

**Learmonth Pipeline Fabrication Facility**

**Marine Operational Environmental Monitoring  
Plan**

**APFAC017-HSE-00007**

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### **REVISION RECORD SHEET**

<b>Revision</b>	<b>Issue Date</b>	<b>Purpose</b>	<b>Description of Updated/Modified Sections (if any)</b>
Draft 1	09.09.2019	Internal Review	NA
Final Draft	11.09.2019	External Review	Minor revisions to proposed monitoring

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## Executive Summary

Table 1 provides a summary of the Proposal and the purpose of the Marine Operational Environmental Monitoring Plan (MOEMP) (this document).

<b>Summary of Proposal</b>	
Proposal Title	Learmonth Pipeline Fabrication Facility
Proponent Name	Subsea 7 Australia Contracting (Subsea 7)
Short Description	Construction and operation of an onshore Bundle fabrication facility at Heron Point.
Purpose of MOEMP (this document)	Document the monitoring measures to be undertaken to evaluate whether impacts on benthic communities and habitats (BCH) during Bundle launch are commensurate with those predicted.
Key environmental factor and objective	Benthic Communities and Habitats (BCH)  EPA Objective: To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.
Key monitoring programmes in the plan	<ul style="list-style-type: none"> <li>• Water quality (turbidity) monitoring.</li> <li>• BCH monitoring (benthic grabs, towed video transects)</li> </ul>

**Table 1: Proposal Summary**

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>3</b>
<b>1 CONTEXT, SCOPE AND RATIONALE .....</b>	<b>5</b>
1.1 PROPOSAL OVERVIEW.....	5
1.2 BUNDLE LAUNCH AND TOW .....	7
1.2.1 Bundle Launch .....	7
1.2.2 Off Bottom Tow .....	7
1.2.3 Surface Tow.....	7
1.2.4 Controlled Depth Tow Method .....	7
1.3 KEY ENVIRONMENTAL FACTOR: BENTHIC COMMUNITIES AND HABITAT (BCH)..	9
1.3.1 Impact Prediction and Assessment.....	9
1.3.2 Baseline Data.....	12
1.3.3 Key Assumptions and Uncertainties.....	12
<b>2 OPERATIONAL ENVIRONMENTAL MONITORING PLAN PROVISIONS.....</b>	<b>13</b>
2.1 OBJECTIVES .....	13
2.2 BCH MONITORING PROGRAM .....	14
2.2.1 Overview .....	14
2.2.2 Monitoring Sites .....	15
2.2.3 Monitoring Timing/Frequency .....	15
2.2.4 Monitoring Methods .....	17
<b>3 REPORTING PROVISIONS.....</b>	<b>18</b>
3.1 COMPLIANCE ASSESSMENT REPORTING.....	18
3.2 BUNDLE LAUNCH REPORTING .....	18
<b>4 STAKEHOLDER CONSULTATION .....</b>	<b>19</b>
<b>5 REFERENCES.....</b>	<b>20</b>

## TABLES

Table 1: Proposal Summary.....	3
Table 2: Monitoring Programme Summary.....	14

## FIGURES

Figure 1: Proposal Location.....	6
Figure 2: Offshore Operation Area .....	8
Figure 3: Offshore Operation Area and Nominated ZoHI and ZoI Associated with Bundle Launches .....	11
Figure 4: Indicative water quality and BCH monitoring sites.....	16

## **1 CONTEXT, SCOPE AND RATIONALE**

This Marine Operational Environmental Monitoring Plan (MOEMP) is submitted in support of the Environmental Review Document (ERD) (Assessment Number 2208 / EPBC 2017-8079) developed by Subsea 7 for the Learmonth Pipeline Fabrication Facility (the Proposal) (Subsea 7 2019).

The MOEMP includes the protocols and procedures for monitoring of water quality (turbidity) and impacts to Benthic Communities and Habitat (BCH) to determine whether the operation of the Proposal achieves the outcomes as represented by the Zone of High Impact (ZoHI) and Zone of Influence (ZoI) during the operational phase, as nominated within the ERD (Subsea 7 2019).

### **1.1 PROPOSAL OVERVIEW**

Subsea 7 proposes to construct and operate a new pipeline fabrication facility (the Proposal) adjacent to the western shoreline of Exmouth Gulf, at Learmonth, approximately 35 km south of the Exmouth townsite (Figure 1). The proposed facility will allow the construction and launching of pipeline Bundles for the offshore oil and gas industry.

The Proposal includes the construction of a fabrication shed, where the Bundles will be constructed, a storage area where the Bundle materials will be stored prior to use, and two approximately 10 km long Bundle tracks along which each Bundle will be constructed and then launched. A Bundle launchway, crossing the beach and extending into the shallow subtidal area, will facilitate the launch of each Bundle.



Scale: 1:400000  
 Aerial Photo: ESRI Satellite  
 Original Size: A4  
 Grid: GDA 94 / MGA Zone 50

Notes: Location of proposed Bundle Site.  
  
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**subsea 7**  
 Figure 1: Location of Proposal

## **1.2 BUNDLE LAUNCH AND TOW**

### **1.2.1 Bundle Launch**

To launch a Bundle, the towhead on the offshore end of the Bundle is connected to a tug (the 'Leading Tug') via a long towline. The tug then slowly ( $\leq 2$  knots) heads offshore, pulling the Bundle along the track and into the ocean. The onshore end of the Bundle is connected to another line which is slowly unwound from an onshore winch, until the Bundle reaches sufficient water depth for connection to another tug (the 'Trailing Tug'). The Bundle rolls down the track, which extends across the beach and into the shallow subtidal area. As the Bundle towheads (both lead and trailing towheads) enter the water and gain depth, they will become buoyant as the structure and floatation devices enter the water.

Ballast chains are attached at intervals along the length of the Bundle to provide stability control during the launch and lift during the offshore Controlled Depth Tow Method (CDTM) tow out to the production field. Each Bundle is custom designed and built, so chain dimensions may vary. Typically the ballast chains that hang beneath the Bundle vary between short and long lengths, typically alternating in a short-long-short-long configuration. The typical chain size used is 76 mm diameter chain. Short lengths are typically 10-12 links (3-4 m) and long chain lengths are typically 18-20 links (5-6 m). The long chain lengths are typically spaced at 20 m intervals along the Bundle. The longer Bundle chain lengths will have some contact (4-5 links touching the seabed) along the length of the tow route out to the Bundle Parking area (approximately 30 km).

### **1.2.2 Off Bottom Tow**

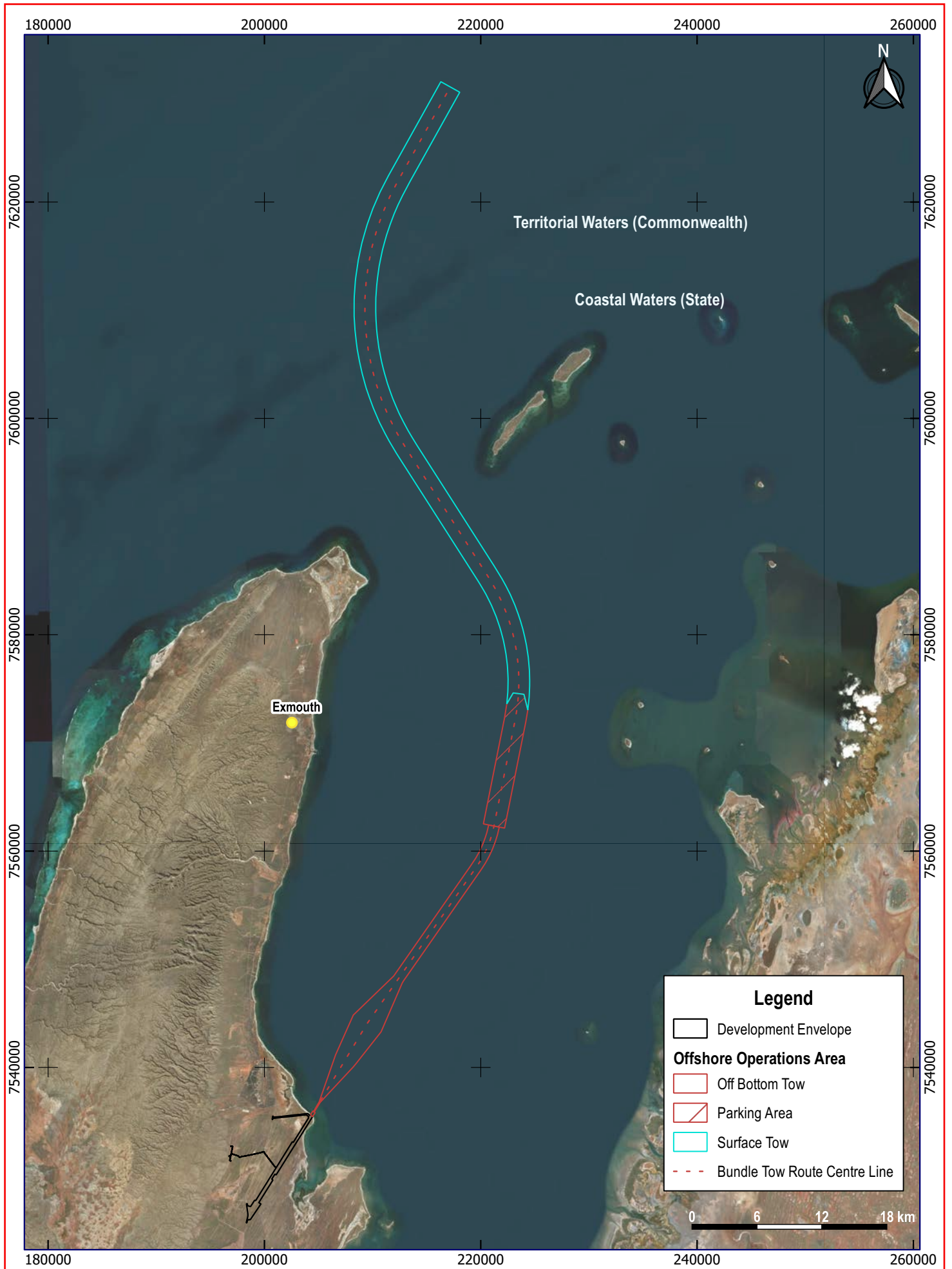
Following launch, the Bundle will be towed slowly (3-4 knots, up to a maximum of 5 knots) offshore along the tow route (Figure 2). The Bundle will be in 'Off bottom tow', meaning that the Bundle (including towheads) will be clear of the seabed. The lower links of the long Bundle chains will be in contact with the seabed in this mode. On arrival at the Bundle Parking area, the Bundle will be stopped and various checks and reconfiguration for the subsequent Surface tow completed. The Bundle may remain within this area for nominally up to 24 hours to allow for all checks and reconfiguration to be completed, and to allow for the Surface tow out of Exmouth Gulf to be aligned with optimal environmental conditions.

### **1.2.3 Surface Tow**

On exit from the Bundle Parking area the tow vessels will increase the tow speed to 5-6 knots (up to a possible maximum of 8 knots). Hydrodynamic forces acting on the ballast chains produce a lift component and the Bundle will rise to the surface in a controlled manner. In this 'Surface tow' configuration the Bundle lies right at the surface, ensuring maximum clearance from the seabed within Ningaloo Marine Park (Figure 2). The trailing tug provides back tension during tow, as required.

### **1.2.4 Controlled Depth Tow Method**

Once the Bundle and tow fleet exit the Exmouth Gulf and enter deeper waters, the Bundle tow speed will be reduced slightly (to a maximum of 5 knots), and the tension from the trailing tug reduced, to allow the Bundle to be lowered to sit at mid depth in the water column. The actual depth varies pending the Bundle tow characteristics, and the environmental conditions at the time, but is typically in the region of 50 m water depth. Once this depth is reached, and the Bundle is stable, the tow has entered 'Controlled Depth Tow Method' (CDTM) which will continue until the Bundle reaches the installation location.



Scale: 1:450000  
 Aerial Photo: ESRI Satellite  
 Original Size: A4  
 Grid: GDA 94 / MGA Zone 50

Notes: Data sourced from Subsea 7 (2018).

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**Legend**






-  Development Envelope
- Offshore Operations Area**
-  Off Bottom Tow
-  Parking Area
-  Surface Tow
-  Bundle Tow Route Centre Line



Figure 2: Offshore Operations Area and Indicative Tow Route



### **1.3 KEY ENVIRONMENTAL FACTOR: BENTHIC COMMUNITIES AND HABITAT (BCH)**

The Environmental Protection Authority (EPA) Objective for Benthic Communities and Habitat (BCH) is *"To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained."*

The potential impacts to BCH during the operation of the Proposal are:

- Direct loss of BCH during Bundle launch and tow.
- Indirect loss or degradation of BCH during Bundle launch and tow.
- Direct loss of BCH during Bundle tow in the event of a loss of control of the Bundle.
- Indirect loss of BCH during Bundle tow in the event of a loss of control of the Bundle or support vessel (e.g. from physical contact or a chemical spill).
- Indirect loss of BCH due to altered water flows and sediment movement as a result of the presence of the launchway.

The MOEMP addresses the direct loss of BCH during Bundle launch and tow, and the potential indirect loss or degradation of BCH during Bundle launch and tow. Construction phase impacts are addressed within the Marine Construction Monitoring and Management Plan (MCMMP). Impacts associated with changes to sediment transport adjacent to the shoreline, due to altered water flows and sediment movement as a result of the presence of the launchway, will be addressed through monitoring and management as outlined in the ERD (Subsea 7 2019) (to be included in overarching Operations Environmental Management Plan).

#### **1.3.1 Impact Prediction and Assessment**

The EPA's approach to the prediction of impacts associated with dredging proposals (EPA 2016) was followed in the prediction of impacts associated with the Bundle chains during a launch. The scheme consists of three zones that represent different levels of impact:

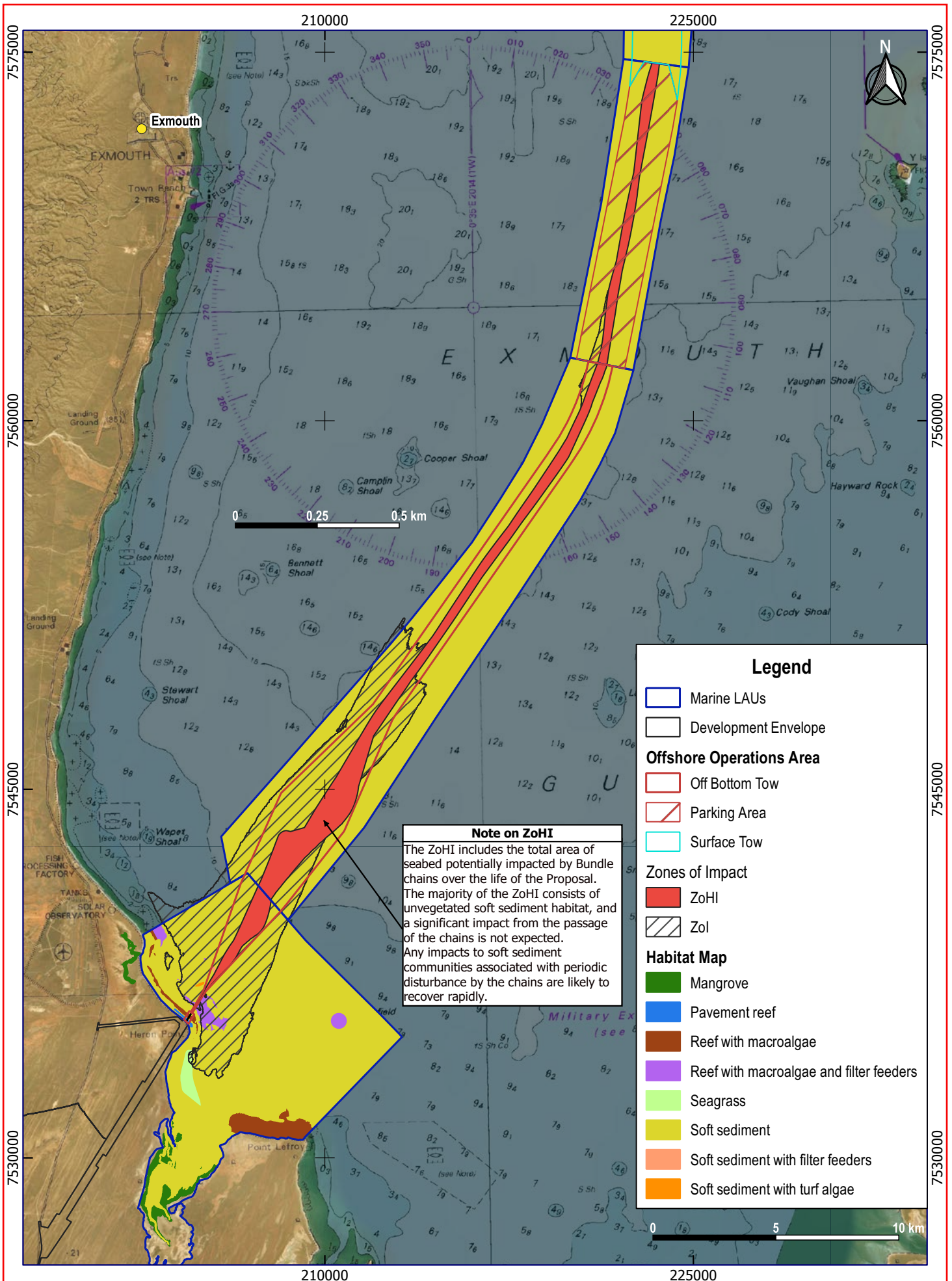
- The Zone of High Impact (ZoHI) is the area where impacts on benthic communities or habitats are predicted to be irreversible. The term irreversible means 'lacking a capacity to return or recover to a state resembling that prior to being impacted within a timeframe of five years or less'.
- The Zone of Moderate Impact (ZoMI) is the area within which predicted impacts on benthic organisms are recoverable within a period of five years.
- The Zone of Influence (ZoI) is the area within which changes in environmental quality are predicted and anticipated at some point, but where these changes would not result in a detectable impact on benthic biota. These areas can be large, but at any point in time impacts to water quality are likely to be restricted to a relatively small portion of the Zone of Influence.

The chains touching the seabed within the Off bottom tow area, which is already disturbed, primarily soft sediment, habitat is not expected to have a significant impact. However, to quantify the potential (but highly unlikely) 'absolute worst case' outcome following multiple Bundle launches, and assuming no recovery of BCH between Bundle launches, calculations were completed based on the total area potentially impacted by Bundle chains over the life of the Proposal. This area has been designated a potential ZoHI (Figure 3).

Hydrodynamic and sediment fate modelling was completed to predict the spatial extent, magnitude and persistence of suspended sediment loads during and following a Bundle launch. The general pattern of suspended sediment movement predicted by modelling was that the sediment material suspended in the lower layers of the water column during a

Bundle launch will drift to one side of the tow route (north during an ebb tide or south during a flood tide), before a proportion of the suspended sediment is deposited on the seabed during the next slack tide period. The remaining suspended sediments will then be transported by subsequent tidal currents back and forth (north-south) across the tow route, with deposition occurring steadily. As the suspended sediments drift back and forth they gradually resettle onto the seabed, leading to a decrease in the spatial extent of the plume over the following 1-2 days (RPS 2019, Subsea 7 2019).

To identify the area within which short term changes in environmental quality would be expected, but where these changes would not result in a detectable impact on BCH (the ZoI), the following threshold was applied to the modelling predictions: *'the median depth averaged turbidity over 24 hours exceeds the 80th percentile of baseline data'*. The area predicted to experience turbidity exceeding this threshold were designated as a ZoI (Figure 3). No ZoMI associated with the operational phase of the Proposal has been defined.



Scale: 1:200000  
 Original Size: A4  
 Aerial Photo: ESRI Satellite  
 Grid: GDA 94 / MGA Zone 50

Notes: Data sourced from Commonwealth of Australia (2018) and RPS (2019).

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Figure 3: Zones of High and Moderate Impact and Zone of Influence (Worst Case)

### 1.3.2 Baseline Data

Intertidal and subtidal habitats off Heron Point were surveyed in December 2016 (360 Environmental 2017). A follow up survey, to map all BCH off Heron Point, was completed in May/June 2017 (360 Environmental 2017). Three intertidal BCH types were recorded:

- Fine sand (Fine sand within upper littoral zone).
- Pavement reef (Unvegetated pavement reef within the upper littoral zone).
- Reef with macroalgae:
  - Pavement reef within the mid littoral zone with mud veneer and sparse macroalgae (*Sargassum* sp.).
  - Pavement reef within the lower littoral zone with macroalgae (*Halimeda* sp., *Padina* sp., *Sargassum* sp.) and occasional hard corals (*Turbinaria* spp.) and soft corals (*Lobophytum* spp.)

Six subtidal BCH types were recorded off Heron Point (360 Environmental 2017):

- Soft sediment (Mud and sand dominated habitats with sparse turf algae).
- Soft sediment with turf algae (Mud and sand dominated habitats with turf algae/microphytobenthos (MPB)).
- Seagrass (Mud and sand dominated habitats with sparse *H. uninervis* and *H. ovalis*).
- Soft sediment with filter feeders (Soft sediment veneer overlying low relief reef. Sparse cover of filter feeders (sponges and soft corals)).
- Reef with macroalgae (Low relief reef with macroalgae (brown)).
- Reef with macroalgae and filter feeders (Low relief reef with macroalgae (brown) and filter feeders (sponges, soft corals, hard corals)).

A towed video survey of the original Bundle laydown area (now termed the Parking area) was completed in September 2017 (360 Environmental 2017). This survey was augmented by the completion of 114 towed video transects across the Offshore Operations Area including along the proposed tow route within the Ningaloo Marine Park. Three BCH types were recorded (MBS Environmental 2018):

- Soft sediment.
- Pavement Reef with filter feeders.
- Pavement reef with macroalgae and filter feeders.

### 1.3.3 Key Assumptions and Uncertainties

The key assumption regarding BCH is that Exmouth Gulf currently experiences natural periods of elevated turbidity, associated with storm events or during periods of spring tides and persistent strong wind, which act to re-suspend fine sediments around the margins of Exmouth Gulf (particularly adjacent to the south and eastern shores). This was confirmed following the completion of the baseline current and turbidity monitoring events.

The BCH present are expected to be relatively tolerant of short-term increases in suspended sediment loads, as are predicted during and immediately following a Bundle launch.

## **2 OPERATIONAL ENVIRONMENTAL MONITORING PLAN PROVISIONS**

### **2.1 OBJECTIVES**

The broad objectives of the monitoring program are:

- To evaluate whether impacts on BCH during Bundle launch are commensurate with those predicted in the ERD (Subsea 7 2019).
- Confirm the duration and magnitude of changes to turbidity adjacent to the tow route during and immediately following a Bundle launch.
- Allow repeated measurements before and following the implementation of the Proposal to reliably determine the nature, and magnitude, of any changes to biological components of the marine environment.
- Determine whether any significant changes (if recorded) are due to natural variation or the result of Proposal activities.
- Compare any significant changes attributed to the Proposal (i.e. impacts) to the predicted impacts and approved environmental protection outcomes.

## 2.2 BCH MONITORING PROGRAM

### 2.2.1 Overview

Monitoring in relation to BCH will be undertaken as outlined in Table 2 (refer also Figure 3).

Zone	Predicted Environmental Outcome	Planned Monitoring
ZoHI	Permanent loss of BCH	<p><b>Biological:</b> Grab sampling within subtidal Soft Sediment habitat to characterise infauna community structure before and after Bundle launch.</p> <p><b>Water Quality:</b> Assessment of the spatial extent of turbidity along the tow route during Bundle launch.</p>
ZoI	Short-term changes in environmental quality anticipated, but no detectible impact on benthic biota.	<p><b>Biological:</b> Grab sampling within Soft Sediment habitat to characterise infauna community structure before and after Bundle launch.</p> <p>Quantitative towed video transects within 'Reef with macroalgae' and 'Reef with macroalgae and filter feeders' BCH types to characterise primary producer and filter feeder composition and cover before and after Bundle launch.</p> <p><b>Water Quality:</b> Monitoring of turbidity adjacent to tow route during Bundle launch to confirm extent, severity and duration of impacts to water quality (turbidity).</p> <p>Assessment of the spatial extent of turbidity along the tow route during Bundle launch.</p>
Beyond ZoI	No significant changes in environmental quality or impact on benthic biota.	<p><b>Biological:</b> Grab sampling within Soft Sediment habitat to characterise infauna community structure before and after Bundle launch at 'non-impact' sites.</p> <p>Quantitative towed video transects within 'Reef with macroalgae' and 'Reef with macroalgae and filter feeders' BCH types to characterise primary producer and filter feeder composition and cover before and after Bundle launch at 'non-impact' sites.</p> <p><b>Water Quality:</b> Monitoring of turbidity adjacent to tow route during Bundle launch to confirm no significant changes to water quality.</p> <p>Assessment of the spatial extent of turbidity along the tow route during Bundle launch.</p>

**Table 2: Monitoring Programme Summary**

### 2.2.2 Monitoring Sites

Selection of locations for monitoring (impact and reference) sites were based on a number of considerations including:

- The locations of ZoHI and ZoI boundaries.
- The distribution of BCH in those zones.
- Water depths and the accessibility of locations.
- The location of previous survey sites.
- The likelihood of third party impacts to monitoring sites.

The indicative monitoring sites are shown in Figure 4.

### 2.2.3 Monitoring Timing/Frequency

#### 2.2.3.1 Biological Monitoring

Biological monitoring will be completed prior to and after the initial two Bundle launch. Monitoring prior to a Bundle launch will be undertaken in the six-week period prior to launch. Monitoring after the launch will be undertaken within six weeks of completion of a Bundle launch.

Following the initial two Bundle launches, assuming no impacts beyond the ZoHI are detected, monitoring will not be continued. Should impacts beyond the ZoHI be detected, these will be quantified (with details provided in the Compliance Assessment Report) and monitoring of BCH recovery will occur (in consultation with the EPA).

#### 2.2.3.2 Water Quality Monitoring

Monitoring of water quality, specifically turbidity, adjacent to the tow route will be completed within and outside of the predicted ZoI during the initial two Bundle launches. The results of each round of monitoring (i.e. associated with each Bundle launch) will be compared to modelled values with the following actions taken:

- **Results less than predicted** (extent, severity and duration of turbidity) – No further water sampling conducted following second Bundle launch.
- **Results consistent with predictions** (extent, severity and duration of turbidity) – No further water sampling conducted following second Bundle launch.
- **Results exceed predictions** (extent, severity and duration of turbidity) – model re-calibrated and re-run to provide revised 'realistic worst case' impact predictions, water sampling conducted for next (third) launch to assist in final validation exercise.

A visual assessment of the spatial extent of turbidity along the tow route during each launch will be completed.

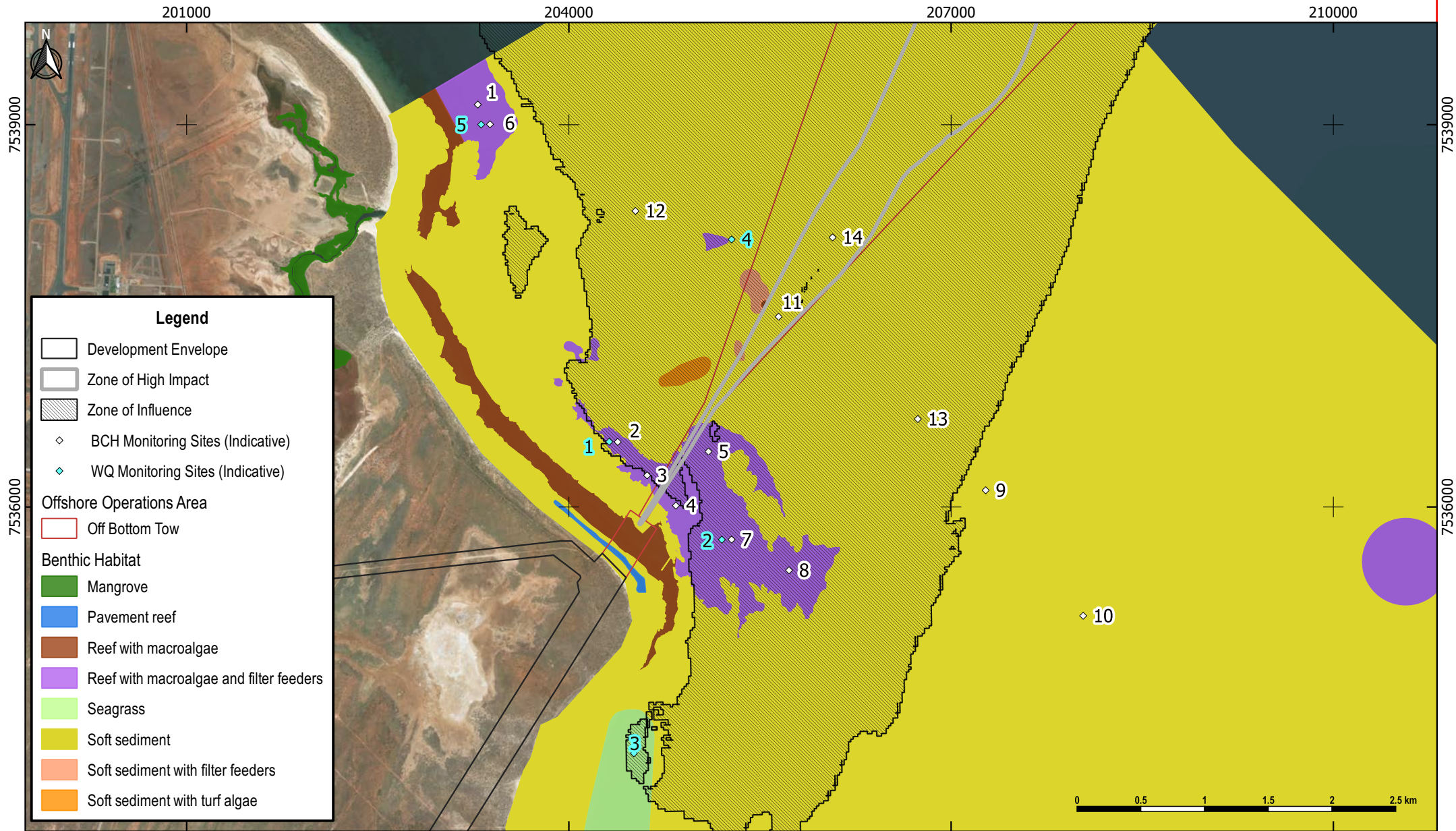


Figure 4: Indicative BCH and Water Quality Monitoring Sites



## 2.2.4 Monitoring Methods

### 2.2.4.1 Benthic grabs

Replicate subtidal infauna samples will be collected using a Van Veen grab. Samples will be wet sieved (through a 1mm sieve) offshore, using seawater, to separate the infauna from the fine sediments. The retained samples will then be stored in 100% ethanol prior to transport to the laboratory for analysis.

The laboratory processing of samples for benthic infauna will involve two processes:

- Sample sorting—the separation of biological material from sediment, shell-hash, and other non-living biological material retained by the selected mesh size (e.g. 1.0 mm).
- Species identification and enumeration—the accurate identification (using stereomicroscopy) of all benthic macrofauna found in a sample to the lowest reliable taxonomic level and the accurate counting of the number of benthic macrofauna in each taxonomic category.

The infaunal community structure within each sample will be investigated by examination of the individual and species numbers recorded and by the use of multivariate analysis methods.

### 2.2.4.2 Towed video transects

A towed video system will be used to record video footage along monitoring transects at each monitoring location. The system will be towed at a speed of approximately 1-2 km/h, at a height of approximately 0.5 m from the seabed.

Quantitative habitat data will be obtained from the video footage. The footage from each transect will be split into 30 second long sections for analysis purposes.

A number of habitat descriptors will be recorded from each 30 second section of video footage including:

- Dominant seabed type (e.g. soft sediment, reef).
- The percentage cover of flora (macroalgae).
- The abundance (count) of fauna of different genera/species (e.g. sponges, soft corals, hard corals).
- Other features or mobile fauna as visible within the footage.

### 2.2.4.3 Water quality (turbidity) monitoring

Calibrated turbidity loggers will be attached to a star picket and positioned approximately 1 m above the seabed to capture the approximate maximum water column turbidity.

The spatial extent of turbidity along the tow route during each Bundle launch will be determined by the capture and analysis of remote imagery (for example aerial photography or drone imagery).

### **3 REPORTING PROVISIONS**

#### **3.1 COMPLIANCE ASSESSMENT REPORTING**

Evidence of implementation of the MOEMP will be provided within each Compliance Assessment Report (CAR) required under the Ministerial Statement for the Proposal. The format of these reports will be consistent with the approved Compliance Assessment Plan (CAP).

#### **3.2 BUNDLE LAUNCH REPORTING**

At the completion of each Bundle launch, and associated monitoring program, a completion report will be prepared summarising the outcomes of the launch including the results of operational and environmental monitoring, outcomes in relation to the approved environmental performance outcomes and any issues or incidents.

#### **4 STAKEHOLDER CONSULTATION**

A number of meetings and briefings on the Proposal have been held with the local community, local, State and Federal government agencies, other industry participants, non-government organisations, Traditional Owner groups and the pastoralist.

A broad cross-section of community and service organisations local to Exmouth, including conservation groups, has also been contacted regarding the Proposal. The subjects of discussion have varied through the range of stakeholders, and valuable input has been gained for development of the environmental investigation programmes and design of the Proposal.

Extensive comments were raised in relation to the Bundle launch, with the majority concerning the impact to BCH and marine fauna.

This plan outlines the monitoring to be undertaken to confirm the extent of impacts to water quality, and BCH, associated with a Bundle launch. The outcomes of the monitoring will be presented within a Bundle Launch Report, which will be made publicly available.

## 5 REFERENCES

360 Environmental. 2017. Subsea 7 Learmonth Habitat Surveys. Report on behalf of Subsea 7.

Environmental Protection Authority (EPA). 2016. Technical Guidance Environmental Impact Assessment of Marine Dredging. Perth: EPA.

MBS Environmental. 2018. Exmouth Gulf Benthic Communities and Habitat Survey Report. November 2018.

RPS. 2019. Learmonth Sediment Dispersion Modelling Report. March 2019.

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