions, and to compare these to the proposed dredge material to be disposed in accordance with the National Assessment Guidelines for Dredging (NAGD 2009).

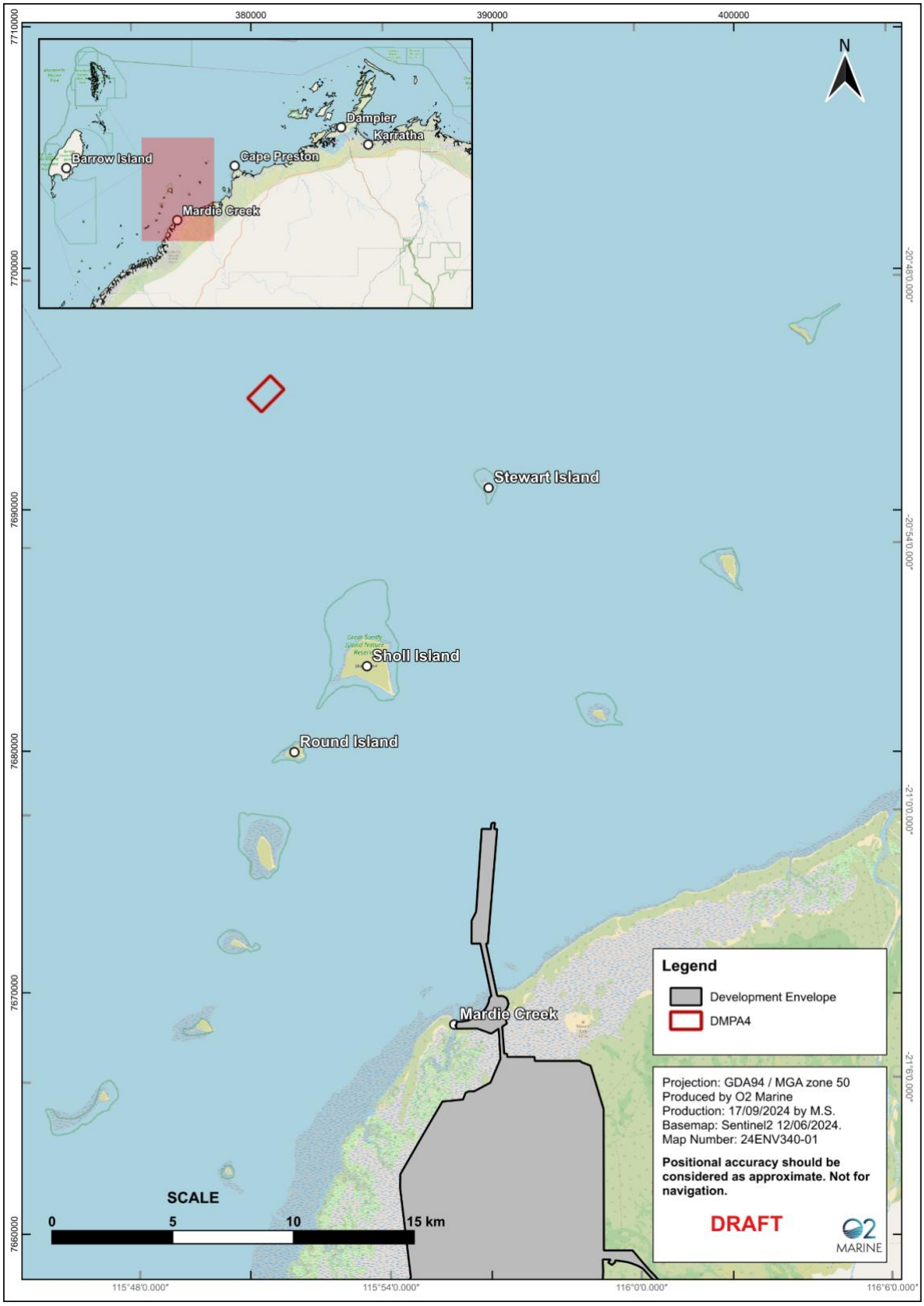

Figure 1: Regional overview of DMPA4.

2. Methods

2.1. Sample Location

Four sediment samples (in addition to triplicates and splits for quality assurance and quality control(QA/QC)) were collected within the study area. The sampling locations are presented in Table 1 and Figure 2.

Table 1: Sediment sample locations coordinates within the study area (GDA94 MGA Zone 50).

Sample ID	Easting	Northing
SG01	380181.4	7694637.0
SG02	380458.5	7694348.6
SG03	380785.5	7695235.1
SG04	381064.1	7694948.1

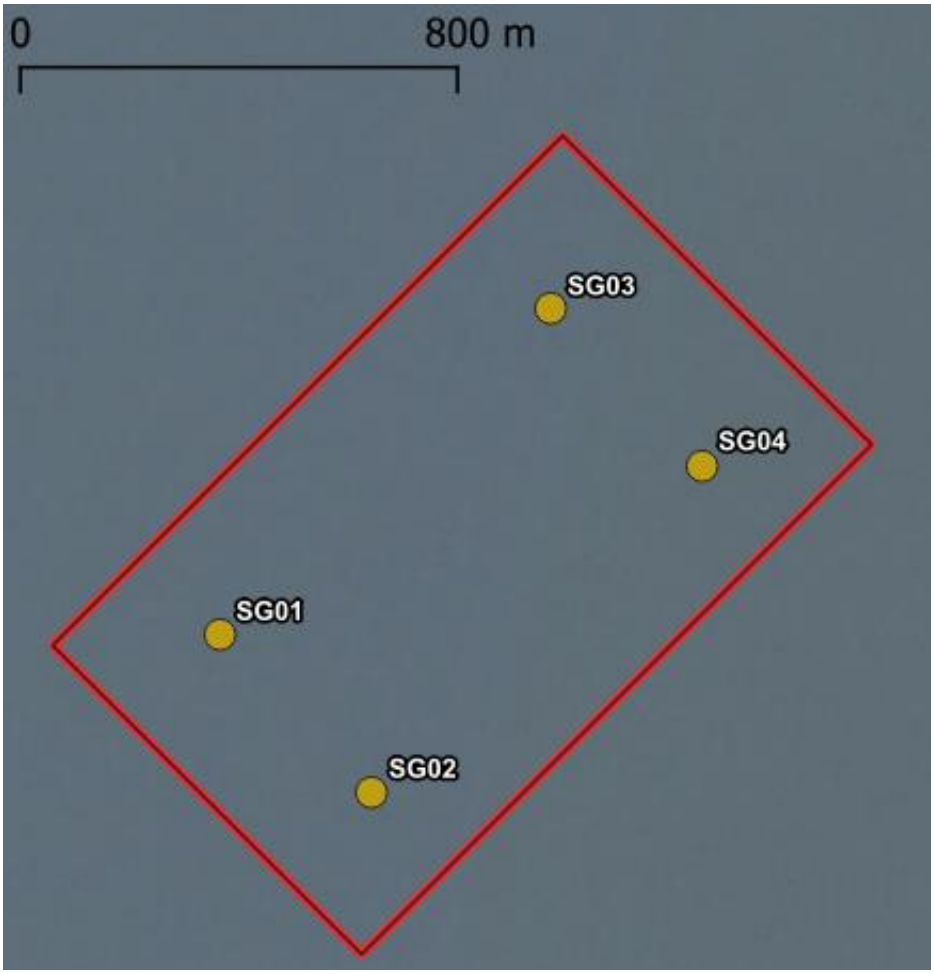

Figure 2: Sediment sample locations within the study area.

2.2. Collection Methods

Sediment samples were collected using a Van Veen grab sampler (Figure 3). At each sampling location the grab sampler was deployed by hand, and once the sampler was on the seabed a GPS mark was recorded. The Van Veen grab was retrieved using a mechanical capstan onto the vessel, where 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. Sediments for particle size distribution (PSD) analysis were transferred into zip lock bags and sediments for contaminant analysis were transferred into glass jars. Both zip-lock bags and glass jars were provided by the laboratory and labelled by the field team prior to filling. Samples were then stored in a chilled cooler box, ready for transport to a NATA accredited laboratory. Samples were consigned with a chain of custody (CoC) form (Attachment 1) 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.

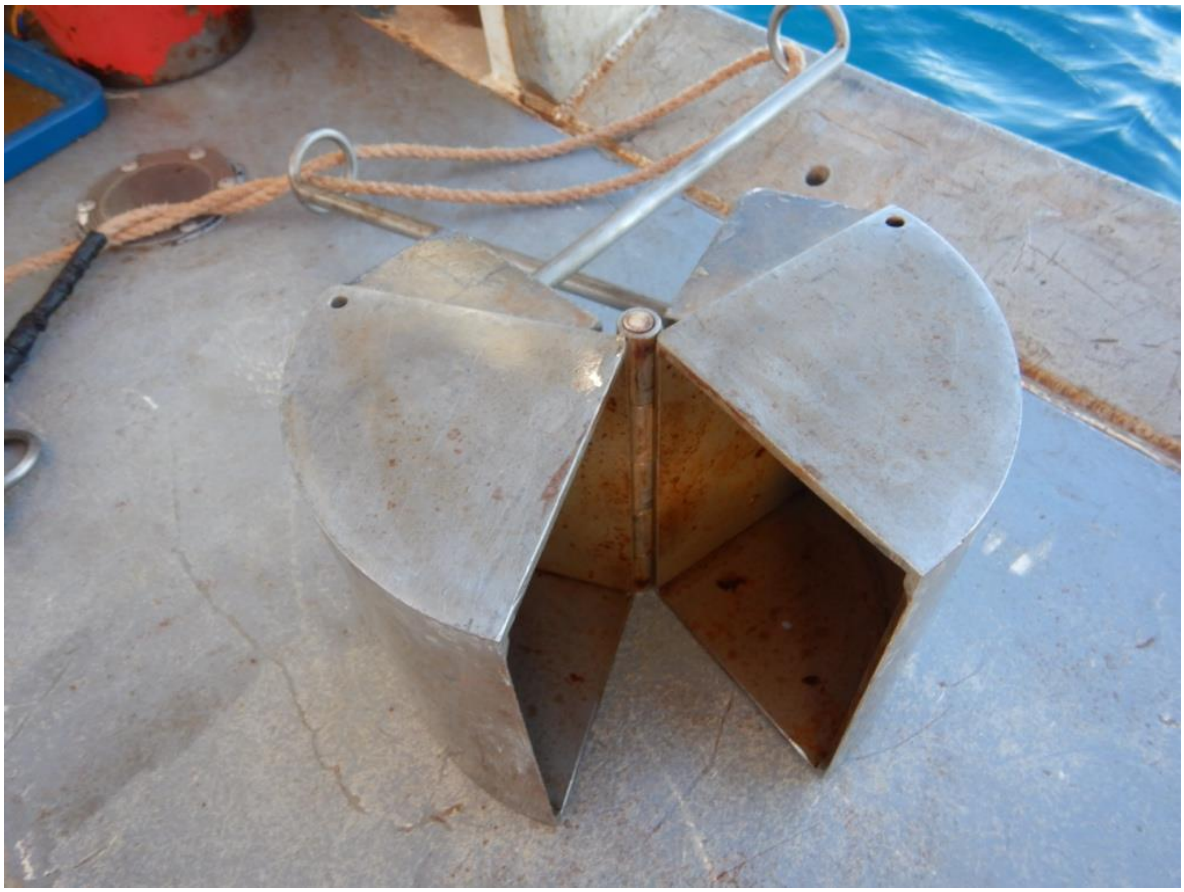

Figure 3: Van Veen Sediment Sampler

2.3. Analysis Parameters

The analytes selected for laboratory analysis were determined by a previously completed literature review for the project site, and the level of coastal development of the area (O2 Marine 2019), and included the following:

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

2.4. Field Quality Assurance / Quality Control

The field 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 was undertaken. A CoC (Attachment 1) was included with the samples provided to the laboratory.

3. Results

3.1. Metals

All sediment samples (except one arsenic result at SG01) recorded concentrations below their respective NAGD (2009) screening levels (Table 2). Arsenic at SG01 was recorded at 21 mg/kg, marginally higher than the screening level of 20 mg/kg. Overall, SG01 recorded higher metal concentrations across all parameters (except cadmium, copper, mercury and silver of which were unanimously below the laboratory limit of reporting (LoR)). SG02 and SG03 were comparable, with slightly lower concentrations than SG01, while SG04 recorded the lowest concentrations of all parameters.

Aluminium ranged between 530 mg/kg and 13,000 mg/kg and this potential contaminant does not have a NAGD (2009) screening level for comparison. However, DEC (2006) documents contaminant concentrations throughout the Pilbara region including aluminium, and sampling location ONS4 within the region had similar mean results with 10,566 mg/kg. There are no applicable manganese assessment criteria to compare data against, though sampling results ranged between 43 mg/kg at SG04 and 95 mg/kg at SG01, with SG02 and SG03 having similar results with 70 mg/kg and 73 mg/kg respectively

Table 2 shows results from both the study area and the dredge channel (sampled in 2023). Whilst some parameters had slightly different LoRs (antimony, arsenic, manganese, mercury and silver), the data outlines relatively comparable concentrations between the two sampling locations. Slightly higher aluminium concentrations were recorded within the dredge channel compared to offshore study area. One notable difference between the two sample locations is the low level of arsenic recorded across all sites within the dredge channel in 2023.

Table 2: Metals concentrations at the offshore study area compared to the dredge channel samples collected in 2023.

	Aluminium	Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Manganese	Mercury	Nickel	Silver	Zinc
2024 Sediment Sample Results from offshore study area												
LOR	***20***	***0.5***	***1***	***0.1***	***1***	***1***	***1***	***5***	***0.01***	***1***	***0.1***	***1***
Units	***mg/kg***	***mg/kg***	***mg/kg***	***mg/kg***	***mg/kg***	***mg/kg***	***mg/kg***	***mg/kg***	***mg/kg***	***mg/kg***	***mg/kg***	***mg/kg***
NAGD Screening level (ISQG-Low)	***-***	***2***	***20***	***1.5***	***80***	***65***	***50***	***-***	***0.15***	***21***	***1***	***200***
SG01	1300	0.7	21	< 0.1	14	< 1	1.8	95	< 0.01	2.6	< 0.1	2.6
SG02	1100	0.6	20	< 0.1	11	< 1	1.4	73	< 0.01	2	< 0.1	2.1
SG03	1000	< 0.5	14	< 0.1	11	< 1	1.5	70	< 0.01	2	< 0.1	1.9
SG04	530	< 0.5	8.3	< 0.1	6.4	< 1	1.1	43	< 0.01	1.2	< 0.1	1.3
2023 Sediment Sampling Results from the dredge channel												
LOR	***20***	***2***	***5***	***0.1***	***1***	***1***	***1***	***1***	***0.02***	***1***	***1***	NA
Units	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	NA
G1	2200	< 2	< 5	< 0.1	4.9	< 1	1	52	< 0.02	1.9	< 1	NA
G2	1800	< 2	< 5	< 0.1	3.3	< 1	< 1	49	< 0.02	1.3	< 1	NA
G3	2800	< 2	5.2	< 0.1	9.5	1.8	1.8	79	< 0.02	3.6	< 1	NA
G4	1900	< 2	< 5	< 0.1	1.4	< 1	< 1	32	< 0.02	< 1	< 1	NA
G5	1800	< 2	< 5	< 0.1	1.9	< 1	< 1	43	< 0.02	< 1	< 1	NA
G6	1300	< 2	< 5	< 0.1	1.3	< 1	< 1	44	< 0.02	< 1	< 1	NA

3.2. Hydrocarbons

Hydrocarbon results for SG02, SG03 and SG04 were all below their respective laboratory LORs (Table 3). Sample SG01 recorded slightly higher concentrations for several TRH strains including TRH C15-C28 (130 mg/kg), TRH C29-C36 (320 mg/kg), and TRH C10-C36 total (450 mg/kg) for the 1999 NEPM fractions, and TRH CC16-C34 (310 mg/kg), and TRH C34-C40 (360 mg/kg) for the 2013 NEPM fractions. These results were all under the NAGD (2009) screening level of 550 mg/kg. One result (SG01) for TRH C10-C40 (total) recorded a concentration of 670 mg/kg, above the NAGD (2009) screening level of 100 mg/kg. Hydrocarbon results recorded within the dredge channel in 2023 were all below the laboratory LoRs.

Table 3: Hydrocarbon concentrations within samples at the offshore study area

	Total Recoverable Hydrocarbons - 1999 NEPM Fractions					Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
	TRH C6-C9	TRH C10-C14	TRH C15-C28	TRH C29-C36	TRH C10-C36 (Total)	Naphthalene	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	TRH >C10-C16 less Naphthalene (F2)	TRH >C10-C40 (total)
LOR	20	20	50	50	50	0.5	50	100	100	50	100
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SG01	< 20	< 20	130	320	450	< 0.5	< 50	310	360	< 50	670
SG02	< 20	< 20	< 50	< 50	< 50	< 0.5	< 50	< 100	< 100	< 50	< 100
SG03	< 20	< 20	< 50	< 50	< 50	< 0.5	< 50	< 100	< 100	< 50	< 100
SG04	< 20	< 20	< 50	< 50	< 50	< 0.5	< 50	< 100	< 100	< 50	< 100

3.3. Polycyclic Aromatic Hydrocarbons (PAH)

All PAH constituents analysed (including total PAH) recorded concentrations below the laboratory LoR (0.005 mg/kg). Full laboratory results are presented in Attachment 2.

3.4. Tributyltin (TBT)

All sediment samples within the study area recorded TBT concentrations below the laboratory LoR (0.5 µg/kg). Full laboratory results are presented in Attachment 2.

3.5. BTEXN

Concentrations for Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene were below their respective laboratory LoRs for all four sample locations. Full laboratory results are presented in Attachment 2.

3.6. Total Organic Carbon

Sample site SG03 recorded a TOC value of 0.4%, while the remaining samples all recorded TOC values below the laboratory LoR (0.1%). Full laboratory results are presented in Attachment 2.

3.7. Particle Size Distribution

PSD results at all sites within the study were dominated (approximately 55% of the sample) by coarse sand (500-2000 µm) (Figure 4). All four samples also contain a smaller proportion (approximately 20 % of the sample) of both medium sand (205-500µm) and gravel (2000-10000 µm). Silts and clays represented less than 5 % and 1 % of each sample respectively. In-field photos of each sample are presented in Figure 5.

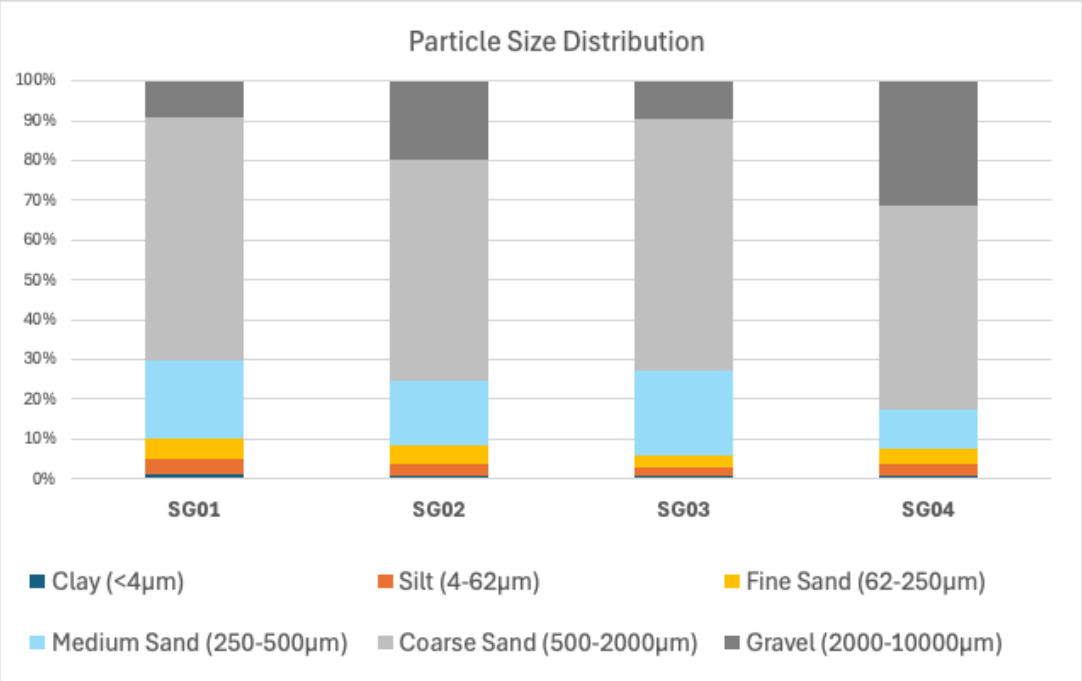

Figure 4: Particle size distribution for samples withih the study area.

Figure 5: Sediment samples at SG01 (top left), SG02 (top right), SG03 (bottom left) and SG04 (bottom right).

3.8. Quality assurance/quality control results

Analysis of the QA/QC samples found the relative percent difference (RPD) within the field duplicates for all contaminants were within 50 %, and the relative standard deviation (RSD) results from the primary and secondary laboratories for the field triplicates were also within 50 % (Table 4). Therefore, in accordance with NAGD (2009) these metals results are considered accurate and reliable. Note any laboratory results reported below the LoR were not included in the QA/QC assessment.

Table 4: QA/QC results for duplicate and replicate samples

Analyte	LoR	Units	Primary Result	Duplicate	Second Laboratory	RPD	RSD
Aluminium	20	mg/kg	1100	1000	1440	9%	7%
Arsenic	1	mg/kg	20	14	24.5	35%	25%
Chromium	1	mg/kg	11	10	16	9%	7%
Lead	1	mg/kg	1.4	1.6	2.3	13%	9%
Nickle	1	mg/kg	2	1.9	1.9	5%	4%
Manganese	5	mg/kg	73	65	109	11%	8%
Zinc	5	mg/kg	2.1	1.8	3	15%	11%

4. Discussion

Sample results recorded from the four sites at he offshore spoil gorund study area generally reflect sediment characteristics expected from an offshore greenfield site in the Pilbara. The majority of the contaminants (metals, hydrocarbons, TBT and BTEXN) were either below the laboratory LoRs, below the NAGD (2009) ISQG-low screening levels, or comparable to concentrations along the Pilbara coast as documented in DEC (2006). These results are also comparable to the six dredge footprint sediment samples collected in 2023 (O2 Marine 2023).

Sample SG01 recorded comparatively higher concentrations of metals and hydrocarbons to the other three sites (SG02, SG03 and SG04), with arsenic marginally above the NAGD (2009) screening level of 20 mg/kg (21 mg/kg), and TRH C10-C40 (total) was above the screening level of 550 mg/kg (670 mg/kg). Arsenic concentrations within the Pilbara are known to be naturally elevated, and likely related to the geology of the region (DEC 2006). All laboratory QA/QC calculations indicate that analysis results are accurate and reliable, and as such, it is possible that the comparatively elevated concentrations of hydrocarbons at SG01 may be a result of field contamination during the sampling process.

PSD results indicate that all four sites are largely comprised of coarse sand, with smaller proportions of fine sand and gravel. These results are comparable to five northern most sediment samples (SS1, SS2, SS3, SS4, and SS5) collected within the dredge channel in 2022 (O2 Marine 2022).

Based on both the contaminant and PSD results, sediment characteristics between the dredge footprint and offshore study area were found to be similar, and as such, it is unlikely that no biological impacts will result from placing dredge material at DMPA4.

5. References

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.

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

O2 Marine (2023). Sediment Quality Assessment 2023, Mardie Project. Report Number: R220345, Rev 0.

Attachment 1 – Chain of Custody

O2 MARINE Chain of Custody (CoC) Record

1143989

Project:	DMPA4 Investigations			**Laboratory:**	ARL
				Address:	46-48 Banksia Road, Welshpool, 6106
Client:	BCI Mardie Project	**Job No.:**	24ENV340	**Lab. Contact:**	
Lab Quote No.:		**Turnaround Time:**			
O2M Project Manager (Ph. Number):	Josh Abbott 0477039 996	**Email Address:**	josh.abbott@o2marine.com.au		

Please Note:
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.

Sediment

O2M Sample ID	Laboratory Sample ID	Date	Time	Container: Sample Matrix (S-Soil / SL-Sludge / W-Water / A-Air)	Container: Type (B-Bottle / J-Jar / V-Vial / G-Glass / P-Plastic)	Container: Preservative (Unpreserved / HCL / H_2SO^4 / HNO_3 / Other)	Container: No. of Samples	Container: Total Volume (mL)	Analyses: Metals (Ag, Al, As, Cd, Cr, Cu, Pb, Mn, Hg, Ni, Sb, Zn)	Analyses: PAH, TRH & BTEXEN	Analyses: TBT	Analyses: PSD	Analyses: TOC	Comments
SG1		24/09/2024	13:04	S					x	x	x	x	x	
SG2		24/09/2024	13:16	S					x	x	x	x	x	
SG3		24/09/2024	12:18	S					x	x	x	x	x	
SG4		24/09/2024	13:46	S					x	x	x	x	x	
Trip 2		24/09/2024	12:30	S					x	x	x	x	x	
Trip 3		24/09/2024	12:50	S					x	x	x	x	x	
~~Dup~~				~~S~~					~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	Subcontract duplicate to ALS

Sampled By:	BJ / MS	**Date/Time:**	24/09/2024	**Relinquished By:**	**Date/Time:**
Received By Lab:	R2	**Date/Time:**	27/9/24 11:55	**Courier:**	
Sample Cold (Yes/No):		**Sample Container Sealed (Yes/No):**	67.2		

Each Sample has: 2x big jars

1x Small jars

Dup goes to secondary lab

O2 MARINE Chain of Custody (CoC) Record

Project:	DMPA4 Investigations		
Client:	BCI Mardie Project	**Job No.:**	24ENV340
Lab Quote No.:		**Turnaround Time:**	
O2M Project Manager (Ph. Number):	Josh Abbott 0477039 996	**Email Address:** josh.abbott@o2marine.com.au	

Laboratory:	ALS
Address:	26 Rigalie Way, Wnagara
Lab. Contact:	

Please Note:
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.

Sediment

O2M Sample ID	Laboratory Sample ID	Date	Time	Sample Matrix S-Soil / SL-Sludge / W-Water / A-Air	Container: Type B-Bottle / J-Jar / V-Vial / G-Glass / P-Plastic	Container: Preservative Unpreserved / HCL / H_2SO_4 / HNO_3 / Other	Container: No. of Samples	Container: Total Volume (mL)	Analyses: Metals (Ag, Al, As, Cd, Cr, Cu, Pb, Mn, Hg, Ni, Sb, Zn)	Analyses: PAH, TRH & BTEXEN	Analyses: TBT	Analyses: PSD	Analyses: TOC	Comments
DUP	1	24/09/2024	13:16	S					x	x	x	x	x	Please subcontract to ALS

Sampled By:	BJ / MS	**Date/Time:**	24/09/2024	**Relinquished By:**	**Date/Time:**
Received By Lab:	ZN ALS	**Date/Time:**	20/9 1020	**Courier:**	
Sample Cold (Yes/No):	/	**Sample Container Sealed (Yes/No):**			

Environmental Division
Perth
Work Order Reference
EP2414182

Telephone : + 61-8-9406 1301

Attachment 2 – Laboratory Results.

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

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Russell Stevens**

Report **1143989-S**
Project name DMPA4 Inbvestigations
Received Date Sep 27, 2024

Client Sample ID			**SG1**	**SG2**	**SG3**	**SG4**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**L24-Se0072805**	**L24-Se0072806**	**L24-Se0072807**	**L24-Se0072808**
Date Sampled			**Sep 24, 2024**	**Sep 24, 2024**	**Sep 24, 2024**	**Sep 24, 2024**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	130	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	320	< 50	< 50	< 50
TRH C10-C36 (Total)	50	mg/kg	450	< 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
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)*[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	310	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	360	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	670	< 100	< 100	< 100
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	%	70	70	66	70
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Polycyclic Aromatic Hydrocarbons (NAGD)						
2-Methylnapthalene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Acenaphthene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Acenaphthylene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Anthracene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Benz(a)anthracene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Benzo(a)pyrene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Benzo(b&j)fluoranthene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Benzo(e)pyrene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Benzo(g.h.i)perylene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Benzo(k)fluoranthene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Chrysene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Coronene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005

Client Sample ID			SG1	SG2	SG3	SG4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			L24-Se0072805	L24-Se0072806	L24-Se0072807	L24-Se0072808
Date Sampled			Sep 24, 2024	Sep 24, 2024	Sep 24, 2024	Sep 24, 2024
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons (NAGD)						
Dibenz(a.h)anthracene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Fluoranthene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Fluorene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Indeno(1.2.3-cd)pyrene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Naphthalene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Perylene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Phenanthrene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Pyrene	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Total PAH*	0.005	mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
2-Fluorobiphenyl (surr.)	1	%	70	79	83	69
p-Terphenyl-d14 (surr.)	1	%	79	94	100	89
Total Organic Carbon	0.1	%	< 0.1	< 0.1	0.4	< 0.1
Organotins*			see attached	see attached	see attached	see attached
Particle Size Distribution			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	20	mg/kg	1300	1100	1000	530
Manganese	5	mg/kg	95	73	70	43
Heavy Metals (NAGD)						
Antimony	0.5	mg/kg	0.7	0.6	< 0.5	< 0.5
Arsenic	1	mg/kg	21	20	14	8.3
Cadmium	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Chromium	1	mg/kg	14	11	11	6.4
Copper	1	mg/kg	< 1	< 1	< 1	< 1
Lead	1	mg/kg	1.8	1.4	1.5	1.1
Mercury	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Nickel	1	mg/kg	2.6	2.0	2.0	1.2
Silver	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Zinc	1	mg/kg	2.6	2.1	1.9	1.3
Sample Properties						
% Moisture	1	%	34	34	37	32

Client Sample ID			Trip 2	Trip 3
Sample Matrix			Soil	Soil
Eurofins Sample No.			L24-Se0072809	L24-Se0072810
Date Sampled			Sep 24, 2024	Sep 24, 2024
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons				
TRH C6-C9	20	mg/kg	< 20	< 20
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
TRH C6-C10	20	mg/kg	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)*[N01]	50	mg/kg	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100

Client Sample ID			Trip 2	Trip 3
Sample Matrix			Soil	Soil
Eurofins Sample No.			L24-Se0072809	L24-Se0072810
Date Sampled			Sep 24, 2024	Sep 24, 2024
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons				
TRH >C34-C40	100	mg/kg	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100
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	%	70	69
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5
Polycyclic Aromatic Hydrocarbons (NAGD)				
2-Methylnapthalene	0.005	mg/kg	< 0.005	< 0.005
Acenaphthene	0.005	mg/kg	< 0.005	< 0.005
Acenaphthylene	0.005	mg/kg	< 0.005	< 0.005
Anthracene	0.005	mg/kg	< 0.005	< 0.005
Benz(a)anthracene	0.005	mg/kg	< 0.005	< 0.005
Benzo(a)pyrene	0.005	mg/kg	< 0.005	< 0.005
Benzo(b&j)fluoranthene	0.005	mg/kg	< 0.005	< 0.005
Benzo(e)pyrene	0.005	mg/kg	< 0.005	< 0.005
Benzo(g.h.i)perylene	0.005	mg/kg	< 0.005	< 0.005
Benzo(k)fluoranthene	0.005	mg/kg	< 0.005	< 0.005
Chrysene	0.005	mg/kg	< 0.005	< 0.005
Coronene	0.005	mg/kg	< 0.005	< 0.005
Dibenz(a.h)anthracene	0.005	mg/kg	< 0.005	< 0.005
Fluoranthene	0.005	mg/kg	0.020	< 0.005
Fluorene	0.005	mg/kg	< 0.005	< 0.005
Indeno(1.2.3-cd)pyrene	0.005	mg/kg	< 0.005	< 0.005
Naphthalene	0.005	mg/kg	< 0.005	< 0.005
Perylene	0.005	mg/kg	< 0.005	< 0.005
Phenanthrene	0.005	mg/kg	< 0.01	< 0.005
Pyrene	0.005	mg/kg	0.028	< 0.005
Total PAH*	0.005	mg/kg	0.05	< 0.005
2-Fluorobiphenyl (surr.)	1	%	74	83
p-Terphenyl-d14 (surr.)	1	%	94	107
Total Organic Carbon	0.1	%	< 0.1	< 0.1
Organotins*			see attached	see attached
Particle Size Distribution			see attached	see attached
Heavy Metals				
Aluminium	20	mg/kg	1800	1000
Manganese	5	mg/kg	120	65
Heavy Metals (NAGD)				
Antimony	0.5	mg/kg	0.9	< 0.5
Arsenic	1	mg/kg	33	14
Cadmium	0.1	mg/kg	0.1	< 0.1
Chromium	1	mg/kg	15	10

Client Sample ID			Trip 2	Trip 3
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**L24-Se0072809**	**L24-Se0072810**
Date Sampled			**Sep 24, 2024**	**Sep 24, 2024**
Test/Reference	LOR	Unit		
Heavy Metals (NAGD)				
Copper	1	mg/kg	1.1	< 1
Lead	1	mg/kg	2.0	1.6
Mercury	0.01	mg/kg	< 0.01	< 0.01
Nickel	1	mg/kg	3.1	1.9
Silver	0.1	mg/kg	< 0.1	< 0.1
Zinc	1	mg/kg	3.0	1.8
Sample Properties				
% Moisture	1	%	36	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
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Welshpool	Sep 30, 2024	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	Sep 30, 2024	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	Sep 30, 2024	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Welshpool	Sep 30, 2024	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons (NAGD)	Melbourne	Oct 01, 2024	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water (NAGD)			
Total Organic Carbon	Melbourne	Oct 01, 2024	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
Heavy Metals	Melbourne	Oct 01, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Heavy Metals (NAGD)	Melbourne	Oct 01, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Welshpool	Sep 30, 2024	14 Days
- Method: ARL135 Moisture in Solids			

eurofins

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

Project Name: DMPA4 Inbvestigations

Order No.:
Report #: 1143989
Phone:
Fax:

Received: Sep 27, 2024 11:55 AM
Due: Oct 4, 2024
Priority: 5 Day
Contact Name: Russell Stevens

Eurofins Analytical Services Manager : Elden Garrett

Sample Detail						Aluminium	Antimony	Manganese	Organotins	Particle Size Distribution*	Silver	Total Organic Carbon	Metals M8	Moisture Set	Eurofins Suite B4
Perth Laboratory - NATA # 2377 Site # 2370						X	X	X			X		X	X	X
Melbourne Laboratory - NATA # 1261 Site # 1254												X			
External Laboratory									X	X					
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	SG1	Sep 24, 2024	1:04PM	Soil	L24-Se0072805	X	X	X	X	X	X	X	X	X	X
2	SG2	Sep 24, 2024	1:16PM	Soil	L24-Se0072806	X	X	X	X	X	X	X	X	X	X
3	SG3	Sep 24, 2024	12:18PM	Soil	L24-Se0072807	X	X	X	X	X	X	X	X	X	X
4	SG4	Sep 24, 2024	1:46PM	Soil	L24-Se0072808	X	X	X	X	X	X	X	X	X	X
5	Trip 2	Sep 24, 2024	12:30PM	Soil	L24-Se0072809	X	X	X	X	X	X	X	X	X	X
6	Trip 3	Sep 24, 2024	12:50PM	Soil	L24-Se0072810	X	X	X	X	X	X	X	X	X	X
Test Counts						6	6	6	6	6	6	6	6	6	6

Internal Quality Control Review and Glossary

General

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

Holding Times

Please refer to the '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 before sample receipt deadlines as stated on the SRA.

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ppm:** parts per million
µg/L: micrograms per litre	**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	**Colour:** Pt-Co Units (CU)	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
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 moisture has been determined on a solid sample, the result is expressed on a dry weight 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 represents 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 similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
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 6.0
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 only be used as a guide 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%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as 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 are 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							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
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							
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	
Method Blank							
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Aluminium	mg/kg	< 20			20	Pass	
Manganese	mg/kg	< 5			5	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons (NAGD)							
2-Methylnapthalene	mg/kg	< 0.005			0.005	Pass	
Acenaphthene	mg/kg	< 0.005			0.005	Pass	
Acenaphthylene	mg/kg	< 0.005			0.005	Pass	
Anthracene	mg/kg	< 0.005			0.005	Pass	
Benz(a)anthracene	mg/kg	< 0.005			0.005	Pass	
Benzo(a)pyrene	mg/kg	< 0.005			0.005	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.005			0.005	Pass	
Benzo(e)pyrene	mg/kg	< 0.005			0.005	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.005			0.005	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.005			0.005	Pass	
Chrysene	mg/kg	< 0.005			0.005	Pass	
Coronene	mg/kg	< 0.005			0.005	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.005			0.005	Pass	
Fluoranthene	mg/kg	< 0.005			0.005	Pass	
Fluorene	mg/kg	< 0.005			0.005	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.005			0.005	Pass	
Naphthalene	mg/kg	< 0.005			0.005	Pass	
Perylene	mg/kg	< 0.005			0.005	Pass	
Phenanthrene	mg/kg	< 0.005			0.005	Pass	
Pyrene	mg/kg	< 0.005			0.005	Pass	
Method Blank							
Total Recoverable Hydrocarbons							
TRH C10-C14	mg/kg	< 20			20	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C6-C9	%	87			70-130	Pass	
TRH C10-C14	%	93			70-130	Pass	
TRH C6-C10	%	86			70-130	Pass	
TRH >C10-C16	%	102			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	90			70-130	Pass	
Toluene	%	84			70-130	Pass	
Ethylbenzene	%	100			70-130	Pass	
m&p-Xylenes	%	95			70-130	Pass	
o-Xylene	%	95			70-130	Pass	
Xylenes - Total*	%	95			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	110			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons (NAGD)							
Acenaphthene	%	91			70-130	Pass	
Acenaphthylene	%	104			70-130	Pass	
Anthracene	%	106			70-130	Pass	
Benz(a)anthracene	%	94			70-130	Pass	
Benzo(a)pyrene	%	88			70-130	Pass	
Benzo(b&j)fluoranthene	%	71			70-130	Pass	
Benzo(g.h.i)perylene	%	87			70-130	Pass	
Benzo(k)fluoranthene	%	106			70-130	Pass	
Chrysene	%	112			70-130	Pass	
Dibenz(a.h)anthracene	%	84			70-130	Pass	
Fluoranthene	%	106			70-130	Pass	
Fluorene	%	106			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	90			70-130	Pass	
Naphthalene	%	91			70-130	Pass	
Phenanthrene	%	110			70-130	Pass	
Pyrene	%	100			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Aluminium	%	112			80-120	Pass	
Manganese	%	110			80-120	Pass	
LCS - % Recovery							
Total Organic Carbon	%	89			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C10-C14	%	94			70-130	Pass	
TRH >C10-C16	%	98			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons				Result 1					
TRH C6-C9	L24-Se0072764	NCP	%	97			70-130	Pass	
TRH C10-C14	L24-Se0070474	NCP	%	98			70-130	Pass	
TRH C6-C10	L24-Se0072764	NCP	%	96			70-130	Pass	
TRH >C10-C16	L24-Se0070474	NCP	%	84			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	L24-Se0072764	NCP	%	80			70-130	Pass	
Toluene	L24-Se0072764	NCP	%	93			70-130	Pass	
Ethylbenzene	L24-Se0072764	NCP	%	108			70-130	Pass	
m&p-Xylenes	L24-Se0072764	NCP	%	102			70-130	Pass	
o-Xylene	L24-Se0072764	NCP	%	101			70-130	Pass	
Xylenes - Total*	L24-Se0072764	NCP	%	102			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	L24-Se0072764	NCP	%	109			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Aluminium	M24-Oc0002604	NCP	%	123			75-125	Pass	
Manganese	M24-Oc0001114	NCP	%	112			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	L24-Se0072805	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	L24-Oc0000722	NCP	mg/kg	30	30	<1	30%	Pass	
TRH C15-C28	L24-Oc0000722	NCP	mg/kg	770	860	11	30%	Pass	
TRH C29-C36	L24-Oc0000722	NCP	mg/kg	700	730	5.0	30%	Pass	
TRH C6-C10	L24-Se0072805	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	L24-Oc0000722	NCP	mg/kg	67	68	1.0	30%	Pass	
TRH >C16-C34	L24-Oc0000722	NCP	mg/kg	1200	1200	7.0	30%	Pass	
TRH >C34-C40	L24-Oc0000722	NCP	mg/kg	540	590	9.0	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	L24-Se0072805	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	L24-Se0072805	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	L24-Se0072805	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	L24-Se0072805	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	L24-Se0072805	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	L24-Se0072805	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	L24-Se0072805	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	M24-Se0075020	NCP	mg/kg	7100	6600	7.0	30%	Pass	
Manganese	M24-Se0075020	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons (NAGD)				Result 1	Result 2	RPD			
2-Methylnapthalene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Acenaphthene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Acenaphthylene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Anthracene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Benz(a)anthracene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	

Duplicate									
Polycyclic Aromatic Hydrocarbons (NAGD)				Result 1	Result 2	RPD			
Benzo(a)pyrene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Benzo(b&j)fluoranthene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Benzo(e)pyrene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Benzo(g.h.i)perylene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Benzo(k)fluoranthene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Chrysene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Coronene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Dibenz(a.h)anthracene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Fluoranthene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Fluorene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Naphthalene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perylene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Phenanthrene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Pyrene	L24-Se0072808	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Organic Carbon	L24-Se0072808	CP	%	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Organic Carbon	L24-Se0072810	CP	%	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	L24-Se0072810	CP	%	35	36	4.0	30%	Pass	

Comments

Organotins analysed by MPL, NATA Accreditation Number 2901, report reference PFJ0064

Particle size distribution analysed by: Microanalysis, NATA accreditation no. 20283, report reference 24_1758

Sample Integrity

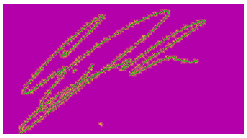
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	No
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
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.

Authorised by:

Elden Garrett	Analytical Services Manager
Douglas Todd	Senior Analyst-Sample Properties
Joseph Edouard	Senior Analyst-Organic
Mary Makarios	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Metal
Patrick Patfield	Senior Analyst-Organic
Patrick Patfield	Senior Analyst-Volatile
Vivian Wang	Senior Analyst-Metal



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

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Certificate of Analysis PFJ0064

Client Details

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

Sample Details

Your Reference	1143989
Number of Samples	6 Soil
Date Samples Received	01/10/2024
Date Instructions Received	01/10/2024

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 soils and on an as received basis for other matrices.

Report Details

Date Results Requested by	10/10/2024
Date of Issue	07/10/2024

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

Authorisation Details

Results Approved By	Travis Carey, Organics Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PFJ0064

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PFJ0064-01	24-Se0072805	Soil	24/09/2024	01/10/2024
PFJ0064-02	24-Se0072806	Soil	24/09/2024	01/10/2024
PFJ0064-03	24-Se0072807	Soil	24/09/2024	01/10/2024
PFJ0064-04	24-Se0072808	Soil	24/09/2024	01/10/2024
PFJ0064-05	24-Se0072809	Soil	24/09/2024	01/10/2024
PFJ0064-06	24-Se0072810	Soil	24/09/2024	01/10/2024

Certificate of Analysis PFJ0064

Organometallics (Soil)

Envirolab ID	Units	PQL	PFJ0064-01	PFJ0064-02	PFJ0064-03	PFJ0064-04	PFJ0064-05
Your Reference			24-Se0072805	24-Se0072806	24-Se0072807	24-Se0072808	24-Se0072809
Date Sampled			24/09/2024	24/09/2024	24/09/2024	24/09/2024	24/09/2024
Tributyltin as Sn	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Surrogate Triphenyltin	%		*104*	*106*	*109*	*97.7*	*101*

Envirolab ID	Units	PQL	PFJ0064-06
Your Reference			24-Se0072810
Date Sampled			24/09/2024
Tributyltin as Sn	µg/kg	0.50	<0.50
Surrogate Triphenyltin	%		*113*

Certificate of Analysis PFJ0064

Inorganics - Moisture (Soil)

Envirolab ID	Units	PQL	PFJ0064-01	PFJ0064-02	PFJ0064-03	PFJ0064-04	PFJ0064-05
Your Reference			24-Se0072805	24-Se0072806	24-Se0072807	24-Se0072808	24-Se0072809
Date Sampled			24/09/2024	24/09/2024	24/09/2024	24/09/2024	24/09/2024
Moisture	%	0.10	31	31	34	25	34

Envirolab ID	Units	PQL	PFJ0064-06
Your Reference			24-Se0072810
Date Sampled			24/09/2024
Moisture	%	0.10	33

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 PFJ0064

Client Details

Client	Eurofins ARL Pty Ltd
Your Reference	1143989
Date Issued	07/10/2024

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	No	Duplicate Outliers Exist - See detailed list below
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 PFJ0064

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
TBT | Soil	1-6	24/09/2024	03/10/2024	03/10/2024	Yes
Moisture | Soil	1-6	24/09/2024	03/10/2024	03/10/2024	Yes

Outliers: Duplicates

INORG-008\|Inorganics - Moisture (Soil)\| Batch BFJ0584

Sample ID	Duplicate ID	Analyte	% Limits	RPD
BFJ0584-DUP1#	DUP1	Moisture	50.00	101[1]

Quality Control PFJ0064

ORG-025_TBT_S|Organometallics (Soil) | Batch BFJ0585

Analyte	Units	PQL	Blank	DUP1 BFJ0585-DUP1# Samp | QC | RPD %	LCS %	Spike % PFJ0064-01
Tributyltin	µg/kg	0.5		<0.50 | <0.50 | [NA]	109	108
Tributyltin as Sn	µg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	[NA]	[NA]
Surrogate Triphenyltin	*%*		*99.5*	*106 | 107*	*95.4*	*94.5*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-008|Inorganics - Moisture (Soil) | Batch BFJ0584

Analyte	Units	PQL	Blank	DUP1 BFJ0584-DUP1# Samp | QC | RPD %	LCS %
Moisture	%	0.1		0.340 | 1.04 | 101 [1]	[NA]

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

QC Comments

Identifier	Description
[1]	Duplicate %RPD may be flagged as an outlier to routine laboratory acceptance, however, where one or both results are <10*PQL, the RPD acceptance criteria increases exponentially.

CERTIFICATE OF ANALYSIS

Work Order	: **EP2414182**	Page	: 1 of 7
Client	: **WA MARINE PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: JOSH ABBOTT	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	: 23ENV340 DMPA4 Investigations	Date Samples Received	: 30-Sep-2024 10:20
Order number	: ----	Date Analysis Commenced	: 03-Oct-2024
C-O-C number	: ----	Issue Date	: 10-Oct-2024 22:25
Sampler	: BJ/MS		
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*
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Kim McCabe	Senior Inorganic 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

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.

- EP080-SD: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	DUP	----	----	----	----
			Sampling date / time	24-Sep-2024 13:16	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2414182-001	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**24.9**	----	----	----	----
EA150: Particle Sizing								
+75µm	----	1	%	**95**	----	----	----	----
+150µm	----	1	%	**94**	----	----	----	----
+300µm	----	1	%	**88**	----	----	----	----
+425µm	----	1	%	**77**	----	----	----	----
+600µm	----	1	%	**59**	----	----	----	----
+1180µm	----	1	%	**28**	----	----	----	----
+2.36mm	----	1	%	**18**	----	----	----	----
+4.75mm	----	1	%	**9**	----	----	----	----
+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	%	**3**	----	----	----	----
Silt (2-60 µm)	----	1	%	**1**	----	----	----	----
Sand (0.06-2.00 mm)	----	1	%	**75**	----	----	----	----
Gravel (>2mm)	----	1	%	**21**	----	----	----	----
Cobbles (>6cm)	----	1	%	<1	----	----	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	**2.51**	----	----	----	----
EG005(ED093)-SD: Total Metals in Sediments by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**1470**	----	----	----	----
EG020-SD: Total Metals in Sediments by ICPMS								
Antimony	7440-36-0	0.50	mg/kg	**0.88**	----	----	----	----
Arsenic	7440-38-2	1.00	mg/kg	**24.5**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	DUP	----	----	----	----
				Sampling date / time	24-Sep-2024 13:16	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2414182-001	--------	--------	--------	--------
					Result	----	----	----	----
EG020-SD: Total Metals in Sediments by ICPMS - Continued									
Cadmium	7440-43-9	0.1	mg/kg		<0.1	----	----	----	----
Chromium	7440-47-3	1.0	mg/kg		**16.0**	----	----	----	----
Copper	7440-50-8	1.0	mg/kg		<1.0	----	----	----	----
Lead	7439-92-1	1.0	mg/kg		**2.3**	----	----	----	----
Manganese	7439-96-5	10	mg/kg		**109**	----	----	----	----
Nickel	7440-02-0	1.0	mg/kg		**2.9**	----	----	----	----
Silver	7440-22-4	0.1	mg/kg		<0.1	----	----	----	----
Zinc	7440-66-6	1.0	mg/kg		**3.0**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg		<0.01	----	----	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		**0.18**	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg		<3	----	----	----	----
>C16 - C34 Fraction	----	3	mg/kg		**16**	----	----	----	----
>C34 - C40 Fraction	----	5	mg/kg		**13**	----	----	----	----
>C10 - C40 Fraction (sum)	----	3	mg/kg		**29**	----	----	----	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg		<3	----	----	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg		<3	----	----	----	----
C10 - C14 Fraction	----	3	mg/kg		<3	----	----	----	----
C15 - C28 Fraction	----	3	mg/kg		**7**	----	----	----	----
C29 - C36 Fraction	----	5	mg/kg		**13**	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	3	mg/kg		**20**	----	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		<3	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	DUP	----	----	----	----
				Sampling date / time	24-Sep-2024 13:16	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2414182-001	--------	--------	--------	--------
					Result	----	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons - Continued									
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		<3.0	----	----	----	----
EP080-SD: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.2	mg/kg		<0.2	----	----	----	----
Ethylbenzene	100-41-4	0.2	mg/kg		<0.2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg		<0.2	----	----	----	----
ortho-Xylene	95-47-6	0.2	mg/kg		<0.2	----	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	----	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	----	----	----	----
Naphthalene	91-20-3	0.2	mg/kg		<0.2	----	----	----	----
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		<5	----	----	----	----
2-Methylnaphthalene	91-57-6	5	µg/kg		<5	----	----	----	----
Acenaphthylene	208-96-8	4	µg/kg		<4	----	----	----	----
Acenaphthene	83-32-9	4	µg/kg		<4	----	----	----	----
Fluorene	86-73-7	4	µg/kg		<4	----	----	----	----
Phenanthrene	85-01-8	4	µg/kg		<4	----	----	----	----
Anthracene	120-12-7	4	µg/kg		<4	----	----	----	----
Fluoranthene	206-44-0	4	µg/kg		<4	----	----	----	----
Pyrene	129-00-0	4	µg/kg		<4	----	----	----	----
Benz(a)anthracene	56-55-3	4	µg/kg		<4	----	----	----	----
Chrysene	218-01-9	4	µg/kg		<4	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		<4	----	----	----	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg		<4	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	DUP	----	----	----	----
				Sampling date / time	24-Sep-2024 13:16	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2414182-001	--------	--------	--------	--------
					Result	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(e)pyrene	192-97-2	4	µg/kg		<4	----	----	----	----
Benzo(a)pyrene	50-32-8	4	µg/kg		<4	----	----	----	----
Perylene	198-55-0	4	µg/kg		<4	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		<4	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		<4	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		<4	----	----	----	----
Coronene	191-07-1	5	µg/kg		<5	----	----	----	----
^ **Sum of PAHs**	----	4	µg/kg		<4	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	4	µg/kg		<4	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	4	µg/kg		**5**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	4	µg/kg		**10**	----	----	----	----
EP080-SD: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**130**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		**83.2**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		**104**	----	----	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		**78.7**	----	----	----	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		**91.7**	----	----	----	----
Anthracene-d10	1719-06-8	10	%		**118**	----	----	----	----
4-Terphenyl-d14	1718-51-0	10	%		**98.9**	----	----	----	----

Surrogate Control Limits

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

Inter-Laboratory Testing

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

(SOIL) EA150: Soil Classification based on Particle Size

(SOIL) EA150: Particle Sizing

(SOIL) EA152: Soil Particle Density

microanalysis australia

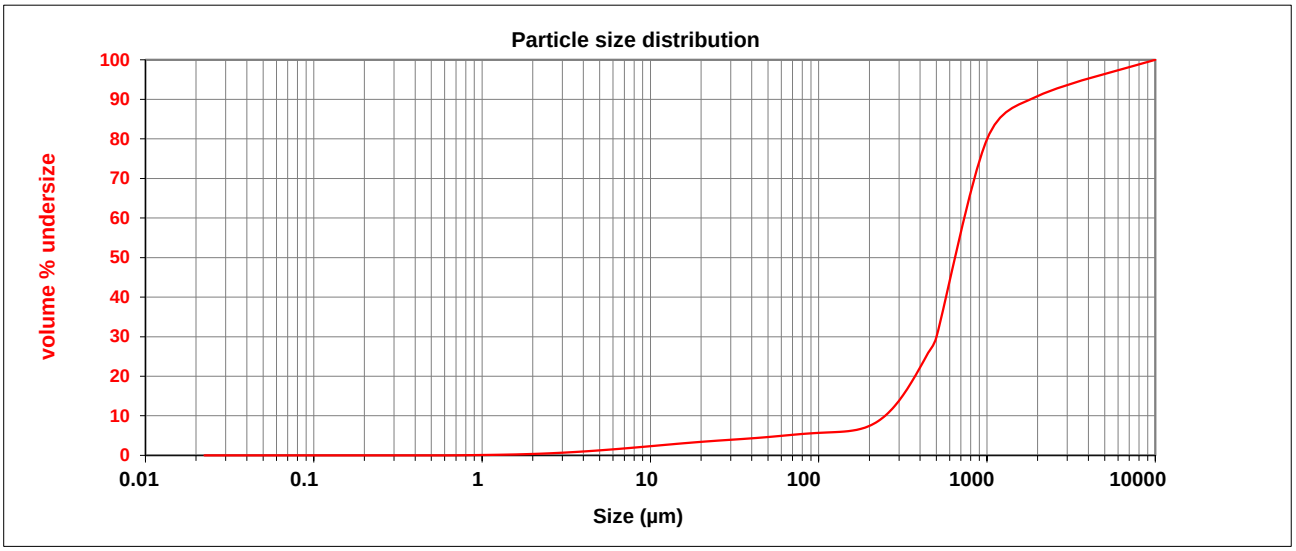
5 Alvan Street
Mount Lawley
WA 6050

Client:	Eurofins ARL Pty Ltd	**Date received:**	1/10/2024
Client address:	46 - 48 Banksia Road WELSHPOOL WA 6106	**Date analysed**	16/10/2024
Client ID:	1143989 24-Se0072805 SG1	**Date reported:**	17/10/2024
Job ID:	24_1758		
Lab ID:	24_1758_001		
Revision No. :	0		

Comment: 'Due to the high concentration of coarse material present the residual fit is higher than the ideal 1% this may affect accuracy of the final results.'

Analysis:	Laser diffraction size distribution following ISO13320-1:2020 Wet sieving following MAWI301	**Result units:**	Volume
Dispersant:	Water	**Analysis model:**	General purpose
Additives:	10 millilitres sodium hexametaphosphate		
Sonication:	18 min sonication		

Span:	2.39	**Vol. Weighted mean D[4,3]:**	1003.18 µm	**d(0.1)**	247.84 µm
		Surface Weighted mean D[3,2]	98.38 µm	**d(0.5)**	701.61 µm
				d(0.9)	1924.86 µm



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.020	0.00	0.142	0.00	1.002	0.09	7.096	1.77	50.238	4.64	355.66	18.47
0.022	0.00	0.159	0.00	1.125	0.12	7.962	1.95	56.368	4.83	399.05	22.12
0.025	0.00	0.178	0.00	1.262	0.15	8.934	2.14	63.246	5.03	447.74	25.98
0.028	0.00	0.200	0.00	1.416	0.19	10.024	2.32	70.963	5.22	500.00	29.81
0.032	0.00	0.224	0.00	1.589	0.24	11.247	2.51	79.621	5.40	1000.00	79.89
0.036	0.00	0.252	0.00	1.783	0.29	12.619	2.70	89.337	5.56	2000.00	90.82
0.040	0.00	0.283	0.00	2.000	0.36	14.159	2.89	100.237	5.69		
0.045	0.00	0.317	0.00	2.244	0.43	15.887	3.07	112.468	5.79		
0.050	0.00	0.356	0.00	2.518	0.52	17.825	3.25	126.191	5.88		
0.056	0.00	0.399	0.00	2.825	0.62	20.000	3.41	141.589	6.02		
0.063	0.00	0.448	0.00	3.170	0.73	22.440	3.57	158.866	6.27		
0.071	0.00	0.502	0.00	3.557	0.85	25.179	3.72	178.250	6.71		
0.080	0.00	0.564	0.00	3.991	0.98	28.251	3.87	200.000	7.45		
0.089	0.00	0.632	0.00	4.477	1.12	31.698	4.01	224.404	8.59		
0.100	0.00	0.710	0.01	5.024	1.27	35.566	4.15	251.785	10.24		
0.112	0.00	0.796	0.04	5.637	1.43	39.905	4.30	282.508	12.44		
0.126	0.00	0.893	0.06	6.325	1.60	44.774	4.47	316.979	15.20	10000	100.00

Note: Data from 500µm to 10000µm by wet screening, from 0.02µm to 500µm by laser diffraction.

Analysed: Akash Patel,M Eng(Chemical)
Reported: Akash Patel,M Eng(Chemical)
Approved: Benjamin Rainer, Diploma(Laboratory Technology)

microanalysis australia

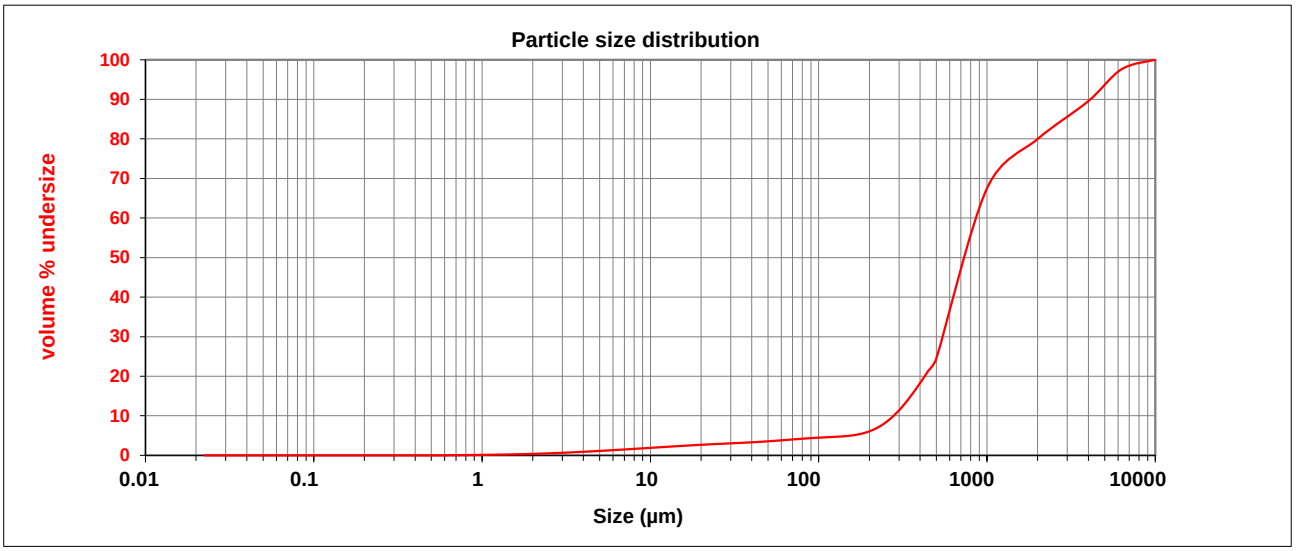
5 Alvan Street
Mount Lawley
WA 6050

Client:	Eurofins ARL Pty Ltd	**Date received:**	1/10/2024
Client address:	46 - 48 Banksia Road WELSHPOOL WA 6106	**Date analysed**	16/10/2024
Client ID:	1143989 24-Se0072806 SG2	**Date reported:**	17/10/2024
Job ID:	24_1758		
Lab ID:	24_1758_002		
Revision No. :	0		

Comment: 'Due to the high concentration of coarse material present the residual fit is higher than the ideal 1% this may affect accuracy of the final results.'

Analysis:	Laser diffraction size distribution following ISO13320-1:2020 Wet sieving following MAWI301	**Result units:**	Volume
Dispersant:	Water	**Analysis model:**	General purpose
Additives:	10 millilitres sodium hexametaphosphate		
Sonication:	19 min sonication		

Span:	4.83	**Vol. Weighted mean D[4,3]:**	1415.25 µm	**d(0.1)**	278.60 µm
		Surface Weighted mean D[3,2]	109.18 µm	**d(0.5)**	796.68 µm
				d(0.9)	4128.36 µm



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.020	0.00	0.142	0.00	1.002	0.12	7.096	1.50	50.238	3.56	355.66	15.21
0.022	0.00	0.159	0.00	1.125	0.15	7.962	1.63	56.368	3.71	399.05	18.20
0.025	0.00	0.178	0.00	1.262	0.18	8.934	1.77	63.246	3.87	447.74	21.35
0.028	0.00	0.200	0.00	1.416	0.22	10.024	1.90	70.963	4.04	500.00	24.48
0.032	0.00	0.224	0.00	1.589	0.27	11.247	2.03	79.621	4.20	1000.00	67.49
0.036	0.00	0.252	0.00	1.783	0.32	12.619	2.17	89.337	4.35	2000.00	79.98
0.040	0.00	0.283	0.00	2.000	0.37	14.159	2.30	100.237	4.48	4000.00	89.55
0.045	0.00	0.317	0.00	2.244	0.44	15.887	2.43	112.468	4.59	6300.00	97.60
0.050	0.00	0.356	0.00	2.518	0.52	17.825	2.55	126.191	4.69		
0.056	0.00	0.399	0.00	2.825	0.60	20.000	2.67	141.589	4.83		
0.063	0.00	0.448	0.00	3.170	0.69	22.440	2.78	158.866	5.06		
0.071	0.00	0.502	0.00	3.557	0.79	25.179	2.88	178.250	5.44		
0.080	0.00	0.564	0.00	3.991	0.90	28.251	2.98	200.000	6.07		
0.089	0.00	0.632	0.02	4.477	1.01	31.698	3.08	224.404	7.04		
0.100	0.00	0.710	0.04	5.024	1.13	35.566	3.19	251.785	8.41		
0.112	0.00	0.796	0.07	5.637	1.25	39.905	3.30	282.508	10.23		
0.126	0.00	0.893	0.09	6.325	1.37	44.774	3.42	316.979	12.51	10000	100.00

Note: Data from 500µm to 10000µm by wet screening, from 0.02µm to 500µm by laser diffraction.

Analysed: Akash Patel,M Eng(Chemical)
Reported: Akash Patel,M Eng(Chemical)
Approved: Benjamin Rainer, Diploma(Laboratory Technology)

microanalysis australia

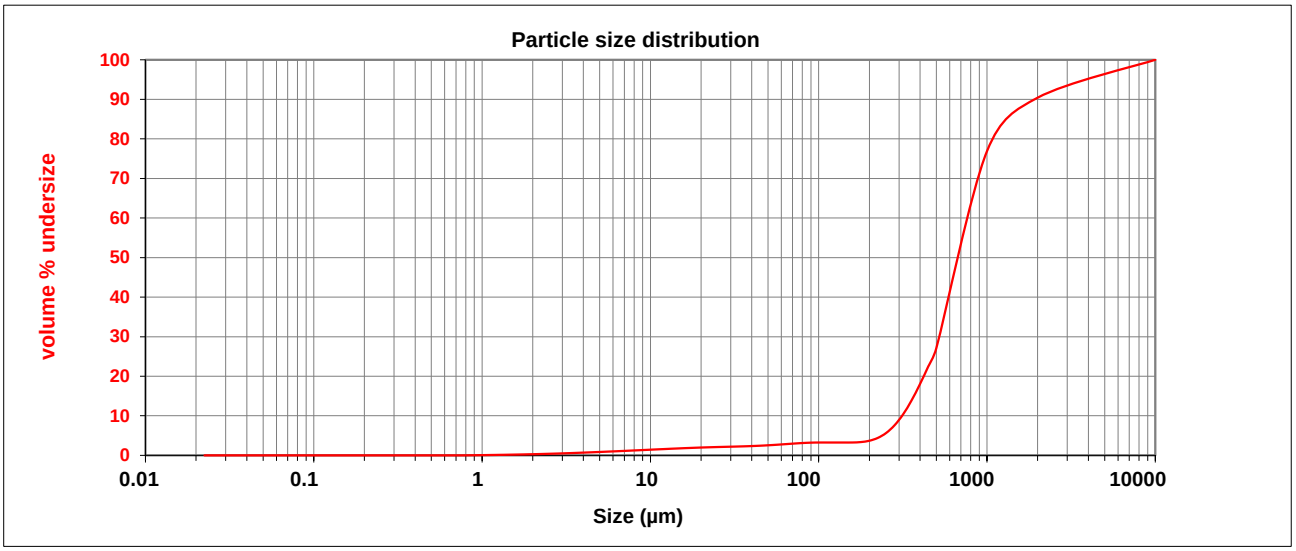
5 Alvan Street
Mount Lawley
WA 6050

Client:	Eurofins ARL Pty Ltd	**Date received:**	1/10/2024
Client address:	46 - 48 Banksia Road WELSHPOOL WA 6106	**Date analysed**	16/10/2024
Client ID:	1143989 24-Se0072807 SG3	**Date reported:**	17/10/2024
Job ID:	24_1758		
Lab ID:	24_1758_003		
Revision No. :	0		

Comment: 'Due to the high concentration of coarse material present the residual fit is higher than the ideal 1% this may affect accuracy of the final results.'

Analysis:	Laser diffraction size distribution following ISO13320-1:2020 Wet sieving following MAWI301	**Result units:**	Volume
Dispersant:	Water	**Analysis model:**	General purpose
Additives:	10 millilitres sodium hexametaphosphate		
Sonication:	18 min sonication		

Span:	2.27	**Vol. Weighted mean D[4,3]:**	1059.52 µm	**d(0.1)**	312.74 µm
		Surface Weighted mean D[3,2]	140.98 µm	**d(0.5)**	729.98 µm
				d(0.9)	1968.82 µm



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.020	0.00	0.142	0.00	1.002	0.06	7.096	1.14	50.238	2.55	355.66	13.82
0.022	0.00	0.159	0.00	1.125	0.09	7.962	1.24	56.368	2.68	399.05	17.95
0.025	0.00	0.178	0.00	1.262	0.12	8.934	1.33	63.246	2.83	447.74	22.48
0.028	0.00	0.200	0.00	1.416	0.16	10.024	1.43	70.963	2.98	500.00	27.09
0.032	0.00	0.224	0.00	1.589	0.20	11.247	1.53	79.621	3.11	1000.00	76.89
0.036	0.00	0.252	0.00	1.783	0.24	12.619	1.63	89.337	3.21	2000.00	90.42
0.040	0.00	0.283	0.00	2.000	0.29	14.159	1.73	100.237	3.25		
0.045	0.00	0.317	0.00	2.244	0.34	15.887	1.82	112.468	3.25		
0.050	0.00	0.356	0.00	2.518	0.40	17.825	1.90	126.191	3.25		
0.056	0.00	0.399	0.00	2.825	0.47	20.000	1.98	141.589	3.25		
0.063	0.00	0.448	0.00	3.170	0.54	22.440	2.05	158.866	3.26		
0.071	0.00	0.502	0.00	3.557	0.61	25.179	2.11	178.250	3.36		
0.080	0.00	0.564	0.00	3.991	0.69	28.251	2.16	200.000	3.70		
0.089	0.00	0.632	0.00	4.477	0.78	31.698	2.22	224.404	4.41		
0.100	0.00	0.710	0.00	5.024	0.86	35.566	2.28	251.785	5.67		
0.112	0.00	0.796	0.01	5.637	0.95	39.905	2.35	282.508	7.62		
0.126	0.00	0.893	0.03	6.325	1.05	44.774	2.44	316.979	10.33	10000	100.00

Note: Data from 500µm to 10000µm by wet screening, from 0.02µm to 500µm by laser diffraction.

Analysed: Akash Patel,M Eng(Chemical)
Reported: Akash Patel,M Eng(Chemical)
Approved: Benjamin Rainer, Diploma(Laboratory Technology)

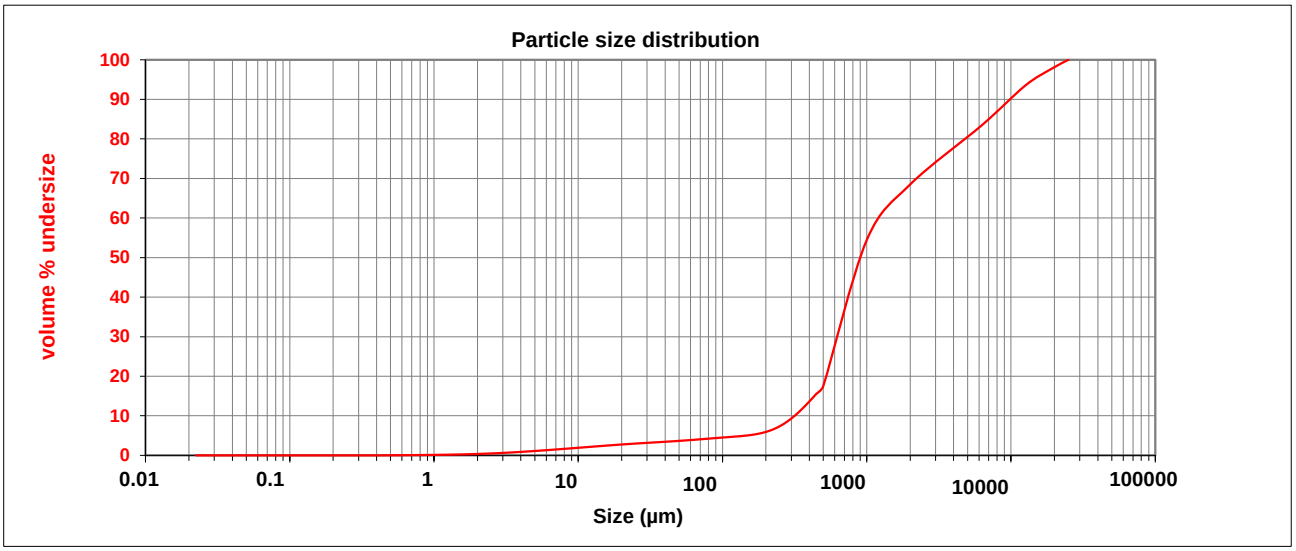
5 Alvan Street
Mount Lawley
WA 6050

Client:	Eurofins ARL Pty Ltd	**Date received:**	1/10/2024
Client address:	46 - 48 Banksia Road WELSHPOOL WA 6106	**Date analysed**	16/10/2024
Client ID:	1143989 24-Se0072808 SG4	**Date reported:**	17/10/2024
Job ID:	24_1758		
Lab ID:	24_1758_004		
Revision No. :	0		

Comment: 'Due to the high concentration of coarse material present the residual fit is higher than the ideal 1% this may affect accuracy of the final results.'

Analysis:	Laser diffraction size distribution following ISO13320-1:2020 Wet sieving following MAWI301	**Result units:**	Volume
Dispersant:	Water	**Analysis model:**	General purpose
Additives:	10 millilitres sodium hexametaphosphate		
Sonication:	18 min sonication		

Span:	10.68	**Vol. Weighted mean D[4,3]:**	3077.31 µm	**d(0.1)**	316.31 µm
		Surface Weighted mean D[3,2]	110.32 µm	**d(0.5)**	939.76 µm
				d(0.9)	10354.06 µm



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.020	0.00	0.142	0.00	1.002	0.12	7.096	1.50	50.238	3.67	355.66	11.71
0.022	0.00	0.159	0.00	1.125	0.14	7.962	1.64	56.368	3.79	399.05	13.59
0.025	0.00	0.178	0.00	1.262	0.17	8.934	1.78	63.246	3.93	447.74	15.58
0.028	0.00	0.200	0.00	1.416	0.21	10.024	1.92	70.963	4.07	500.00	17.57
0.032	0.00	0.224	0.00	1.589	0.25	11.247	2.06	79.621	4.22	1000.00	54.44
0.036	0.00	0.252	0.00	1.783	0.30	12.619	2.21	89.337	4.37	2000.00	68.49
0.040	0.00	0.283	0.00	2.000	0.35	14.159	2.35	100.237	4.51	6300.00	83.51
0.045	0.00	0.317	0.00	2.244	0.42	15.887	2.48	112.468	4.64	12500.00	93.43
0.050	0.00	0.356	0.00	2.518	0.49	17.825	2.62	126.191	4.79	19000.00	97.69
0.056	0.00	0.399	0.00	2.825	0.57	20.000	2.75	141.589	4.95		
0.063	0.00	0.448	0.01	3.170	0.67	22.440	2.87	158.866	5.17		
0.071	0.00	0.502	0.02	3.557	0.77	25.179	2.99	178.250	5.48		
0.080	0.00	0.564	0.03	3.991	0.87	28.251	3.10	200.000	5.93		
0.089	0.00	0.632	0.05	4.477	0.99	31.698	3.21	224.404	6.57		
0.100	0.00	0.710	0.06	5.024	1.11	35.566	3.32	251.785	7.45		
0.112	0.00	0.796	0.08	5.637	1.24	39.905	3.43	282.508	8.60		
0.126	0.00	0.893	0.10	6.325	1.37	44.774	3.54	316.979	10.03	25000	100.00

Note: Data from 500µm to 25000µm by wet screening, from 0.02µm to 500µm by laser diffraction.

Analysed: Akash Patel,M Eng(Chemical)
Reported: Akash Patel,M Eng(Chemical)
Approved: Benjamin Rainer, Diploma(Laboratory Technology)

microanalysis australia

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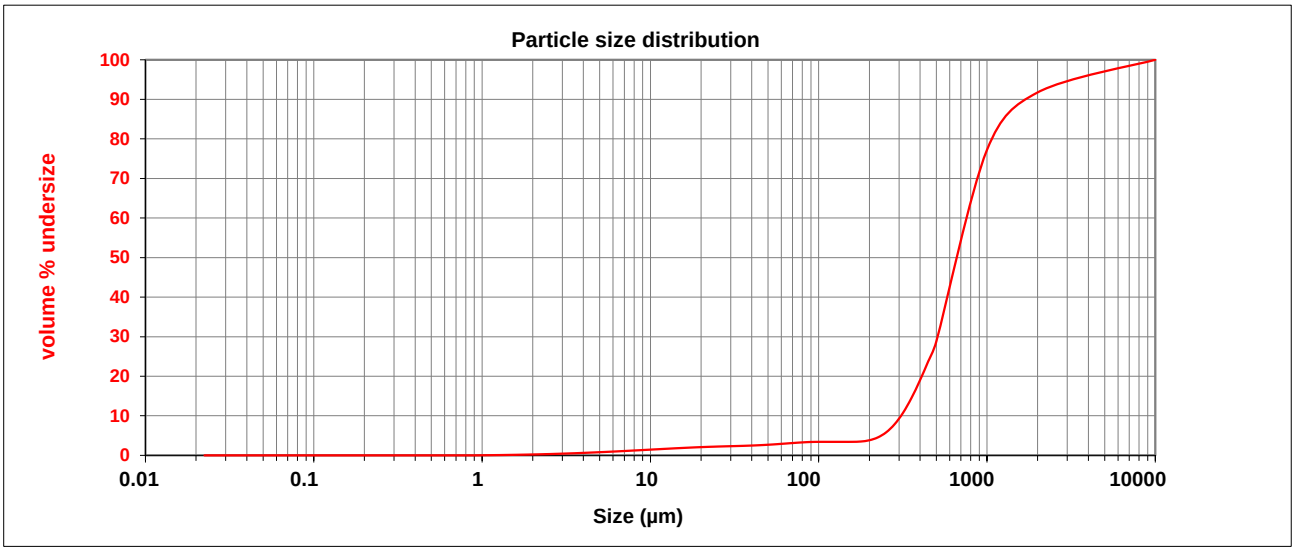
Client:	Eurofins ARL Pty Ltd	**Date received:**	1/10/2024
Client address:	46 - 48 Banksia Road WELSHPOOL WA 6106	**Date analysed**	16/10/2024
Client ID:	1143989 24-Se0072809 Trip 2	**Date reported:**	17/10/2024
Job ID:	24_1758		
Lab ID:	24_1758_005		
Revision No. :	0		

Comment: 'Due to the high concentration of coarse material present the residual fit is higher than the ideal 1% this may affect accuracy of the final results.'

Analysis:	Laser diffraction size distribution following ISO13320-1:2020 Wet sieving following MAWI301	**Result units:**	Volume
Dispersant:	Water	**Analysis model:**	General purpose
Additives:	10 millilitres sodium hexametaphosphate		
Sonication:	16 min sonication		

Span:	2.18	**Vol. Weighted mean D[4,3]:**	1010.37 µm	**d(0.1)**	308.10 µm
		Surface Weighted mean D[3,2]	150.29 µm	**d(0.5)**	718.98 µm
				d(0.9)	1878.98 µm



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.020	0.00	0.142	0.00	1.002	0.02	7.096	1.11	50.238	2.69	355.66	14.47
0.022	0.00	0.159	0.00	1.125	0.05	7.962	1.22	56.368	2.83	399.05	18.90
0.025	0.00	0.178	0.00	1.262	0.08	8.934	1.33	63.246	2.98	447.74	23.79
0.028	0.00	0.200	0.00	1.416	0.11	10.024	1.45	70.963	3.14	500.00	28.79
0.032	0.00	0.224	0.00	1.589	0.14	11.247	1.56	79.621	3.28	1000.00	77.22
0.036	0.00	0.252	0.00	1.783	0.18	12.619	1.68	89.337	3.38	2000.00	91.76
0.040	0.00	0.283	0.00	2.000	0.22	14.159	1.79	100.237	3.42		
0.045	0.00	0.317	0.00	2.244	0.27	15.887	1.90	112.468	3.42		
0.050	0.00	0.356	0.00	2.518	0.33	17.825	1.99	126.191	3.42		
0.056	0.00	0.399	0.00	2.825	0.39	20.000	2.08	141.589	3.42		
0.063	0.00	0.448	0.00	3.170	0.46	22.440	2.16	158.866	3.42		
0.071	0.00	0.502	0.00	3.557	0.54	25.179	2.23	178.250	3.50		
0.080	0.00	0.564	0.00	3.991	0.62	28.251	2.29	200.000	3.82		
0.089	0.00	0.632	0.00	4.477	0.71	31.698	2.35	224.404	4.53		
0.100	0.00	0.710	0.00	5.024	0.80	35.566	2.41	251.785	5.82		
0.112	0.00	0.796	0.00	5.637	0.90	39.905	2.48	282.508	7.86		
0.126	0.00	0.893	0.00	6.325	1.01	44.774	2.57	316.979	10.74	10000	100.00

Note: Data from 500µm to 10000µm by wet screening, from 0.02µm to 500µm by laser diffraction.

Analysed: Akash Patel,M Eng(Chemical)
Reported: Akash Patel,M Eng(Chemical)
Approved: Benjamin Rainer, Diploma(Laboratory Technology)

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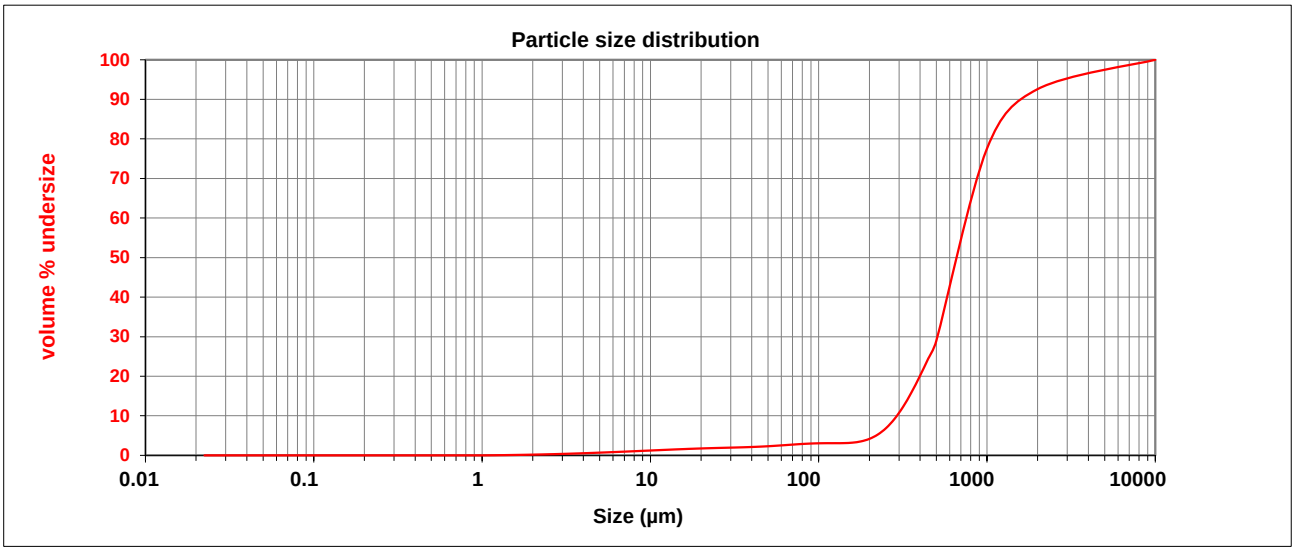
Client:	Eurofins ARL Pty Ltd	**Date received:**	1/10/2024
Client address:	46 - 48 Banksia Road WELSHPOOL WA 6106	**Date analysed**	16/10/2024
Client ID:	1143989 24-Se0072810 Trip 3	**Date reported:**	17/10/2024
Job ID:	24_1758		
Lab ID:	24_1758_006		
Revision No. :	0		

Comment: 'Due to the high concentration of coarse material present the residual fit is higher than the ideal 1% this may affect accuracy of the final results.'

Analysis:	Laser diffraction size distribution following ISO13320-1:2020 Wet sieving following MAWI301	**Result units:**	Volume
Dispersant:	Water	**Analysis model:**	General purpose
Additives:	10 millilitres sodium hexametaphosphate		
Sonication:	17 min sonication		

Span:	2.14	**Vol. Weighted mean D[4,3]:**	979.59 µm	**d(0.1)**	291.25 µm
		Surface Weighted mean D[3,2]	170.52 µm	**d(0.5)**	716.52 µm
				d(0.9)	1827.44 µm



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.020	0.00	0.142	0.00	1.002	0.00	7.096	0.95	50.238	2.31	355.66	15.89
0.022	0.00	0.159	0.00	1.125	0.02	7.962	1.04	56.368	2.44	399.05	20.03
0.025	0.00	0.178	0.00	1.262	0.04	8.934	1.13	63.246	2.59	447.74	24.47
0.028	0.00	0.200	0.00	1.416	0.07	10.024	1.23	70.963	2.74	500.00	28.95
0.032	0.00	0.224	0.00	1.589	0.11	11.247	1.32	79.621	2.88	1000.00	77.56
0.036	0.00	0.252	0.00	1.783	0.14	12.619	1.41	89.337	2.98	2000.00	92.59
0.040	0.00	0.283	0.00	2.000	0.18	14.159	1.50	100.237	3.05		
0.045	0.00	0.317	0.00	2.244	0.23	15.887	1.59	112.468	3.08		
0.050	0.00	0.356	0.00	2.518	0.28	17.825	1.67	126.191	3.08		
0.056	0.00	0.399	0.00	2.825	0.34	20.000	1.75	141.589	3.10		
0.063	0.00	0.448	0.00	3.170	0.40	22.440	1.81	158.866	3.21		
0.071	0.00	0.502	0.00	3.557	0.46	25.179	1.87	178.250	3.53		
0.080	0.00	0.564	0.00	3.991	0.54	28.251	1.93	200.000	4.16		
0.089	0.00	0.632	0.00	4.477	0.61	31.698	1.98	224.404	5.25		
0.100	0.00	0.710	0.00	5.024	0.69	35.566	2.04	251.785	6.92		
0.112	0.00	0.796	0.00	5.637	0.78	39.905	2.11	282.508	9.24		
0.126	0.00	0.893	0.00	6.325	0.86	44.774	2.20	316.979	12.24	10000	100.00

Note: Data from 500µm to 10000µm by wet screening, from 0.02µm to 500µm by laser diffraction.

Analysed: Akash Patel,M Eng(Chemical)
Reported: Akash Patel,M Eng(Chemical)
Approved: Benjamin Rainer, Diploma(Laboratory Technology)