

# **Learmonth Pipeline Fabrication Facility**

## **Marine Construction Monitoring and Management Plan**

**APFAC017-HSE-00002**

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### REVISION RECORD SHEET

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Draft 1	22.01.2019	Internal Review	NA
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Final	11.09.2019	External Review	Minor revisions to include the factor BCH
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Final v3	29.05.2020	External Review	Minor revisions to address EPA comments

## Executive Summary

Table 1 provides a summary of the Proposal and the purpose of the Marine Construction Monitoring and Management Plan (MCMMP) (this document).

Summary of Proposal	
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 MCMMP (this document)	Document the management measures to be implemented to manage potential impacts to Marine Environmental Quality (MEQ), and as a result on Benthic Communities and Habitats (BCH), during construction.
Key environmental factor and objective	<p>MEQ</p> <p>EPA Objective: To maintain the quality of water, sediment, and biota so that environmental values are protected.</p> <p>Subsea 7 Objective: No persistent impacts to water quality beyond the Zone of Moderate Impact (ZoMI).</p> <p>BCH</p> <p>EPA Objective: To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.</p> <p>Subsea 7 Objective: No measurable impacts to BCH (ecosystem health) beyond the ZoMI.</p>
Key provisions in the plan	<ul style="list-style-type: none"> <li>• Use of prefabricated concrete slabs to minimise seabed disturbance.</li> <li>• Rock material to be used in construction to be 'clean' (free of 'fines' - particles &lt; 63 µm in diameter).</li> <li>• Silt curtains deployed as required.</li> <li>• Suspension of turbidity-generating activities as required to meet the objectives.</li> </ul>

**Table 1: Proposal Summary**

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

This Marine Construction Monitoring and Management Plan (MCMMP) 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).

As per the Environmental Scoping Document (ESD), the MCMMP includes the protocols and procedures for monitoring of key marine environmental quality indicators and management of marine environmental quality to ensure that the construction of the proposal achieves the proposed MEQ Objectives and Levels of Ecological Protection defined in the Environmental Quality Plan (EQP) (Subsea 7 2019a). By achieving the MEQ objectives the objectives for BCH will be met.

### **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.



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 Aerial Photo: ESRI Satellite  
 Grid: GDA 94 / MGA Zone 50

Notes: Location of Proposed Learmonth Pipeline Fabrication Facility



Subsea 7 Pipeline Fabrication Facility

Figure 1: Proposal Location



## 1.2 BUNDLE LAUNCHWAY

### 1.2.1 Launchway Components

The launchway will comprise the following components:

- Two parallel skid beams 2.2 m apart from each other, each formed by 12 m long steel beam segments hinge-connected to each other.
- Reinforced concrete slabs of 4 m (width) x 12 m (length) x 0.5m (thickness) onto which the skid beams are attached.
- Ballast grade gravel layer made of angular and durable rocks (Figure 2, Figure 3).

In addition to the above, rock armour materials will be required outside the ballast layer to protect the system against wave impacts. Use of concrete mattress (such as Coastmatt™) is currently proposed as this provides the opportunity to reduce the thickness of protection by up to ¼ (compared to 'standard' rock armour which would require a median rock weight of 1,000 kg across the beach and intertidal area and a median rock size of 600 kg in the subtidal area.

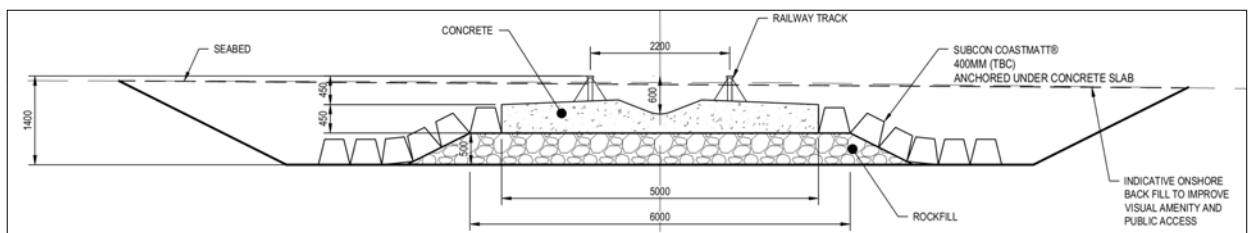


Figure 2: Bundle launchway preliminary design (beach/intertidal section) (Source: GHD 2018)

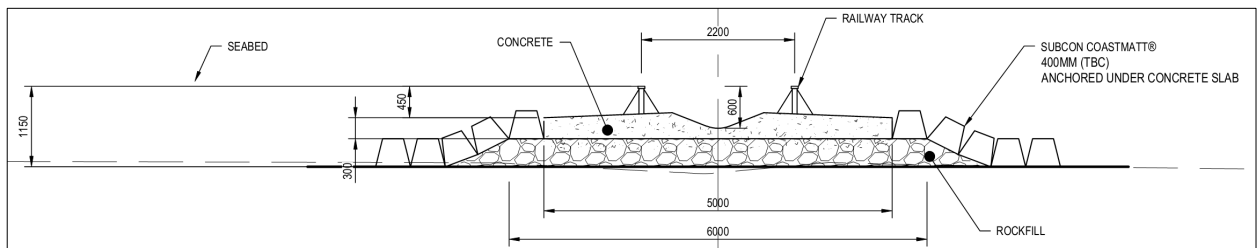


Figure 3: Bundle launchway preliminary design (subtidal section) (Source: GHD 2018)

### 1.2.2 Launchway Construction

The following construction sequence for the launchway is expected:

- Excavate sand on land including the area through the sand dunes.
- Excavate or compact sand on the beach.
- Progressively construct the launchway from the landward extent to the seaward extent, by repeating the following steps:
  - Place rock fill.
  - Place concrete panels.
  - Place concrete mattress or rock armour.



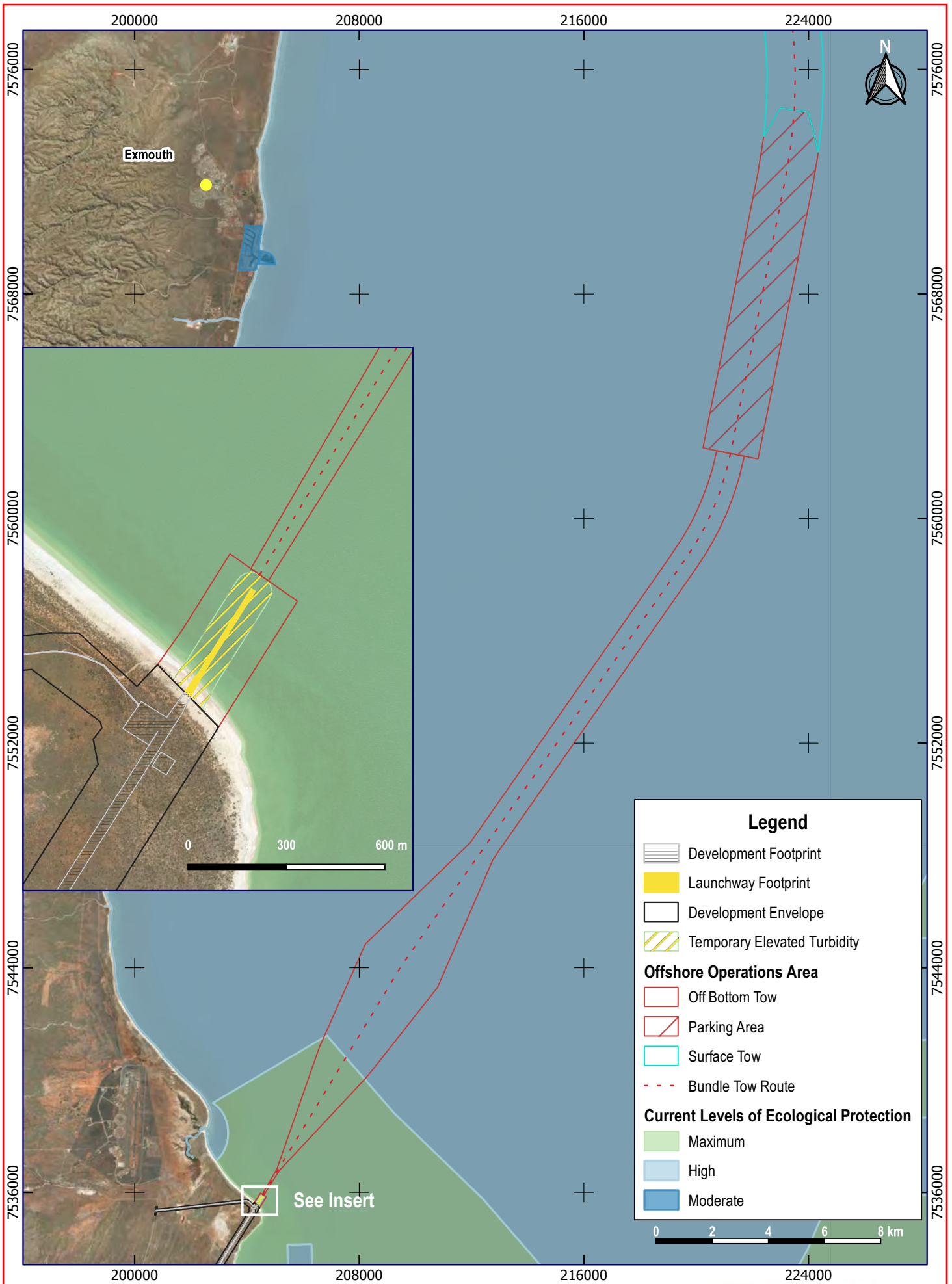
Rock fill will be placed from the shoreline and progressively seaward along the onshore end of the launchway. For the offshore end of the launchway, the rock fill will be placed from a barge.

At the offshore end of the launchway, a minor excavation of seabed material is required. Along the last 24 m of the launchway footprint a trench with a mean depth of 30 cm will be excavated via a barge-mounted backhoe (or similar) to allow the top of the launchway (excluding the tracks) to lie at seabed level. The small volume of sediment material to be removed (approximately 50 m<sup>3</sup>) will be placed adjacent to the launchway footprint (on the north side) while this section of the launchway is completed. Following construction this material is expected to migrate to the south due to natural coastal processes, across the base of the launchway, and to the east around the end of the launchway.

Sediment may be re-suspended, causing a temporary impact to water quality (refer Figure 4), as a result of:

- Disturbance of the seabed in areas of soft sediment (i.e. when the rock fill material makes contact with the seafloor and displaces superficial material).
- Any rock 'fines' contained within the rock fill, or generated as the fill is placed and rocks come into contact with each other, mixing with the surrounding seawater.
- Disturbance of the seabed by construction equipment, including when a 30 cm layer of sediment is removed from the last 24 m length of the launchway footprint.

Launchway construction activities will be limited to daylight operations (day shift) only.



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 Aerial Photo: ESRI Satellite  
 Grid: GDA 94 / MGA Zone 50

Notes: Data sourced from EPA (2018). Maximum level of Ecological Protection areas the same as those identified by CALM as 'Recommended for Reservation (1994).

Subsea 7 Pipeline Fabrication Facility



Figure 4: Zone of Potential Temporary Impacts to Water Quality (Turbidity) during Launchway Construction

### 1.3 KEY ENVIRONMENTAL FACTORS

#### 1.3.1 Marine Environmental Quality (MEQ)

The Environmental Protection Authority (EPA) Objective for Marine Environmental Quality (MEQ) is *"To maintain the quality of water, sediment and biota so that environmental values are protected."*

The potential impacts to MEQ during construction of the Proposal are:

- Temporary impacts to water quality through the release of fines, nutrients or contaminants from sediments during launchway construction.
- Temporary impacts to water quality (turbidity) due to the release of fines from construction materials (quarry rock).

In 2004, the Department of Environment (DoE) ran a planned and targeted public consultation process to obtain comment on environmental values, environmental quality objectives and how they should be applied geographically within the State marine waters from Exmouth Gulf to Cape Keraudren. The resulting report, the 'Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives' (DoE 2006) recommends the Levels of Ecological Protection (LEPs) from the outlined interim Environmental Values (EVs) and Environmental Quality Objectives (EQOs) agreed upon during consultation.

To sustain recreational activities, commercial fishing, aquaculture, and tourism industries, four of the five EVs that the EPA generally expects to be protected throughout Western Australia's coastal waters are expected to apply ('Industrial Water Supply' excluded), as identified in the EQP (Subsea 7 2019a), as follows:

- Ecosystem health.
- Fishing and aquaculture.
- Recreation and aesthetics.
- Cultural and spiritual.

Table 2 outlines the EQOs associated with the four EVs (DoE 2006).

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000) recognises and provides guidelines for three levels of ecological protection: undisturbed; slightly to moderately disturbed; and highly disturbed.

These have been adapted into the four LEPs that apply to WA coastal waters (EPA 2016):

- Maximum (levels of contaminants and other measures of quality remain within limits of natural variation (no detectable changes)).
- High (small detectable changes beyond limits of natural variation but no resultant effect on biota)
- Moderate (moderate changes beyond limits of natural variation but not to exceed specified criteria).
- Low (substantial changes beyond limits of natural variation).

A maximum LEP has been set for waters along the southern and eastern margins of Exmouth Gulf. The majority of the remainder of Exmouth Gulf waters have been designed a high LEP, with small areas surrounding aquaculture leases designated a moderate LEP. The

objectives of this plan are to prevent the occurrence of persistent impacts<sup>1</sup> to water quality beyond the ZoMI, to in turn prevent measurable impacts to BCH (ecosystem health) beyond the ZoMI.

Environmental Values	Environmental Quality Objectives
Ecosystem Health (ecological value)	EQO1: Maintain ecosystem integrity at a: <ul style="list-style-type: none"> <li>• Maximum level of ecological protection.</li> <li>• High level of ecological protection.</li> <li>• Moderate level of ecological protection.</li> <li>• Low level of ecological protection.</li> </ul> This means maintaining the structure (e.g. the variety and quantity of life forms) and functions (e.g. the food chains and nutrient cycles) of marine ecosystems.
Fishing and Aquaculture (social use value)	EQO2: Seafood (caught or grown) is of a quality safe for eating  EQO3: Water quality is suitable for aquaculture purposes.
Recreation and Aesthetics (social use value)	EQO4: Water quality is safe for primary contact recreation (e.g. swimming and diving)  EQO5: Water quality is safe for secondary contact recreation (e.g. fishing and boating)  EQO6: Aesthetic values of the marine environment are maintained
Cultural and Spiritual (social use value)	EQO7: Cultural and spiritual values of the marine environment are protected.

**Table 2: Environmental Values and Environmental Quality Objectives for the Marine Waters of Exmouth Gulf**

### 1.3.2 Benthic Communities and Habitats (BCH)

The EPA Objective for benthic communities and habitats is *"To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained."*

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

- Direct loss of BCH during launchway construction.
- Indirect loss or degradation of BCH due to turbidity created during launchway construction.

<sup>1</sup> In this context persistent impacts to water quality, with the potential to impact BCH health, are those with a duration of more than three days.

This plan addresses the second of these impacts. Given the short term and ‘pulse’ nature of the expected sediment resuspension during launchway construction, significant losses of BCH are not expected. The area within the immediate vicinity of the launchway footprint (<50 m) has been defined as a Zone of Moderate Impact (ZoMI) within which impacts on benthic organisms may occur but are recoverable within a period of five years following completion of construction. Impacts, resulting in measurable changes to BCH, beyond the ZoMI are not expected as a result of launchway construction.

**1.4 RATIONALE AND APPROACH**

**1.4.1 Study Findings**

A number of studies have previously been undertaken within the region, as outlined in the ERD (Subsea 7 2019b). Subsea 7 has augmented the information from these previous studies by commissioning additional, Proposal-specific studies (Table 3).

Survey Date	Researcher/Consultant	Study Description/Title
<b>Project-specific Studies</b>		
2017	360 Environmental	Baseline Water and Sediment Quality Assessment.
2018	GHD	Exmouth Gulf Current and Turbidity Monitoring
2019	GHD	Exmouth Gulf Current and Turbidity Monitoring
2016	360 Environmental	Survey of benthic habitats off Heron Point
2017	360 Environmental	Survey of benthic habitats within the Heron Point Local Assessment Unit (LAU)
2017	360 Environmental	Survey of benthic habitats within the ‘Bundle Laydown Area’
2018	MBS Environmental	Exmouth Gulf Benthic Communities and Habitat survey.

**Table 3: Local Marine Environmental Quality Studies**

360 Environmental (2017a) conducted a water and sediment quality assessment for the proposed Bundle site. The main findings of the assessment were:

- The physical parameters (temperature, salinity, and dissolved oxygen) were typical of the north western Australian coastline. No significant variation was observed vertically throughout the water column, except for measurements of higher turbidity nearer to the seabed.
- Turbidity was recorded to increase with distance from the shoreline (ranging from 1.1 to 2.4 NTU). This was attributed to the change in the sediment composition, with offshore locations characterised by a greater proportion of fine sediments (mud). The levels of light attenuation fell well within the regional measurements for Exmouth Gulf.
- The total and dissolved nutrients within Exmouth Gulf are limited and not readily available for benthic primary producers (BPP), however this may be due to them being utilised prior to measurements being taken. The chlorophyll and nutrient concentrations were consistent with existing regional data.
- There was no indication of contamination within the study area, and it was concluded that contaminant release following sediment disturbance was unlikely.
- Short-term disturbance of sediments was concluded likely to have minimal impact on the local and regional environmental values (ecological and social).

A current monitoring programme was completed by GHD (2018) within the Exmouth Gulf. The monitoring period included two full tidal cycles (22 May–21 June 2018) and comprised of two deployment locations (GHD 2018b). Additional instrumentation was deployed with the current monitoring to record turbidity and photosynthetic available radiation (PAR) data. A further deployment occurred between late November 2018 and late December 2018 (GHD 2019). A summary of the data obtained is provided in Table 4.

Site	Location	Dates	Turbidity (NTU)			
			Mean	Median	95%ile	80%ile
Launchway	Offshore of launchway location	22/5/2018 to 21/6/2018	4.3	3.1	9.4	4.8
Parking	Adjacent to Bundle parking area		3.6	3.1	7.8	4.8
KP2	Adjacent to tow route, 2 km offshore	23/11/2018 to 17/12/2019	2.0	1.8	3.2	2.3
KP4.5	Adjacent to tow route, 4.5 km offshore		4.4	3.4	11.1	5.8

**Table 4: Summary of Baseline Turbidity Data (Source GHD 2018, 2019)**

Three intertidal BCH types were recorded (360 Environmental 2017b):

- 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 2017b, MBS Environmental 2018):

- 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)).



### 1.4.2 Impact Zonation Scheme

The EPA has developed a spatially-based zonation scheme for proponents to use as a common basis to describe the predicted extent, severity, and duration of impacts to MEQ or BCH. 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 detectible 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.

For the Proposal, the launchway footprint has been used to define the ZoHI for BCH in this area, where impacts on benthic communities or habitats are predicted to be irreversible (Subsea 7 2019b). The area within the immediate vicinity of the launchway footprint ( $\leq 50$  m) has been defined a ZoMI within which impacts on benthic organisms may occur, but are recoverable within a period of five years following completion of construction. The ZoI was defined from modelling of a worst case Bundle launch scenario and describes areas likely to experience short-term changes in environmental quality, but where these changes would not result in a detectible impact on benthic biota.

### 1.4.3 Key Assumptions and Uncertainties

The key assumption regarding MEQ 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 by baseline current and turbidity monitoring events.

### 1.4.4 Management Approach

The management approach follows a precautionary approach, whereby a lack of full scientific certainty has not been used as a reason for postponing measures to prevent environmental degradation.

Management and mitigation measures to minimise potential environmental impacts during construction of the Proposal have been developed to avoid impacts as much as possible, and to minimise residual risks.

### 1.4.5 Rationale for Choice of Provisions

Management responses have been developed based on the following approaches (preferred first):

- Avoidance of potential impact (e.g. avoidance of construction methods known to generate high turbidity levels).
- Reduce likelihood of impact occurring (e.g. launchway design and construction methods developed to minimise disturbance of sediment).
- Reduce magnitude of impact (e.g. measures to reduce turbidity associated with launchway construction such as use of silt curtain(s)).



#### 1.4.6 Environmental Protection Outcomes

The EPOs that apply to BCH during the construction phase of the Proposal are:

- Impacts to BCH within the ZOMI are recoverable within five years
- No Impact to BCH in beyond the ZOMI.

## 2. CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN PROVISIONS

This section was prepared in accordance with the Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans (EPA 2018). It identifies the management based provisions that Subsea 7 proposes to implement to ensure potential impacts to MEQ and BCH are managed appropriately and specifies the:

- Management actions that will be implemented to mitigate and manage potential risks.
- Management targets that will be used to measure the efficacy and performance of management actions.
- Monitoring programmes that will be used to assess the effectiveness of the management actions in meeting environmental objectives of this plan.
- Reporting requirements relevant to the implementation of this plan.

### 2.1 MONITORING APPROACH

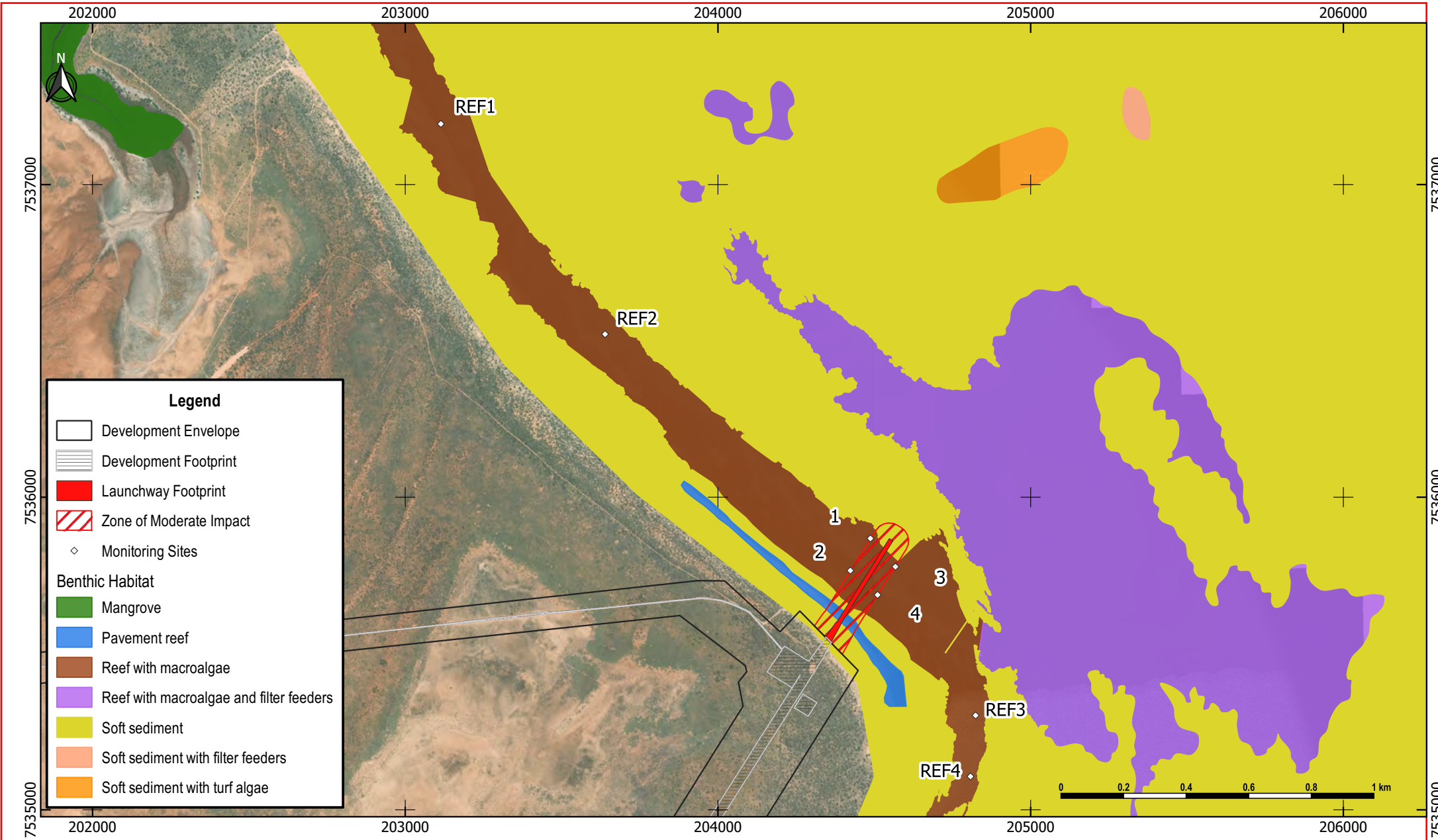
#### 2.1.1 Overview

Monitoring in relation to MEQ and BCH will be undertaken as outlined in Table 5 (refer also Figure 5).

Zone	Predicted Environmental Outcome	Planned Monitoring
ZoHI	Permanent loss of BCH	NA
ZoMI	Recoverable impacts to BCH	<p><b>Biological:</b> Quantitative BCH monitoring (replicate video transects) adjacent to launchway and at reference sites (refer Figure 6) within one month prior to construction and within one year following completion of construction to confirm recovery of BCH. In the event an ongoing impact associated with the Proposal is recorded, monitoring will be completed annually for five years, or until recovery has occurred, whichever is sooner.</p>
Beyond ZoMI	No significant changes in environmental quality or impact on benthic biota.	<p><b>Water Quality:</b> Twice daily (during works: approximately 10am and 2pm) visual monitoring of turbidity during construction. Observations will be taken from the construction site (onshore) or a vessel (construction or independent) depending upon the status of the works.</p> <p>The severity, location and extent of the visible turbidity plume will be recorded. Buoys will be located at a distance of 50 m from the construction footprint (i.e. at the boundary of the ZoMI) to aid in description of the plume extent.</p> <p>In the event that visual monitoring indicates elevated turbidity beyond 50 m (i.e. silt curtain(s) prove ineffective or cannot be deployed) mean seabed light levels (PAR) at the</p>

Zone	Predicted Environmental Outcome	Planned Monitoring
		<p>50 m boundary will be compared to the 20%ile of unimpacted reference site data over 3 consecutive days (refer Figure 5, Section 2.1.3.1).</p> <p><b>Biological:</b>            Quantitative BCH monitoring (photographs and assessment of tagged hard corals) adjacent to launchway and at reference sites (refer Figure 6) within one month prior to construction and within one month following completion of construction to confirm no impacts beyond the ZoMI. In the event an impact associated with the Proposal is recorded, monitoring will be completed annually for five years, or until recovery has occurred, whichever is sooner.</p>

**Table 5: Monitoring Programme Summary**

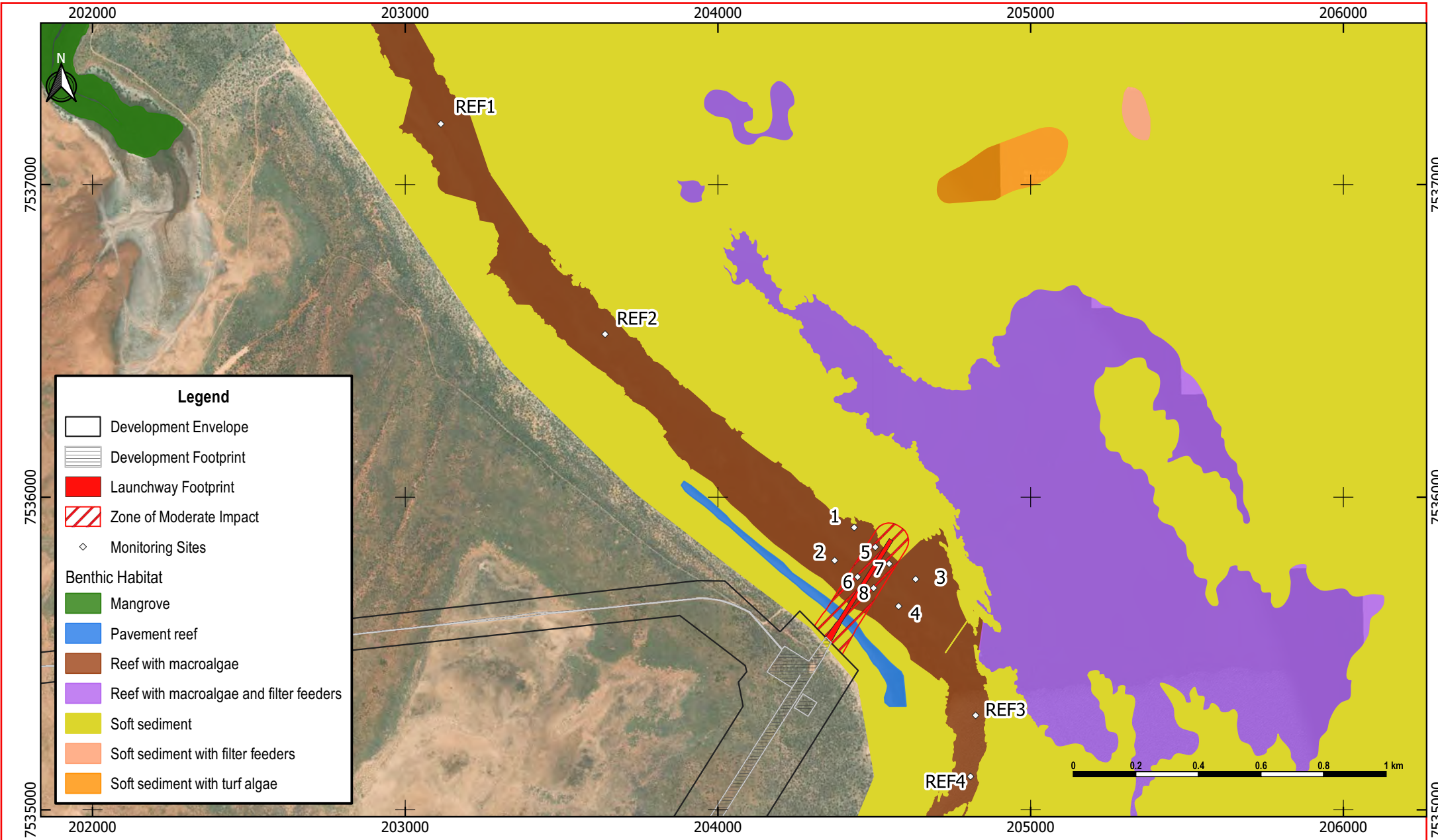


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 Aerial Photo: ESRI Satellite  
 Grid: GDA 94 / MGA Zone 50

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Figure 5: Turbidity Monitoring Sites



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 Aerial Photo: ESRI Satellite  
 Grid: GDA 94 / MGA Zone 50

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Figure 6: BCH Monitoring Sites



### 2.1.2 Monitoring Sites

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

- The location of the ZoMI boundary and the distribution of BCH adjacent to this zone.
- Water depths and the accessibility of locations.
- Sites adjacent to the ZoMI located to allow for the monitoring within a 50 m radius of the central point, while remaining outside the ZoMI.

### 2.1.3 Monitoring Methods

#### 2.1.3.1 Water quality (PAR) monitoring

In the event that silt curtain(s) prove ineffective or cannot be deployed, a calibrated hand-held monitor used to determine light (PAR) levels at 0.5 m above the seabed at sites at the 50 m boundary (sites 1-4), and at reference sites (sites REF1-4) (Figure 5). As stated in Table 5, the mean seabed light (PAR) levels recorded at the 50 m boundary will be compared to the 20%ile of unimpacted reference site data over 3 consecutive days.

Seabed light levels at the 50 m boundary will be recorded at each site (sites 1-4, Figure 5) at 10 am and 2 pm, with the data pooled then analysed to provide a single 'mean' value. The 20%ile of unimpacted reference site data will similarly be recorded at each site (sites REF1-4, Figure 5) at 10 am and 2 pm, with the data pooled then analysed to provide a single 20%ile value. Reference site data collected during the second and third day of monitoring will be added to the previous reference site data 'pool' and a new 20%ile calculated.

Turbidity generating activities will be suspended in the event that the mean seabed light levels at the 50 m boundary fall below the 20%ile of unimpacted reference site data over 3 consecutive days. Turbidity generating activities would only recommence once light levels at the 50 m boundary do not significantly differ from unimpacted reference site levels (as measured on a daily basis at 10 am and 2 pm).

#### 2.1.3.2 ZoMI Monitoring

A towed video system will be used to record video footage along five replicate 20 m monitoring transects at each monitoring location within the ZoMI (Sites 5-8) and at the reference sites (Sites REF1-4). The system will be towed at a speed of approximately 1-2 km/hr, at a height of approximately 0.5 m from the seabed.

The footage from each transect will be quantitatively assessed using Coral Point Count with Excel extensions (CPCe 4.1) (Kohler and Gill 2006), TransectMeasure (SeaGIS), or similar programme.

A number of habitat descriptors will be recorded from the video footage including:

- Dominant seabed type (e.g. soft sediment, reef).
- The abundance or percentage cover of flora (macroalgae).
- The abundance or percentage cover of key fauna groups (e.g. sponges, soft corals, hard corals). Assessment will be limited to specimens visually estimated to be greater than 4 cm in diameter, as specimens smaller than this are difficult to classify accurately.

The mean cover/abundance of macroalgae and hard corals recorded at sites within the ZoMI post-construction will be compared to the data obtained during the baseline survey. In the event of a statistically significant difference in the cover/abundance of macroalgae or corals, then a full comparison with reference site data will be completed. A Before, After, Control, Impact (BACI) approach will be employed whereby statistical analyses will test for an interaction between the impact and reference sites across the baseline and post-construction surveys.

The expected statistical power of the survey design to detect a change of >20% will be confirmed following the completion of the baseline survey. It is noted that within the ZoMI impacts should be 'recoverable within 5 years.

### 2.1.3.3 Beyond ZoMI Monitoring

At each monitoring site adjacent to the ZoMI (Sites 1-4) and at the reference sites (Sites REF1-4) individual hard corals (majority expected to be *Turbinaria* spp.) will be located, tagged, and photographed. The monitoring of hard corals is proposed as they are expected to be the most sensitive group to shading and/or sedimentation impacts associated with launchway construction, though their demonstrated tolerance is noted (refer Section 5.1.6.4 of the ERD). Another advantage of the proposed method, as opposed to the analysis of towed video footage, is that previous studies have demonstrated that a small change (10%) can be detected with a high level of statistical power.

The Reef with macroalgae habitat was described as '*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.)*' (ERD Attachment 2B). It is expected, however, that sufficient corals will be located within 50 m of the central point to support the proposed monitoring programme.

Each colony will be photographed in plain view using a digital camera. A set of Tagged Coral Reference Photographs taken prior to the commencement of construction will be used to compare against each tagged colony to ensure that the correct corals are photographed during subsequent sampling occasions. Corals will be photographed from the same orientation and distance and the tag will be included in the photograph to confirm the site and coral identification code.

The health (percentage alive/dead) of each coral will be determined from analysis, using CPCe, of each monitoring photograph. Where an area of colony is covered in sediment, it will be assumed to be dead. This method is based on the approach of previous coral health monitoring programmes in the Pilbara region (Stoddart and Stoddart 2005, SKM 2009 and GHD 2011).



The target will be to locate, tag and photograph a minimum of 40 corals at each site. It is anticipated that the monitoring of this number of corals at each site will allow detection of a change in coral health of  $\geq 10\%$  (or greater than a standard deviation from the mean)<sup>2</sup>, with a statistical power of 0.8 or greater<sup>3</sup>.

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<sup>2</sup> While the target is 'no measurable impacts to BCH (ecosystem health) beyond the ZoMI', the nominated trigger is a decline in coral cover of  $>10\%$  compared to baseline data and reference site data. This aligns with the guidance presented in ANZECC & ARMCANZ (2000) in relation to default targets for ecologically conservative decisions.

<sup>3</sup> A statistical power of 0.8, or greater, is consistent with the requirements applied to previous monitoring programme, (e.g. Chevron Australia Pty Ltd's Gorgon Gas Development project (Ministerial Statement 800)). Based on the results of previous tagged coral monitoring programmes, monitoring of 40 corals at each site is expected to detect a 10% change with this level of statistical power (Chevron Australia 2011, Oceanica 2013, API Management 2014).

## 2.2 MANAGEMENT ACTIONS AND TARGETS

The overall objectives of this plan are to ensure that:

- The environmental protection outcomes outlined in the environmental quality plan are met (thereby ensuring the EPA objective for MEQ is met).
- Ensure no measurable impacts to BCH (ecosystem health) beyond the ZoMI (thereby ensuring the EPA objective for BCH is met).

The purpose of the management targets is to define Subsea 7's aims in context with the identified potential impacts. To meet the management objectives, a series of fit for purpose management actions have been developed to ensure potential impacts on MEQ and BCH are minimised and are considered acceptable, such that the EPA's objectives will be met.

Management actions and targets, focussed on achieving the overall MCMMP objectives, are presented in Table 6. These actions were specifically developed to ensure the EPA's objective for MEQ, and BCH will be met.

- **EPA Factors:** Marine Environmental Quality, Benthic Communities and Habitats
- **Management Objectives:** No persistent impacts to water quality beyond the ZoMI, No measurable impacts to BCH (ecosystem health) beyond the ZoMI
- **Key Environmental Values:** Nearshore 'Reef with macroalgae' and 'Reef with macroalgae and filter feeders' benthic communities and habitat (BCH) types
- **Key impacts and risks:**  
Temporary impacts to water quality through the release of fines, nutrients or contaminants from sediments during launchway construction, temporary impacts to water quality (turbidity) due to the release of fines from construction materials (quarry rock)

Management Actions	Management Target	Monitoring	Reporting
Launchway designed to minimise footprint (including extent of rock fill) thus reducing seabed disturbance and duration of construction.	No significant and persistent increase in turbidity (compared to unimpacted reference sites) associated with launchway construction beyond immediate surrounds (50 m) of construction area	N/A	Compliance Assessment Report
Use of pre-cast concrete panels will reduce seabed disturbance and duration of construction.		N/A	
Construction methods to minimise the disturbance of sediments.		N/A	
Construction material to be 'clean' (free of 'fines') rock rubble.		Audit of rock fill screening prior to use.	Construction close-out report

- **EPA Factors:** Marine Environmental Quality, Benthic Communities and Habitats
- **Management Objectives:** No persistent impacts to water quality beyond the ZoMI, No measurable impacts to BCH (ecosystem health) beyond the ZoMI
- **Key Environmental Values:** Nearshore 'Reef with macroalgae' and 'Reef with macroalgae and filter feeders' benthic communities and habitat (BCH) types
- **Key impacts and risks:**  
Temporary impacts to water quality through the release of fines, nutrients or contaminants from sediments during launchway construction, temporary impacts to water quality (turbidity) due to the release of fines from construction materials (quarry rock)

Management Actions	Management Target	Monitoring	Reporting
Silt curtains deployed to ensure environmental objectives are achieved.		<p>Twice daily (during works: approximately 10am and 2pm) visual monitoring during construction. Observations will be taken from the construction site (onshore) or a vessel (construction or independent) depending upon the status of the works</p> <p>The severity, location and extent of the visible turbidity plume will be recorded. Buoys located at a distance of 50 m from construction footprint to aid in description of the plume extent.</p> <p>Silt curtain(s) deployed prior to expected turbidity generating activities and/or in the event construction-related turbidity is recorded beyond 50 m from the construction site.</p>	Completion of daily construction log.

- **EPA Factors:** Marine Environmental Quality, Benthic Communities and Habitats
- **Management Objectives:** No persistent impacts to water quality beyond the ZoMI, No measurable impacts to BCH (ecosystem health) beyond the ZoMI
- **Key Environmental Values:** Nearshore 'Reef with macroalgae' and 'Reef with macroalgae and filter feeders' benthic communities and habitat (BCH) types
- **Key impacts and risks:**  
 Temporary impacts to water quality through the release of fines, nutrients or contaminants from sediments during launchway construction, temporary impacts to water quality (turbidity) due to the release of fines from construction materials (quarry rock)

Management Actions	Management Target	Monitoring	Reporting
Suspension of turbidity-generating construction activity in the event a persistent turbidity plume is observed beyond the silt curtain(s).		<p>Twice daily (during works: approximately 10am and 2pm) visual monitoring during construction. The severity, location and extent of the visible turbidity plume will be recorded (as above).</p> <p>In the event that visual monitoring indicates elevated turbidity beyond 50 m (i.e. in the event that silt curtains cannot be deployed or are ineffective), for more than 2 consecutive visual monitoring events, the following criterion will be assessed at the 50 m boundary (Figure 5):</p> <ul style="list-style-type: none"> <li>• Mean seabed light levels (PAR) at the 50 m boundary fall below the 20%ile of unimpacted reference site data over 3 consecutive days.</li> </ul> <p>In the event of threshold exceedance, turbidity generating activities will be suspended until seabed light levels beyond 50 m (from the construction footprint) do not significantly differ from unimpacted reference site levels.</p>	Completion of daily construction log.

- **EPA Factors:** Marine Environmental Quality, Benthic Communities and Habitats
- **Management Objectives:** No persistent impacts to water quality beyond the ZoMI, No measurable impacts to BCH (ecosystem health) beyond the ZoMI
- **Key Environmental Values:** Nearshore 'Reef with macroalgae' and 'Reef with macroalgae and filter feeders' benthic communities and habitat (BCH) types
- **Key impacts and risks:**  
 Temporary impacts to water quality through the release of fines, nutrients or contaminants from sediments during launchway construction, temporary impacts to water quality (turbidity) due to the release of fines from construction materials (quarry rock)

Management Actions	Management Target	Monitoring	Reporting
		<p>Quantitative BCH monitoring (replicate video transects) within the ZoMI adjacent to launchway (sites 5-8) and at reference sites (sites REF1-4) (refer Figure 6) prior to construction and within one year following completion of construction to confirm recovery of BCH.</p> <p>Quantitative BCH monitoring (photographs and assessment of tagged hard corals) adjacent to the ZoMI (sites 1-4) and at reference sites (sites REF1-4) (refer Figure 6) prior to construction and within one month following completion of construction to confirm no impacts beyond the ZoMI.</p>	

**Table 6: Management Objectives, Actions and Targets in Relation to Impacts to MEQ and BCH During Launchway Construction**

### **3. REPORTING PROVISIONS**

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

Evidence of implementation of the MCMMP, and associated management measures, 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 CONSTRUCTION COMPLETION REPORTING**

At the completion of launchway construction, a construction close-out report will be prepared summarising the works undertaken, monitoring results and any management responses.

The report will be prepared summarising the results of environmental monitoring, outcomes in relation to the approved environmental performance outcomes and any issues or incidents. This report will be provided to DWER within three months of the completion of launchway construction, and will include the outcomes from the post-construction BCH monitoring undertaken adjacent to the ZoMI ('Beyond ZoMI' sites and 'Reference' sites).

The outcomes of subsequent BCH monitoring will be presented in the annual Compliance Assessment Reports.

#### **3.3 REPORTING OF MANAGEMENT ACTIONS NOT IMPLEMENTED**

In the event that one or more management actions have not been implemented as specified in this management plan, Subsea 7 will:

- Report the failure to implement management actions in writing to the CEO of DWER within the annual CAR.
- Investigate to determine the cause of the management actions not being implemented. Provide a report in the CAR that shall include:
  - The cause for failure to implement management actions.
  - The findings of the investigations that was undertaken.
  - Relevant changes to proposal activities.



#### **4. ADAPTIVE MANAGEMENT AND REVIEW OF MCMMP**

Adaptive management in relation to the MCMMP will include the following:

- Monitor and evaluate the effectiveness of the management actions against the management targets (e.g. are the nominated management actions proving effective in minimising elevated turbidity beyond the ZoMI).
- In the event one or more of the management targets (Section 2.2) has not been met, or is considered at risk of not being met, review and adjust the management measures and monitoring to ensure the objectives are met, based on what is learned from evaluation of the monitoring data, or any new data that becomes available.
- Review the assumptions in light of the monitoring data or any new data that becomes available.
- The MCMMP (this plan) will be updated as required.

## 5. 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.

Limited comments were raised in relation to construction of the launchway, with the majority concerning the presence of the launchway following construction, access to Heron Point and the Bay of Rest, and the Bundle launch and tow operations. The Cape Conservation Group and local Sea Shepherd Member raised the potential for light spill from the Bundle site, and its potential impact on marine fauna. In response, Subsea 7 revised the design of the launchway to allow for a vehicle crossing. This was presented to the Exmouth community on 24 October 2019. Further, Subsea 7 proposes to provide alternative access tracks to ensure access is maintained to Heron Point and the Bay of Rest. The continued accessibility of these areas remains of paramount importance and Subsea 7 is committed to ensuring access is maintained. Subsea 7 also confirms that launchway construction activity would be performed during daylight hours only. To address the potential impact of light spill during onshore construction and/or Bundle launch operations, mitigating measures have been proposed as part of the Marine Fauna Management Plan, which include timed and directional lighting and a visual assessment of light spill.

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