Dredge Management Plan

23/11/22

Project Name : WS14 – Kangaroo Island Desalinisation Plant – Marine Works

Project Location : Penneshaw, Kangaroo Island, South Australia

Head Contractor : John Holland Guidera O' Connor Joint Venture (JHGO JV)

Principal : South Australia Water Corporation

Contract No : 7120-WS14-006

Internal No. : MC.E.0481

Prepared by: **Maritime Constructions Pty Ltd.**

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Document Title	Dredge Management Plan				
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A	25/05/2022	FOR INTERNAL REVIEW	JRO	SS	-
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1	29/09/2022	EPA APPROVED	SS	EPA	SS
2	21/10/2022	EPA REVISION	SS	EPA	SS
3	21/11/2022	EPA REVISION	SS	EPA	SS

Foreword

This Dredge Management Plan has been prepared on behalf of JHGO JV in accordance with current EPA Dredging Guidelines. This DMP details the project, dredge methodology and specific environmental risks associated with managing the following EPA licenced activities listed on the *Environment Protection Act 1993*.

- Schedule 1. Prescribed activities of environmental significance
    - 7 – Materials Handling and Transportation
        - 4. Dredging

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1 SCOPE, OBJECTIVE AND VALIDITY

1.1 Scope

This Dredge Management Plan (DMP) has been prepared at the request of the client (JHGO JV) and is in compliance with the Environmental Protection Authority (EPA) standard rules and guidelines. This DMP details the scope for the dredging works that form part of the Kangaroo Island Desalination Plant Marine Works project.

The EPA assesses the appropriateness of this plan against the EPA Dredge Guideline 2020. The environmental impact of dredging is a function of the following factors, as listed by the EPA:

- Condition of affected waters
- Physical type of substrate
- Temperature of water and sediment
- Contamination of the substrate
- Living pollutants
- Method of dredging
- Amount of spoil to be moved
- Exposure and elutriation tests
- Retention of supernatant water

The content of this DMP covers all activities in relation to the dredging works and environmental risk mitigation for the preparation, execution and completion of the scope of works detailed in a Contract between the dredging contractor and JHGO JV (the Client).

1.2 Objective

The objective of this DMP is to ensure that the preparation, execution and evaluation of the dredging works are carried out in a controlled and auditable manner and in line with the guidelines under an EPA dredging license. The Objectives of this DMP are as follows:

- To identify all potential environmental risks associated with the proposed dredging work.
- To minimise the potential environmental impacts caused by dredging.
- To ensure the potential impacts on water quality near the dredged and disposal areas are local and temporary.

1.3 Validity

The validity of this DMP starts from the EPA approval date of the DMP up to and including the completion date of the project.

2 REFERENCES

Reference in this DMP is made to the latest revision of the following documents:

Maritime Constructions specific procedures, documents, standards

- All Integrated Management System & Human Resource Procedures
- Relevant vessel specific 'Biofouling Management Plans'

Australian Standards and Regulations

- *Environment Protection Act 1993* (SA)
    - *Environment Protection (Water Quality) Policy 2015*
    - *Environment Protection (Noise) Policy 2007*
- *EPA (SA) Dredging Guideline 2020*
- *Planning, Development and Infrastructure Act 2016 (SA)*
- *Historic Shipwrecks Act 1981*
- *Aboriginal Heritage Act 1988*
    - *SA Water Aboriginal Heritage Standard Operating Procedure (SOP)*
- *Underwater Cultural Heritage Act 2018*

All legislative and other relevant requirements such as guidelines and codes of practice identified in the Contract documents or otherwise applicable to works.

Client and/or Contract specific documents

- Development Approval, Ref. 520/V021/21
- Geotechnical Report, Ref. No 21465877-001-R-Rev0
- Design Marine Works Summary, Ref No. 43101727-WS14-RP-003_30%
- Stakeholder communication management plan
- Sediment sampling and characterisation, WSP Golder, Ref. PS133634-001-R-Rev0 (19 September 2022)

3 OUTLINE OF PROJECT

3.1 Project Details

Name	Kangaroo Island Desalination Plant Marine Works
Location	Penneshaw, Kangaroo Island, South Australia
Contract No.	7120-WS14-006
Project Manager	
Project Contact	

3.2 Client Details

Name	John Holland Guidera O'Connor Joint Venture (JHGO JV)
Address	31 Holland Street, Thebarton SA 5031
Clients Representative	
Client Contact	

3.3 Project Timeline

Start Date	Finish Date	Duration
TBC	TBC	3 months

* this project timeline is indicative only and is subject to schedule changes and/or contract extensions

3.4 Approval References

EPA Dredge Licence #	42842
Development Approval #	520/V021/21

3.5 Emergency Incident Notification

The project manager/supervisor must report to the EPA all incidents causing or threatening serious or material environmental harm, upon becoming aware of the incident on 1800 100 833. In the event that the primary emergency phone number is out of order, then the EPA should be contacted on (08) 8204 2004.

4 PROJECT BACKGROUND INFORMATION

4.1 Project Summary

JHGO JV has entered into a contract with South Australian Water Corporation ("the Principal") to deliver the new Penneshaw Desalination Plant (PDP2) as part of SA Water Corporation's OP20 Capital Plan – Water South ("the Head Contract Works"). The proposed desalination plant will support anticipated growth for the island, and it will help communities achieve greater water security in the long-term.

The new PDP2 will be located to the west of the town of Penneshaw on Kangaroo Island, Australia. A significant part of the works associated with the PDP2 comprise of the development and delivery of marine infrastructure which is best suited for a subcontractor with core marine capabilities. As a result, JHGO has appointed Maritime Constructions Pty Ltd as the specialist marine contractor to help deliver the marine works that form part of the desalination plant and pipeline works project.

Maritime Constructions Pty Ltd works include but are not limited to the supply, installation, commissioning, and testing of new seawater intake and brine discharge systems, as well as all temporary and permanent works associated with these activities.

4.2 Location Selection

The desalination plant is located approximately 2.0 km west of the township of Penneshaw, Kangaroo Island South Australia. SA Water's development application for the desalination plant was informed by detailed marine and land assessments, with the site at the corner of Hog Bay Road and Williams Walkers Way determined as the most suitable, based on a range of criteria.

The independent State Commission Assessment Panel's (SCAP) conducted comprehensive community and stakeholder engagement during the planning process. In fact, community feedback resulted in a decision to move the plant site approximately 60 metres southwest of the initial location. The review and assessment process opened the application for public consultation and considered feedback, with conditions set to ensure areas such as road safety and environmental management are managed in accordance with regulations and community expectations.

Additionally, the proposed location means that the marine infrastructure for the new desalination plant will be built adjacent to the existing Penneshaw Desalination Plant's infrastructure which has been in place for more than 20 years, with no evidence of impact on marine life in the area. *(Source – SA Water).*

4.3 Geological Summary

The KI Desal site is underlain by the following geological unit:

- Tapanappa Formation: Grey, massive to convoluted fine to coarse grained sandstone. Trough and tabular crossbeds with low angle foresets. Erosional bases with cut and fill structures grading up into laminated siltstone interbeds.

Photos of rocky shoreline at dredge area 1 & 2

A summary of generalised subsurface conditions encountered during borehole drilling is presented below. For more information refer to the WSP Geotechnical Report.

Borehole Locations

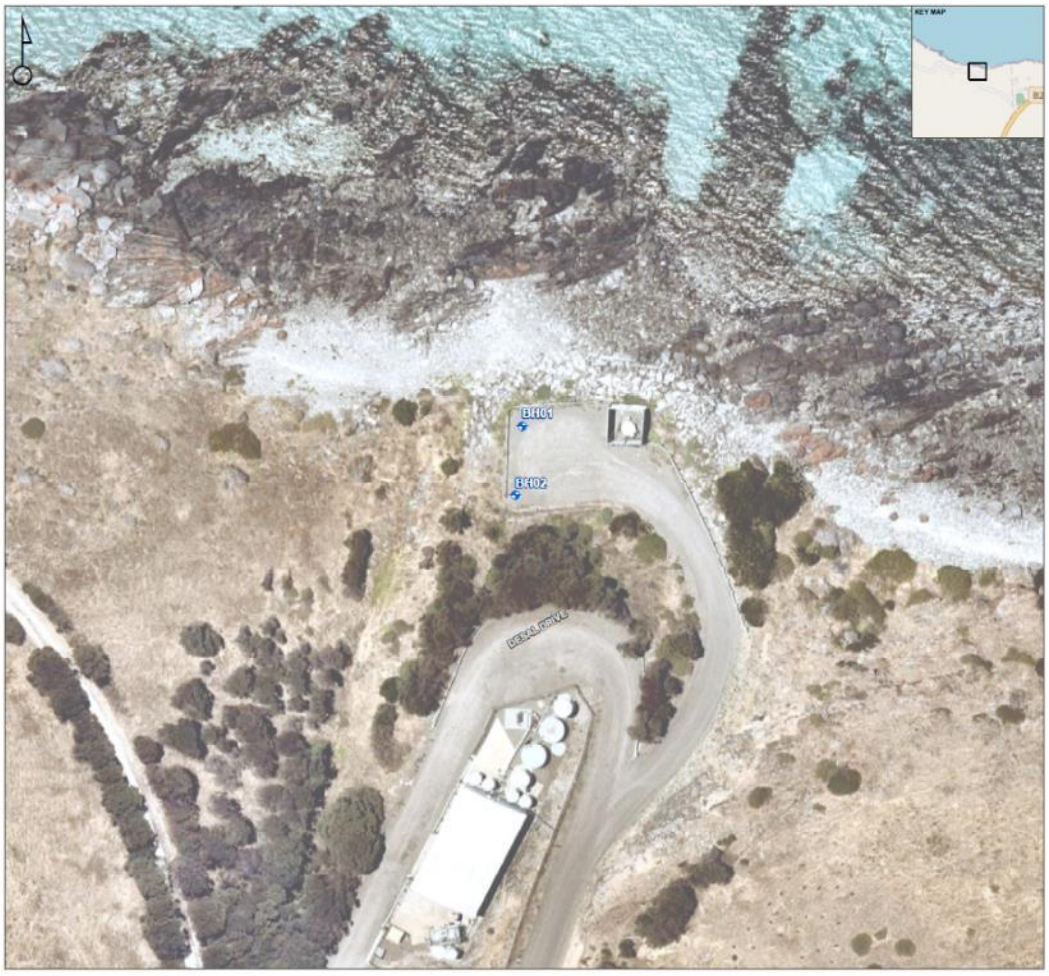


Figure 1 Aerial View Desal Site

PointID : BH01 Depth Range: 4.00 - 8.00 m

Figure 2 – Grey to dark grey sandstone found below carpark fill level (moderately to extremely weathered). Inferred strength 20-60MPa.

4.4 Sediment Analysis

Sediment sampling activities were undertaken on 1 September 2022 by WSP Golder using divers to collect 8 samples across 4 separate dredging locations. In consultation with EPA, analysis of grain size, sulphides and organic carbon was conducted.

Extracts from Golder WSP:

> *The sediments collected from the four proposed dredge areas were a fine to coarse grained pale grey sand with shell inclusions. Diver observations of the surface conditions indicate that Area 4 was both rocky and sandy with sea grasses present, and Areas 1,2 and 3 were rocky and sandy with no sea grasses present.*
>
> *Based on the field observations and results of the laboratory testing program including TOC, Physical parameters and acid sulfate soil analysis, sediments collected are consistent across each location and are dominantly comprised of sand.*
>
> *Based on the result of the chromium reducible sulfur suite testing compared to available guidelines, these samples are considered to be potential acid sulfate soils (PASS).*

In summary, all samples can be considered homogenous with the main risk being PASS. Leading indicators of chromium reducible sulfur (ranging 0.021-0.031%) are marginally above the EPA guidelines (0.01%).

Sediment sampling and analysis report is provided separately to the EPA, Ref. PS133634-001-R-Rev0 (19 September 2022).

4.5 Benthic Assessment

As part of the development application process, SA Water carried out a thorough assessment and management of potential risks to the marine environment to ensure environmental impacts are minimised and monitored. As the proposed development is located in the Encounter Marine Park, the Department for Environment and Water (DEW) was engaged to perform a preliminary assessment of the marine environment in the vicinity of the hypersaline outfall location from the proposed desalination plant expansion.

To assess the potential impacts of the hypersaline discharge, DEW used the below benthic habitat mapping of the impact area generated in 2018 using a combination of towed video and multibeam swath sonar. Habitat mapping of the proposed impact site of the Penneshaw desalination plant and the area surrounding it revealed a mix of sand, seagrass (mostly *Posidonia* with small amounts of *Zostera tasmanica*) and some sparse algal cover. Sand habitats made up a significant component of the shallows (to 4-5m depth; adjacent the current outfall) and some of the deeper areas. Seagrass (mostly *Posidonia*) dominated the medium depths (5-10m: which includes the current desalination plant intake), while further off shore (10 -18m) habitats graded from mixed and patchy seagrass habitats (a mix of *Posidonia* and *Zostera tasmanica* to the west of the intake, and *Zostera tasmanica* and sparse algae and sand to the east of the intake) to sand dominated habitat (with some sparse *Zostera tasmanica* and algae) at the deeper margins of the survey area (see figure below).

Habitat mapping is particularly relevant to this document as it allows MC to conduct a benthic assessment of Dredged Material Placement Areas (DMPAs) and any adjacent zones that may be impacted by dredge spoil and/or anchoring. This will be discussed further in Section 5.

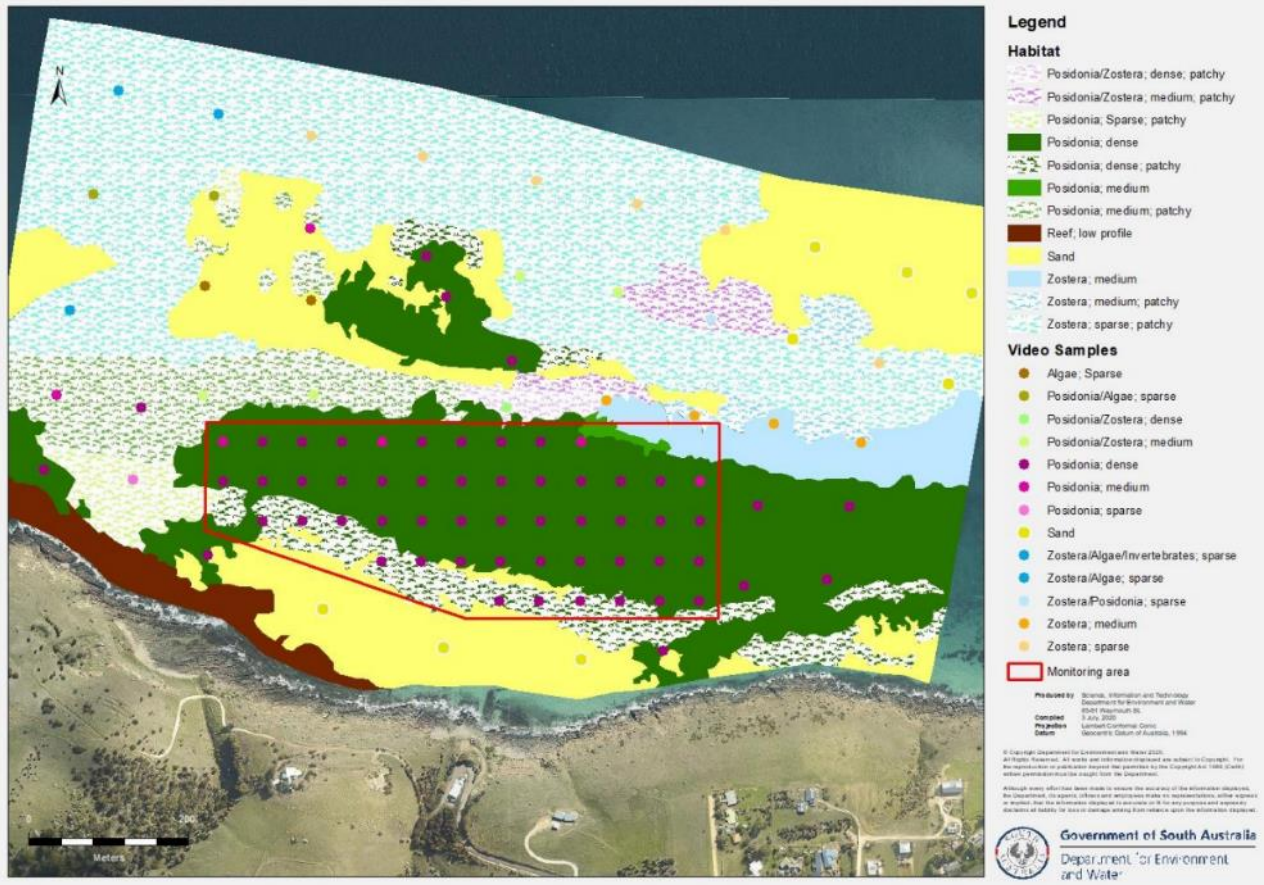


Figure 3 *Habitat mapping the impact area around the desalination intake and outfall*

4.6 Multi Criteria Decision Making for Grab Dredged Material Placement Area (DMPA) Selection

Based on discussions with the EPA and in accordance with EPA Dredging Guidelines (2020), MC must ensure dredging methods are best practice wherever possible or justify why methods vary. Given the unique dredging scenario of an exposed coastline, low volumes and geological conditions, typical dredging methods of spoil placement above high water mark are difficult to achieve. Particular discussion is made on how to mitigate other impacts of greater risk or significance, such as create the need for re-dredging or repeat use of anchors in seagrass meadow.

The purpose of this section is to inform the multi-criteria decision-making (MCDM) method used to select the most feasible dredging method and disposal process. MCDM methods are analytical tools employed to judge the best alternative of a set of possibilities and easy to adapt to different requirements.

The selection was made from a number of alternative dredging and disposal methods in accordance with a set of criteria and possibilities. In this case, the Analytic Hierarchy Process (AHP) was used to rank and compare the selection criteria. The AHP is a structured technique to help with complex decisions. It identifies the most important criteria in a decision-making process and creates a hierarchical structure consisting of successive levels, starting from the overall objective, sorting criteria and sub-criteria, and ending with the proposed alternatives.

The overall process is outlined below.

Step 1 – Define the Problem and Objectives

The objective is to help organise all the information available to make a complex environmental decision, by selecting the dredging method and dredged material placement alternative that provides the best outcome for the environment, the project, and the multiple stakeholders.

Step 2 – List the Alternatives for Achieving Objectives

- ✓ **Alternative A:** Side cast material directly adjacent the dredging site

  Method is based on a rapid dredging exercise and immediate placement of pipeline construction materials, as a result there is not a possibility for dredge spoil recovery due to construction cargo on deck. Due to the tight weather tolerances, placement directly adjacent to dredge areas ensure that the barge does not need to reposition. Any activities that create barge work greater than 2 days significantly increase the risk of requiring a second barge visit due to the weather window being lost. Periods between weather windows are typically 7 to 28 days, avoiding repeat visits is a significant advantage.

- ✓ **Alternative B: Offsite disposal**

  Relates to recovery of dredge material and disposed at an alternative location via a wharf facility. This process achieves the most ideal option to avoid placement of spoil in the ocean or shoreline environment but creates a secondary step that requires 2 or more barge movements. There is a high possibility that due to weather windows, return visits may be required.

- ✓ **Alternative C: Sandy nearshore placement**

  Relates to placement of spoil in the nearshore environment over bare sand. The purpose of this is to consider alternative in-water disposal that does not impact existing seagrass meadow. This method requires the dredge barge to recover materials onto the deck and then reposition to shallower waters before removal off the deck. This process requires the barge to return with construction materials in the next weather window, during which time the dredge area may deteriorate and require re-dredging being predominantly sand.

✓ **Alternative D: Deep water placement**

This method is a very similar to Alternative C which involves dredging and placing of spoil on deck followed by repositioning of barge into deeper water, setting of anchors and placing materials into a zone where seagrass will not be impacted. As per C, this process requires the barge to return with construction materials in the next weather window, during which time the dredge area may deteriorate and require re-dredging being predominantly sand.

✓ **Alternative E: Disposal above high water**

This method would be the typical default method for dredging and managing spoil locally, avoiding in water disposal, however this is difficult due to the rocky coastline and limited access options. Dredge material would need to be transferred from a grab to the shoreline and then recovered with civil plant for placement above high water. Barge would need to be positioned in shallow water over rocky shoreline and would be exposed to risk of damage. Civil plant would operate in the intertidal.

× **Other methods not pursued:**

Other method considerations considered have not been pursued due to the extreme risk they present. Most notably, Cutter Suction Dredge is not appropriate in this scenario due to the low dredge sediment volumes. Pumping low volumes of dredge material to a nearby shoreline will result in significant erosion due to high volumes to water required to be pumped. There is not an adequate volume of solid material to form a swale and control velocity in order to achieve reclamation, neither is there a suitable beach of adequate size to achieve this in the nearby vicinity.

Step 3 – Define Criteria to Measure Performance of Alternatives

The following performance indicators have been selected to compare all five alternatives given their impact on the activity of the object of decision. These indicators were classified into three broader categories as shown below: Economic & Technical, Environmental, and Health & Safety:

- Economic & Technical (construction costs, technical feasibility)
    - Works Duration
    - Equipment Availability
    - Execution of Scope
- Environmental
    - Damage to the Environment & Biodiversity Degradation
- Health & Safety
    - Risk of Injury, Loss of Life or Property Damage

Descriptions of the proposed criteria are as follows:

Criteria & Sub Criteria	Measurable Index	Range
Economic & Technical Minimise Works Duration	Total construction cost and the risk of re-dredging.	Subjective scale [1-5]
Economic & Technical Use Equipment Readily Available	Total construction cost and potential delays to the project	Subjective scale [1-5]
Economic & Technical Reduce Proximity to Disposal Site	Cost associated with transportation and rehandling of material due to proximity from dredging site to disposal site, and disposal method.	Subjective scale [1-5]
Environmental Minimise Ecological Impacts	This criterion measures damage the environment & biodiversity degradation (impact to seagrass meadows, turbidity, biosecurity, coastline erosion).	Subjective scale [1-5]
Health & Safety Reduce Health & Safety Risks	This criterion measures the risk of injury, loss of life or property damage.	Subjective scale [1-5]

Table 1. Proposed Criteria

The scale used to evaluate each of the alternatives is presented in Table 2 below. The scale ranges from 1 to 5, with 1 being the best or causing the least impact to the proposed indicator, and 5 being the worst or causing the largest impact.

Scale	Criteria		
	Economic & Technical	**Environmental**	**Health & Safety**
1 – Negligible	Insignificant impact on construction costs / Technically very feasible	Insignificant or no environmental damage/impact	No injuries / Insignificant financial loss
2 – Low	Minor impact on construction costs / Technically feasible	Minor environmental damage/impact	First aid treatment / Notable financial loss
3 – Medium	Moderate impact on construction costs / Technically less feasible	Significant environmental damage/impact	Injury requiring medical treatment / Substantial financial loss
4 – High	Significant impact on construction costs / Technically impracticable	Major environmental damage/impact	Injury requiring extensive medical treatment or resulting in permanent incapacitation / Significant financial loss
5 – Extreme	Resulting in sharp increase in construction costs / Technically infeasible	Extensive environmental damage & biodiversity degradation	Catastrophic injury resulting in single or multiple deaths / Extensive financial loss

Table 2. Scale Definition

Step 4 – Populate a Decision Matrix of Alternatives v Decision Criteria

Performance of each alternative in meeting each criterion is quantified based on Maritime Constructions expertise and experience. Results are shown in Table 3 below.

Alternatives	Economic & Technical			Environmental	Health & Safety
	Works Duration	Equipment Availability	Execution of Scope	Ecological Impact	Risk of Injury, Loss of Life or Property Damage
A Side cast	1	1	1	3	2
B Offsite	5	4	5	3	1
C Sandy nearshore	4	2	3	3	4
D Deep water	5	4	3	3	1
E Above high-water mark	5	2	3	3	5

Table 3. Decision Matrix Summary

Alternatives	Economic & Technical	Environmental	Health & Safety
	Works Duration Equipment Availability Execution of scope	**Ecological Impact**	**Risk of Injury, Loss of Life or Property Damage**
A Side cast	Best possible outcome in this category due to minimal anchor moves, only 48-hr barge presence, minimal risk of re-dredging and single barge and tug.	Side casting obviously limits the options for dredged material placement. However, MC have identified target placement areas that will minimise impact to seagrass meadows (refer to Section 5.4); activity introduces short-term turbidity during placement.	Performance in this criterion is based on the required proximity of barge to the rocky coast to be able to perform the disposal operation. The closer the barge is to shore, the shallower its anchors will be deployed. A scale of 1 means there is an insignificant risk of the barge being dragged against the coastline; a scale of 5 indicates there is a substantial safety risk with a potential to result in injury or property damage/loss. A scale of 5 is
B Offsite	Ranks low in this category due to the following reasons: *Requires second vessel (split hire) which dramatically increases costs and biosecurity risks. *Longer required weather window; *Likely collapse of dredged area *Requires an increased number of anchor moves. Landfill disposal is also the most-costly option due to the multiple stages (transport of untreated	Reduced turbidity and no smothering of seagrass; Likelihood of repeat anchor moves to seabed; Offsite sediment disposal not consistent with Waste Hierarchy	

	material, treatment, disposal of treated material).		unacceptable for these works.
C Sandy nearshore	Ranks second best in this category. However, re-positioning the barge means that a longer weather window will be required which increases the likelihood of having to re-dredge the areas.	Decreases impact to seagrass meadows although it increases turbidity during placement.	
D Deep water	Ranks low in this category due to similar reasons as the offsite disposal method: *Requires second vessel (split hire) which dramatically increases costs and biosecurity risks. *Longer required weather window; *Likely collapse of dredged area	Ranks high in this category as there is a very low impact to the coastal environment, although it does transfer the impact to another ecosystem and increases water turbidity during placement.	
E Above high-water mark	*Technically very complex. *Requires very favourable wave and wind conditions which would reduce the likelihood of an operational window. *Longer required weather window *Likely collapse of dredged area	Can result in coastal/beach degradation.	

Table 4. Decision Matrix (continued)

Step 5 – Comparison Among Selection Criteria

A weighting structure is also developed for the decision criteria, which reflects differences in the degree of importance or value assigned to each criterion in the decision criteria set. Essentially, the weights assigned to each criterion represent the rate at which people are willing to trade off portions of the criterion range between the objectives. Therefore, the relative importance of objectives and weights should be determined by considering the full range of possible performance of each alternative in terms of each criterion.

Hypothetical weights for each criterion					
Criterion	**Economic (Construction cost, feasibility) (0.40)**			**Environmental (0.30)**	**Health & Safety (0.30)**
	Works Duration	Equipment Availability	Proximity to Disposal Site	Ecological Impact	Risk of Injury, Loss of Life or Property Damage
Weight	0.20	0.10	0.10	0.30	0.30

Table 4. Weighting Structure for Performance Indicators

Finally, the criteria are aggregated to make an overall comparison. The obtained results of the application of the AHP method are presented in Tables 5 and 6 below.

Alternatives	**Economic & Technical**			**Environ-mental**	**Health & Safety**	Total utility
	Works Duration	Equipment Availability	Execution of scope	Ecological Impact	Risk of Injury, Loss of Life or Property Damage	
	0.20	*0.10*	*0.10*	*0.30*	*0.30*	
A - Side cast	1	1	1	3	2	1.90
B - Offsite	5	4	5	3	1	3.10
C - Sandy nearshore	4	2	3	3	4	3.40
D - Deep water	5	4	3	3	1	2.90
E - Above high-water mark	5	2	3	3	5	3.90

Table 5. Overall Comparison of Alternatives

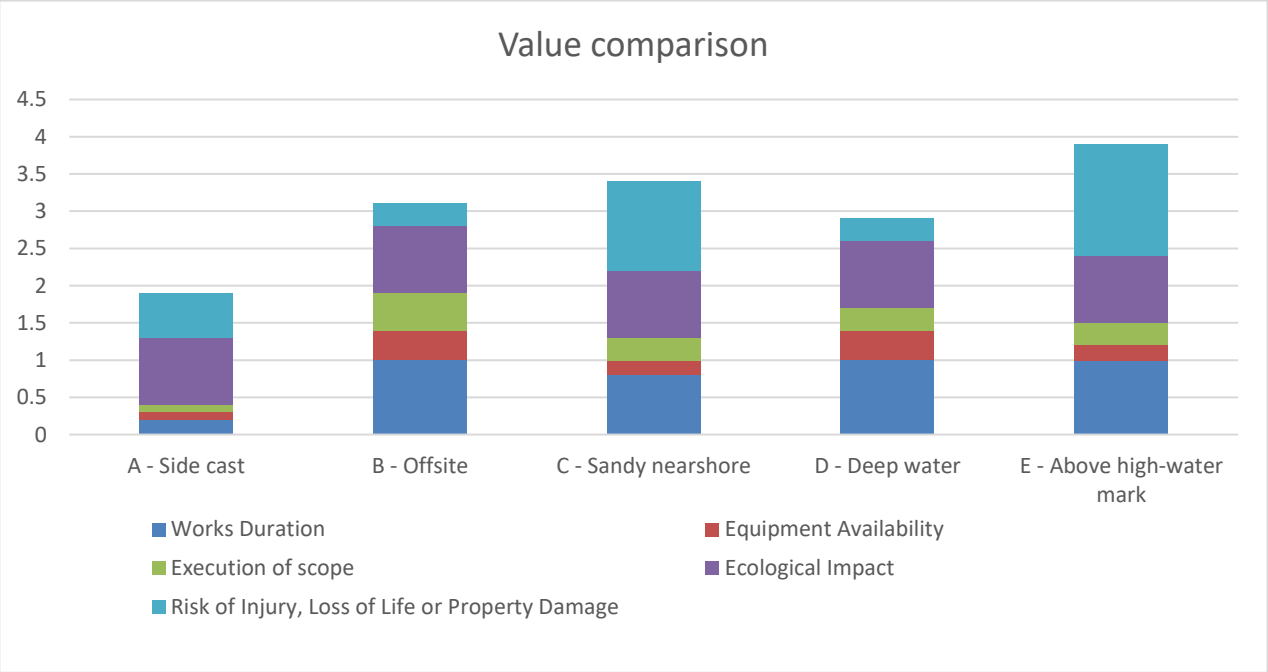


Figure 4. Value path diagram

Step 6 – Summary of Results

A- Side Casting is a clear choice primarily because all other alternative options are driven by the risks of re-dredging which generates higher frequency of site visits and associated anchor handling. All of which drives higher duration, difficult execution and increase ecological risk. As a result, dredge Areas 3 and 4 are focused on the side casting method.

5 DREDGING OPERATIONS

5.1 Summary of Dredging Activities

The marine works for the Kangaroo Island Desalination Plant comprise of the laying of two intake pipelines and one saline discharge pipeline, as well as the installation of a seawater intake structure and a brine outfall system. All three pipes will be trenched into the seabed for the first 107 metres. Furthermore, the intake base block and its associated scour protection system, at Chainage 229m, will also require to be partially buried in the seabed.

The subsea trench will be approximately 3.50m wide at its bottom and will have a variable depth, meaning the dredging volumes will vary from section to section. Conversely, the intake base block will require an area of about 175 sqm to be dredged at an average cut height of 1.25m, including over dredging. Approximately a total of 1,000 m3 is expected to be dredged during this project.

Based on the dredge method, sediment characteristics, and disposal method, dredge locations are split into four areas as shown in *Figure 4 Site Layout & Dredging Areas – Overlay with Habitat Mapping* and detailed below:

1. Chainage 0m to Chainage 57m - **Area 1**
2. Chainage 57m to Chainage 75m - **Area 2**
3. Chainage 75m to Chainage 107m - **Area 3**
4. Chainage 229m - **Area 4**

Between Areas 3 and 4, the weighted pipeline will be laid at natural seabed level and no dredging will be required at this location.

5.2 Dredge Material Considerations

<table>
<tr><td colspan="2">Sediment Characteristics / Substrate Type</td><td colspan="2"><u>Area 1</u> - Chainage 0m – Chainage 57m: Natural rock (meta sandstone)
<u>Area 2</u> - Chainage 57m – Chainage 75m: Natural rock/sand
<u>Area 3</u> - Chainage 75m – Chainage 107m: Natural coarse sand
<u>Area 4</u> - Chainage 229m: Natural sand/dense sea grasses (Spp. Posidonia)</td></tr>
<tr><td colspan="2">Water Characteristics / Clarity</td><td colspan="2">Good</td></tr>
<tr><td colspan="2">Zone / Park Status</td><td colspan="2">General Management Use Zone of Encounter Marine Park</td></tr>
<tr><td>Dredge Method(s)</td><td>Refer Section 5.3</td><td>Dredge Volume</td><td>Estimated total of 1000 m3 distributed as follows:
• 400 m3 in Area 1
• 140 m3 in Area 2.
• 240 m3 in Area 3
• 220 m3 in Area 4</td></tr>
<tr><td>Max. Depth</td><td>-2.72m AHD (Area 1)
-2.72m AHD (Area 2)
-3.08m AHD (Area 3)
-8.75m AHD (Area 4)</td><td>Max. Cut Height</td><td>1-2m</td></tr>
</table>

Table 6 Dredge Material Considerations

5.2.1 Site Layout

Site facilities, laydown areas and transport route to the causeway launching point are shown below.

Figure 5. Site Layout - Facilities

Figure 6. Site Layout & Dredging Areas – Overlay with Habitat Mapping

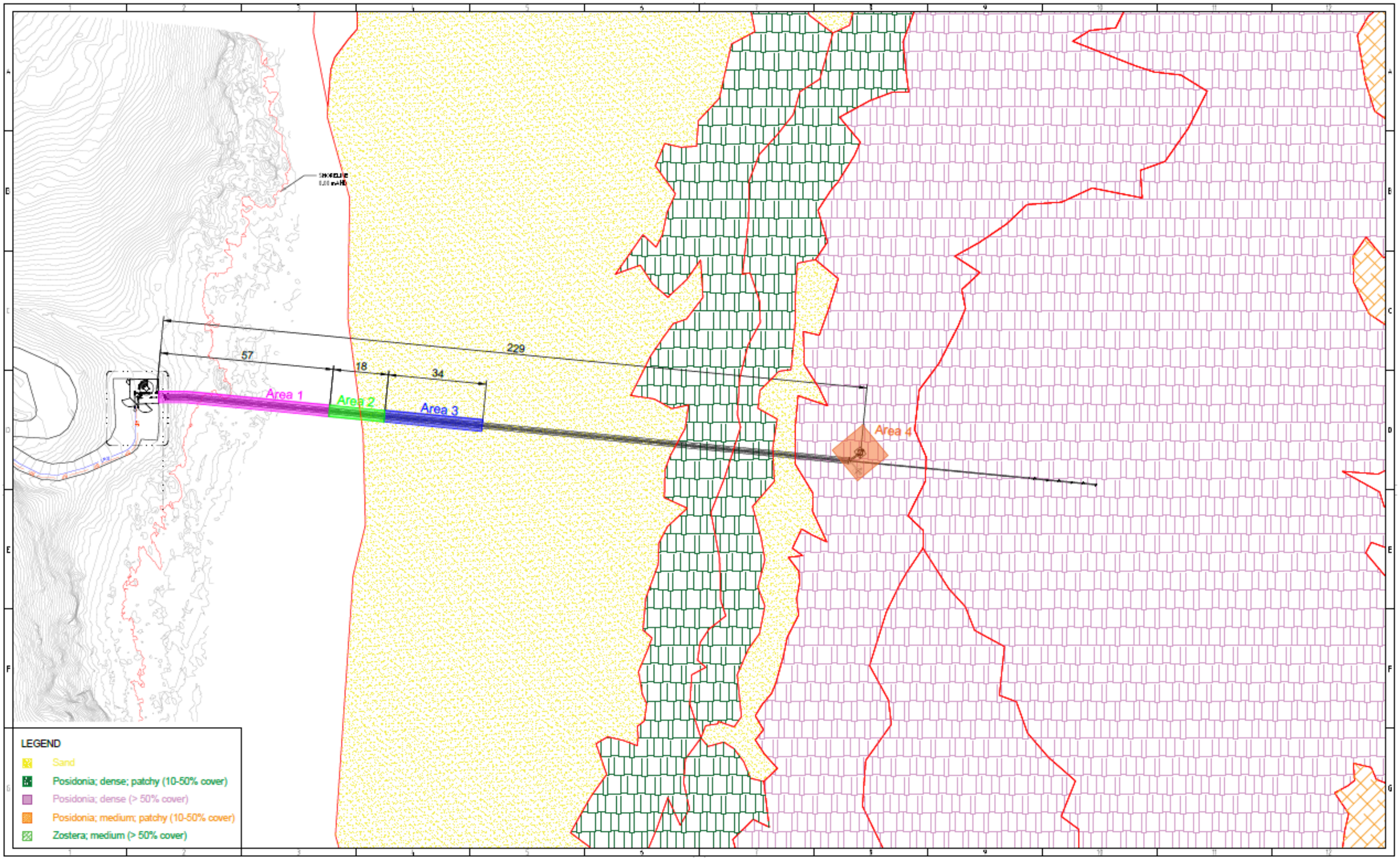
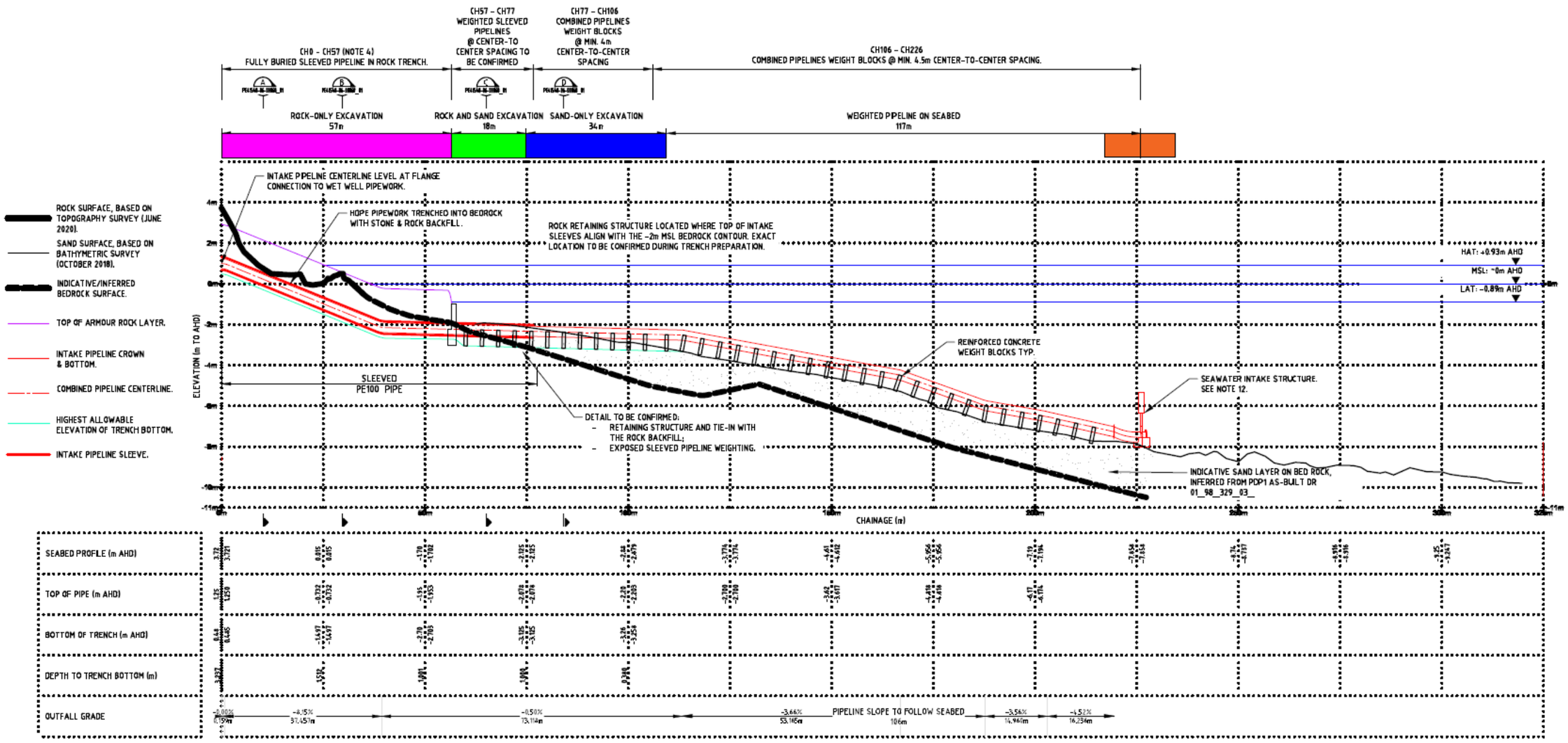


Figure 7. Elevation View Intake Pipeline



ELEVATION VIEW: RAW SEAWATER INTAKE PIPELINE

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

5.3 Dredging Methods

Dredging will be completed using a combination of mechanical dredging methods.

5.3.1 Areas 1 and 2

Excavator from temporary causeway **-** will be dredged using a large 69t excavator. Most rock excavation will be undertaken with an Xcentric ripper attachment, with the rock-breaker attachment employed in areas where ripping becomes inefficient.

Excavated material will be placed behind and ahead of the excavators and will be used to build a causeway that will provide a working platform for the machines to progress seaward. As work progresses toward the ocean, excavators will only work from the causeway, which will be built parallel to the design trench on the western side.

Preliminary calculations have indicated that the volume from the trench excavation will be insufficient to build the causeway. Therefore, MC will be importing material to the site. To mitigate any environmental risk, in particular turbidity, MC will ensure that the imported rock will have less percentage of clays and fine silts (CFS) than the receiving environment and have the appropriate hardness to avoid crushing when the civil plant tracks over it. Refer to Section 5.4 for details relating to imported materials.

Figure 6 below illustrates the proposed dredging methodology for Areas 1 and 2.

5.3.2 Areas 3 and 4

Grab dredge from barge – involves only sand dredging, will be dredged using a grab on a crane. The 'RockSea' barge will have a mounted crawler crane equipped with a grab (clamshell) digging bucket to excavate the material from the seabed and transport it vertically out of the water. The excavated sand will then be placed by the method discussed in Section 4.6. A thorough multi-criteria decision assessment was conducted to select the placement method that provides the best outcome for the environment, the project, and the multiple stakeholders.

Based on the sediment type, these activities are expected to create a temporary plume in the immediate vicinity of the dredge and placement areas. Plume formation at and near the disposal site will be monitored and extent recorded. Due to the very short timeframe and weather tolerances, it's unlikely that any impact will occur from turbid waters.

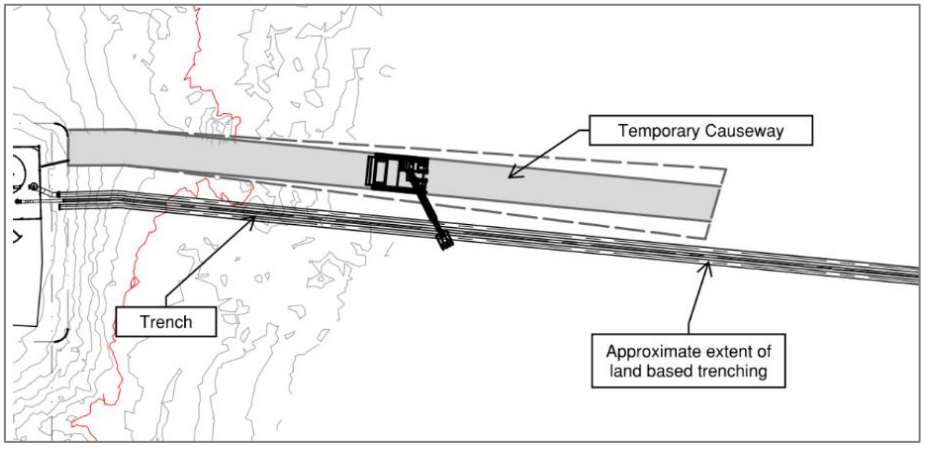


Figure 8. Proposed Dredging Method in Areas 1 &2

5.4 Imported materials for temporary causeway construction and permanent works

As per Section 5.3.1, it will be necessary to import rock materials for use in the construction of the temporary causeway and the permanent works. In accordance with DA, '*…imported materials will be washed to remove clays and fine silts (CFS). The percentage of CFS must be less than that found in the receiving environment'*. In addition to this criterion, there are also structural requirements to armour the temporary causeway adequately so that it is protected against wave and tidal erosion during dredging and construction activities.

As a result there are 4 separate types of rock to be used in the temporary causeway and permanent works:

#	Material type	Total tonnage	Proposed use	Causeway chainage
1	100-300mm spalls	1,300	Core rock	Ch 0-75m
2	300-600mm rock	800	Primary armour rock	Ch 0-50m
3	0.5-1 tonne rock	200	Primary armour rock	Ch 50-75m
4	2 tonne rock	50	Temp and permanent armour	As required for storm protection

Table 7 Imported Materials

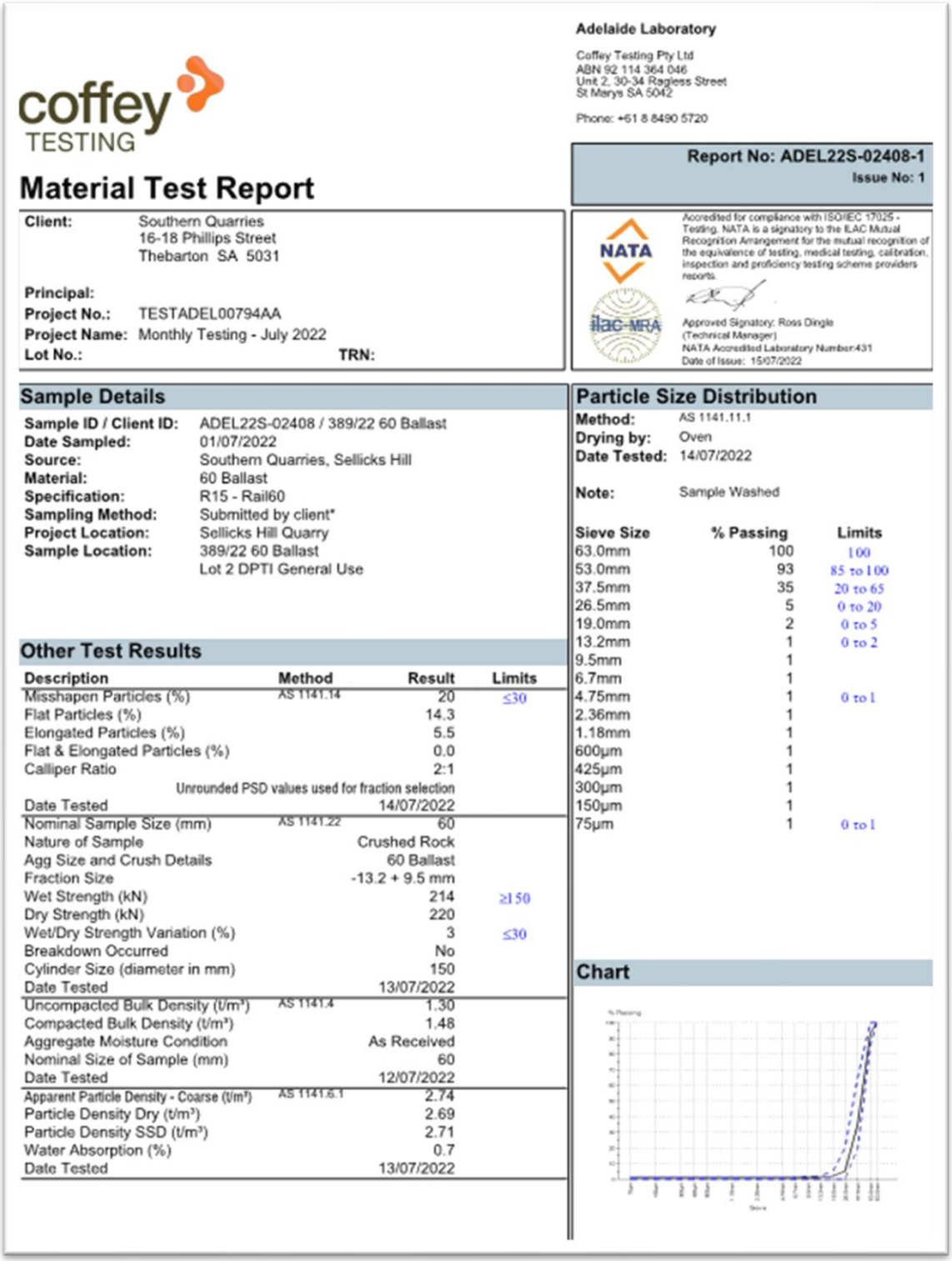
5.4.1 Criteria for Particle Size Distribution

In terms of establishing the percentage of CFS of the imported material and determination of it being less than the receiving environment, one can reference the sediment sampling and analysis (refer Section 4.4) as reference to the PSD of sediment in the 'receiving environment'. All samples analysed for Particle Size Distribution reported particles below 0.075 mm at <1-2%. For the purpose of qualifying the imported materials as suitable against this criterion, it is appropriate to define as any imported materials to contain no greater than 1% equal to or less than 0.075mm particle size.

5.4.2 Quarry sourced material

Materials imported are produced in accordance with Rail ballast quality control tests – Particle Size Distribution AS1141.11 which allow a maximum passing percentage of fines equal to or less than 0.075mm at 1%. The product quality control criteria extract is provided below which outlines the specification that the quarry produces the rock for DIT approved infrastructure. Rocks generated under this standard will undergo a process from blasting to crushing, any large boulders are set aside for either breaking (using excavator) or stockpiled for special use. In the case of this project, all materials sourced are generated from screening and manual sorting processes. Irrespective of this, it is demonstrated from the sample report (#ADEL22S-02408-1) provided in extract below shows no fine materials less than 13.2mm.

Examples of quarry sourced Dolomitic Limestone rocks and boulders



coffey TESTING

Adelaide Laboratory

Coffey Testing Pty Ltd
ABN 92 114 364 046
Unit 2, 30-34 Ragless Street
St Marys SA 5042

Phone: +61 8 8490 5720

Report No: ADEL22S-02408-1
Issue No: 1

Material Test Report

Client: Southern Quarries
16-18 Phillips Street
Thebarton SA 5031

Principal:
Project No.: TESTADEL00794AA
Project Name: Monthly Testing - July 2022
Lot No.: **TRN:**

NATA

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 and proficiency testing scheme providers reports.

Approved Signatory: Ross Dingle
(Technical Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 15/07/2022

Sample Details

Sample ID / Client ID:	ADEL22S-02408 / 389/22 60 Ballast
Date Sampled:	01/07/2022
Source:	Southern Quarries, Sellicks Hill
Material:	60 Ballast
Specification:	R15 - Rail60
Sampling Method:	Submitted by client*
Project Location:	Sellicks Hill Quarry
Sample Location:	389/22 60 Ballast Lot 2 DPTI General Use

Other Test Results

Description	Method	Result	Limits
Misshapen Particles (%)	AS 1141.14	20	≤30
Flat Particles (%)		14.3	
Elongated Particles (%)		5.5	
Flat & Elongated Particles (%)		0.0	
Calliper Ratio		2:1	
Unrounded PSD values used for fraction selection			
Date Tested		14/07/2022	
Nominal Sample Size (mm)	AS 1141.22	60	
Nature of Sample		Crushed Rock	
Agg Size and Crush Details		60 Ballast	
Fraction Size		-13.2 + 9.5 mm	
Wet Strength (kN)		214	≥150
Dry Strength (kN)		220	
Wet/Dry Strength Variation (%)		3	≤30
Breakdown Occurred		No	
Cylinder Size (diameter in mm)		150	
Date Tested		13/07/2022	
Uncompacted Bulk Density (t/m³)	AS 1141.4	1.30	
Compacted Bulk Density (t/m³)		1.48	
Aggregate Moisture Condition		As Received	
Nominal Size of Sample (mm)		60	
Date Tested		12/07/2022	
Apparent Particle Density - Coarse (t/m³)	AS 1141.6.1	2.74	
Particle Density Dry (t/m³)		2.69	
Particle Density SSD (t/m³)		2.71	
Water Absorption (%)		0.7	
Date Tested		13/07/2022	

Particle Size Distribution

Method: AS 1141.11.1
Drying by: Oven
Date Tested: 14/07/2022

Note: Sample Washed

Sieve Size	% Passing	Limits
63.0mm	100	100
53.0mm	93	85 to 100
37.5mm	35	20 to 65
26.5mm	5	0 to 20
19.0mm	2	0 to 5
13.2mm	1	0 to 2
9.5mm	1	
6.7mm	1	
4.75mm	1	0 to 1
2.36mm	1	
1.18mm	1	
600µm	1	
425µm	1	
300µm	1	
150µm	1	
75µm	1	0 to 1

Chart

PSD Lab report extract for Rail Ballast

Rail Ballast

Source Materials

13.3 Source materials must be natural quarried material and must not include recycled material or metallurgical slag. River gravel or crushed river gravel shall not be used as railway ballast because of the poor interlock between the rounded faces of the water worn rock. All testing be undertaken on representative ballast samples and not the source rock within the quarry. The sampling procedure must ensure that the samples are representative of the materials supplied and have not been affected by segregation during handling and transport.

Product Quality Control

Table RD-PV-S1 13-4 Rail Ballast Quality Control Tests

Test Procedure	Manufacturing Tolerance			
Quality Control Tests				
Particle Size Distribution AS 1141.11	Product	RAIL50	RAIL60	RAIL60S (Used under steel sleepers)
	Sieve Size (mm)	Percent Passing		
	63		100	100
	53	100	85 – 100	95 – 100
	37.5	70 – 100	20 – 65	35 – 70
	26.5	-	0 – 20	15 – 30
	19	40 – 60	0 – 5	5 – 15
	13.2	-	0 – 2	0 – 10
	9.5	10 - 30	-	0 - 1
	4.75	0 - 20	0 - 1	-
	1.18	0 - 10	-	-
	0.075	0 - 1	0 - 1	0 - 1
AS 1141.4	Bulk Density	Minimum 1200 kg/m³		
AS 1141.6.1	Particle Density	Minimum 2500 kg/m³		
AS 1141.22	Wet / Dry Strength(2)	Minimum 150 kN Wet Strength, Maximum 30 % Wet / Dry Strength Variation		
AS 1141.23	LA Abrasion Grading B(3)(4)	Track carrying < 6 Mt (gross) per annum: Max 30% Track carrying >6 Mt (gross) per annum: Max 25%		
AS 1141.14(3)	Mis-shapen Particles %(5)	Max 30 %		

Notes:
(1) Refer to Clause 9 "Rail Ballast" for further details.
(2) Samples must be prepared from an appropriately sized fraction of ballast from delivered lots. Wet / Dry Strength testing must be carried out on the fraction of material passing 26.5 mm sieve and retained on 19 mm sieve.
(3) Los Angeles testing must be carried out on the fraction of ballast passing 19 mm sieve and retained on 9.5 mm sieve.
(4) In accordance with AS 2758.7, the ballast itself may be crushed to provide an appropriately graded test within the size range for Los Angeles Testing only.
(5) Misshapen particles must be determined on the fraction of ballast retained on the 9.5 mm test sieve using a 2:1 Calliper Ratio. The report must indicate each of % flat, elongated, and flat and elongated particles.

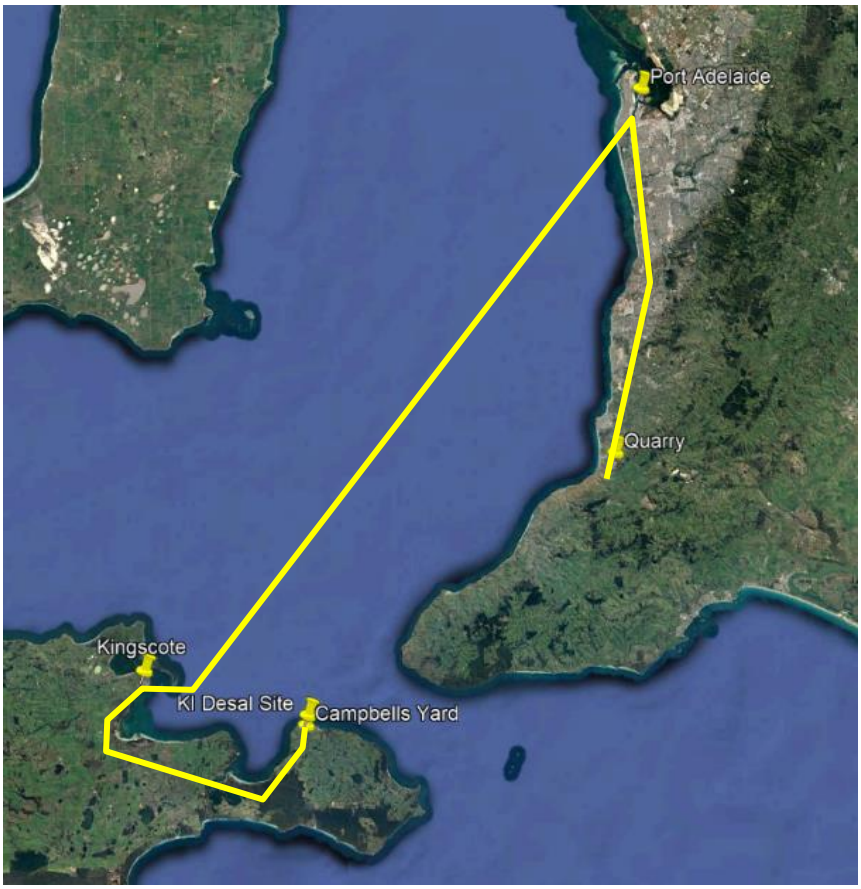
Extract from DIT Rail Ballast Standard (provided by quarry)

5.4.3 Transport and Stockpiling

Due to the quality standards of rock materials, remoteness of Kangaroo Island and the limitation of ferry onto the island, it is necessary to source all material from the mainland and transport via barge or ferry. The logistical process for material transport is complex due to the implications with transferring multiple loads between road and sea transport and associated wharf loading/unloading and stockpile transfer options:

Transport via Barge

1. Sellick's Hill quarry to Port Adelaide by Road
2. Port Adelaide to Kingscote by Barge
3. Kingscote to Campbell's Storage Yard by Road
4. Campbell's Storage Yard to Penneshaw construction area by Road



Transport Route Summary from Quarry to Penneshaw via Barge

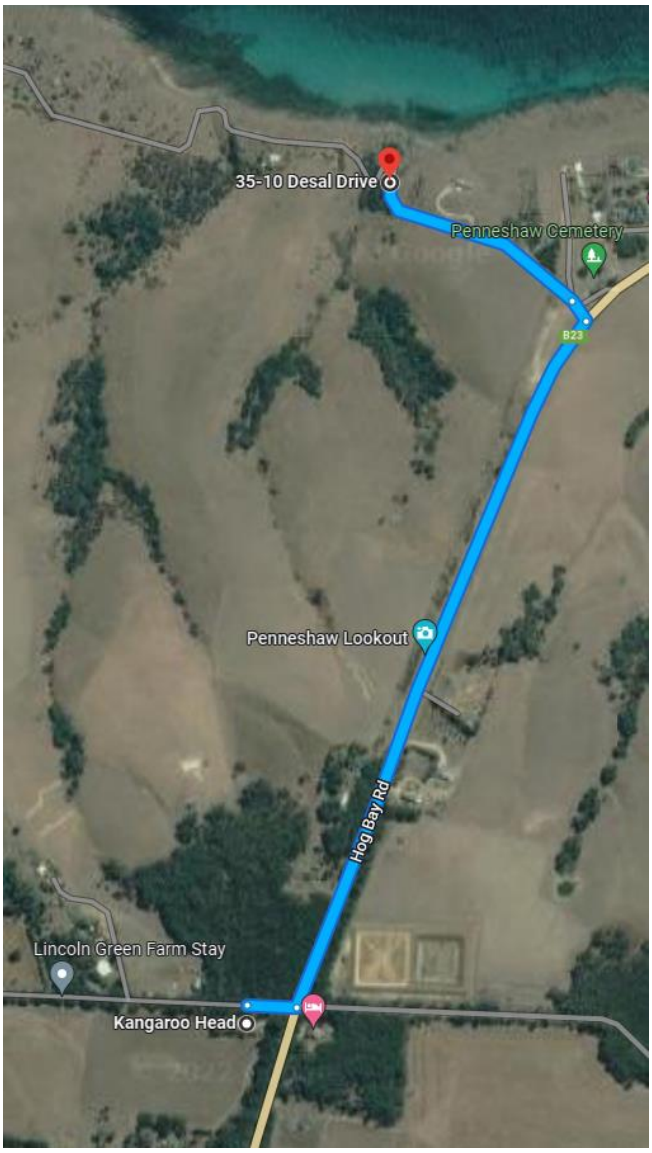
Transport via Ferry (Sealink)

1. Sellick's Hill quarry to Campbell's Storage Yard
2. Campbell's Storage Yard to Penneshaw construction area by Road

5.4.4 Material handling and stockpile management

Due to the multiple handling steps, there is repeated opportunity for fines to generate during transport and handling. This may be in form of rock abrasion and vibration creating smaller fragments and/or in the rehandling of materials and accidental cross contamination between stockpiling sites. Since the source rock contains no fines, the best approach in handling rock materials is to maintain a 'sacrificial layer' whereby only suitable rock is transferred from a stockpile location and any fines material is rejected from transport. Loading equipment will be fitted with a screening bucket (<100mm passing) to prevent excess fines from being collected. This process is to be maintained across each step.

Example of 'screening bucket' used for loading



Transport Route #4 – Campbells yard to Construction site

5.4.5 Campbells Storage Yard

Once all material is ready for construction and site is established, imported materials will be stored locally at a commercially operated storage yard (Campbells Haulage) referred to here as Campbell's Storage Yard and is located on the SW corner of Buick and Hogs Bay Rd, 3km south of construction area. The site comprises as a 2000 m^2 area with a compacted rubble surface surrounded by trees. Adjacent land uses are predominantly agricultural.

At the final leg of transport from Campbells storage yard to the Penneshaw construction area, small loads (<12t) will be brought down to the coastline for progressive causeway construction or, permanent works installation. Rocks loaded onto the transfer truck will be loaded using a screen bucket and inspected for fines. Any residual fines will be left on the ground as a sacrificial layer. If fines inadvertently make their way into the load a refinement of the process may be required, which would involve introduction of a washing process by

use of a water tanker at the storage yard however repeat use of water may result in water damage to the storage pad itself and introduction of fines onto the haulage route road.

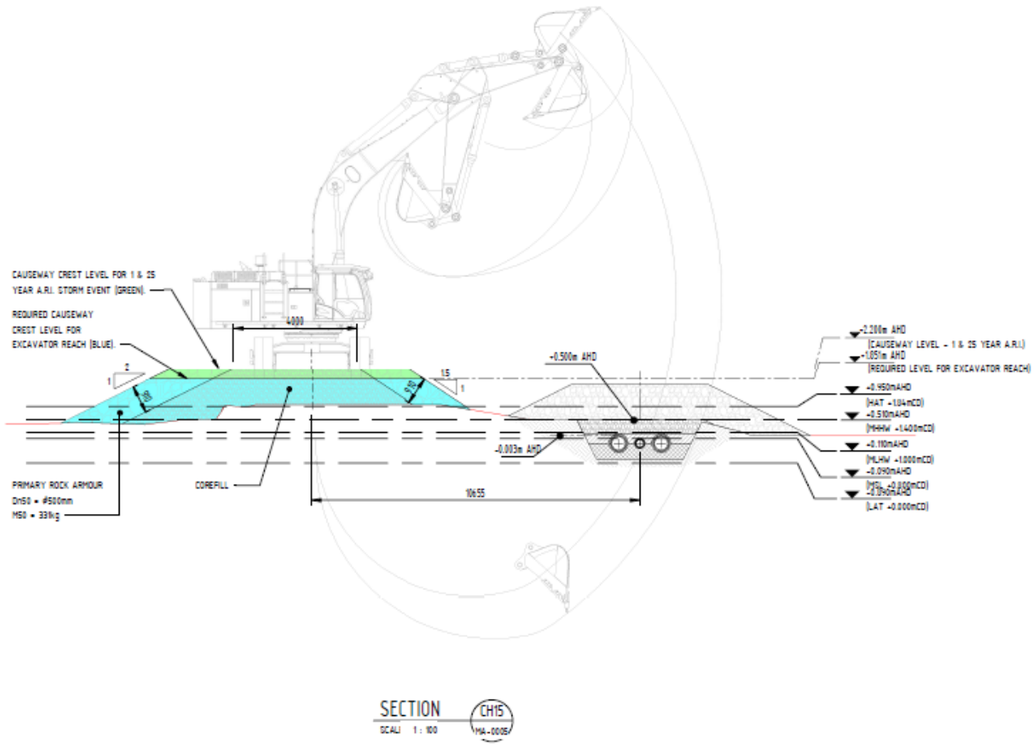
Campbells Storage Yard

5.4.6 Weather risk management

During the period of works for the construction of the temporary causeway it will be likely that works will experience some inclement weather, hence the causeway has been engineered to the site conditions likely to be encountered based on the following design criteria:

- Function category 1 – Structure presenting a low degree of hazard to life and property
- Design working life – Less than five years (temporary works)
- Design wave event – 1/20 years

Figure 9 Cross Sections Dredging Areas 1 & 2



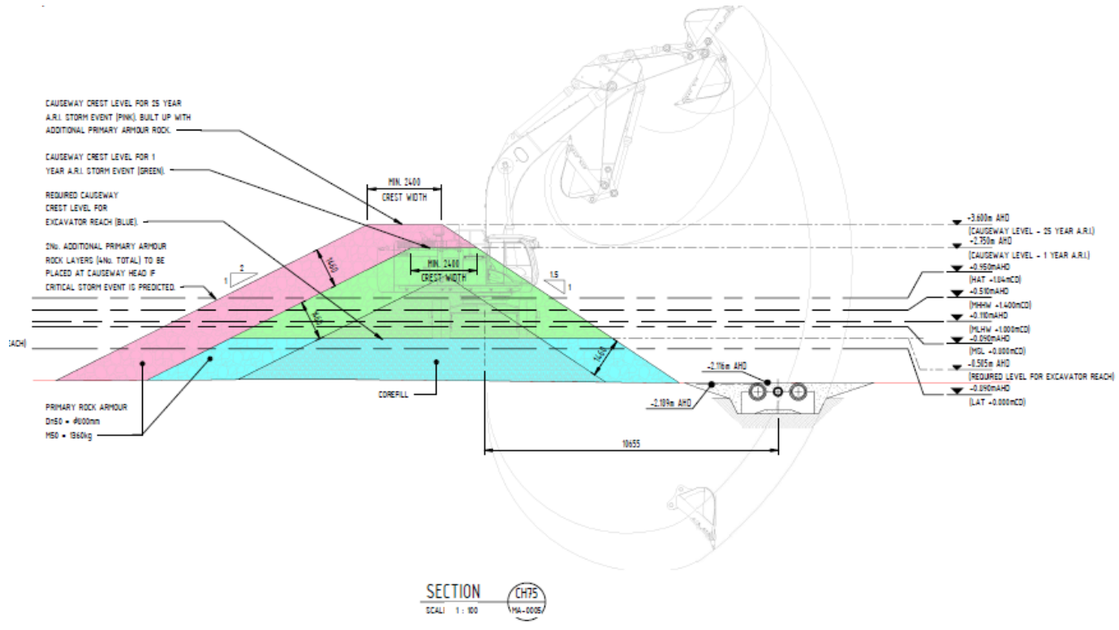
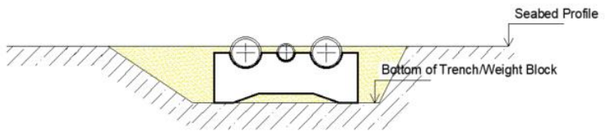


Figure 10 Cross Sections Dredging Areas 3 & 4



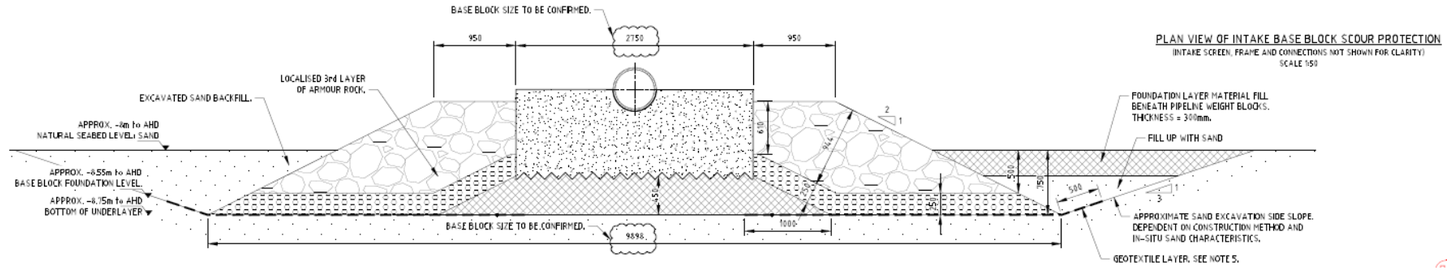
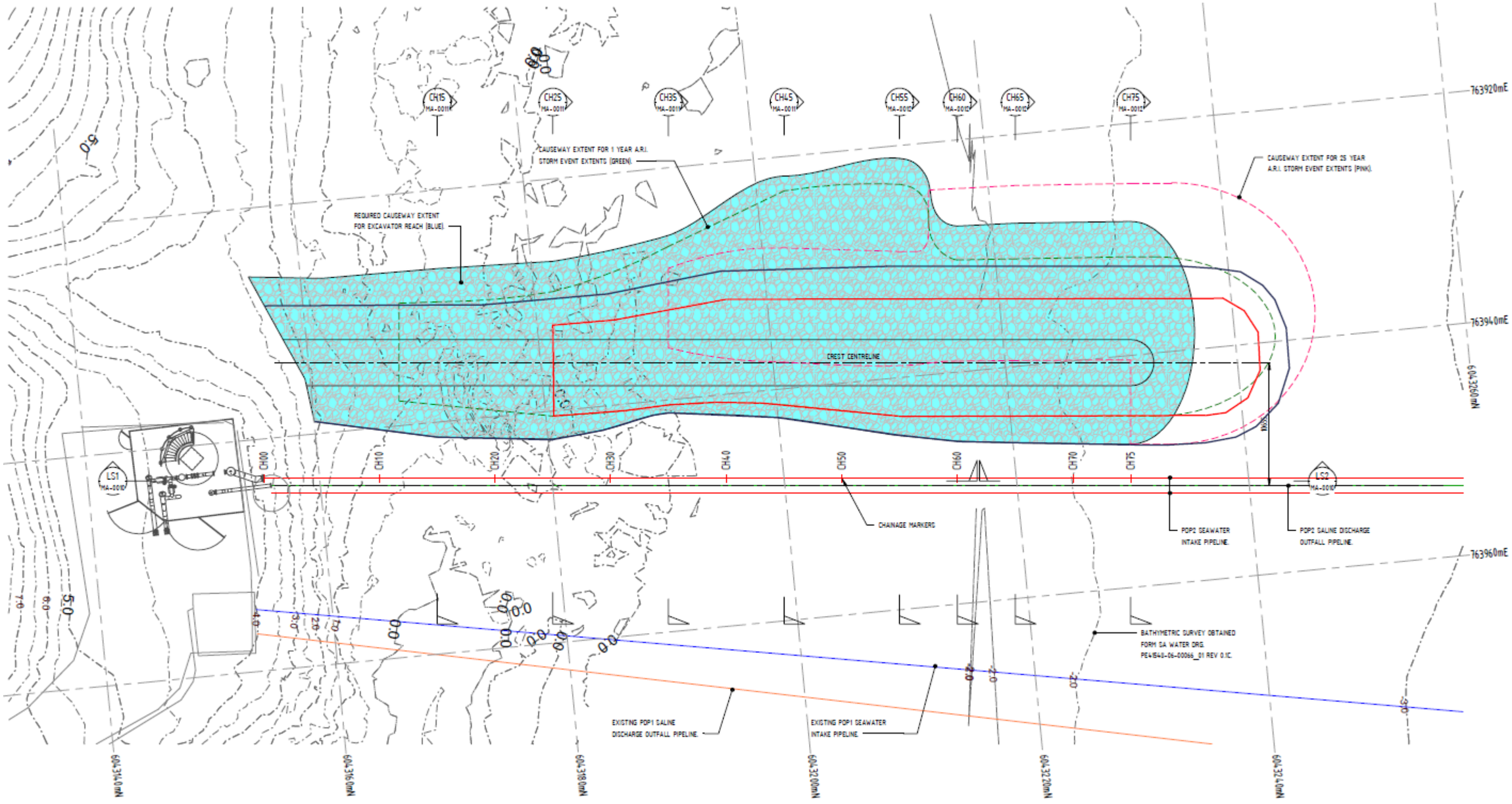


Figure 11 Temporary Causeway to Facilitate Access to Trench



GENERAL ARRANGMENT PLAN

SCALE 1 : 200

5.5 Disposal Management

As discussed above, depending on the area where dredging is taking place, material is to be disposed in different ways.

5.5.1 Temporary causeway dredging and removal

The material dredged from Areas 1 and 2 will consist mainly of rock and will be used to build the temporary causeway as much as practically possible in conjunction with imported materials (Refer Section 5.4).

Dredge material that is not suitable for causeway construction (sand) will be stockpiled and treated as PASS.

Any materials removed from the causeway footprint (~2000t) will be stockpiled at Campbell's storage yard for intended reuse. Rock materials removed will consist of rock >100mm particle size and will freely drain immediately during loading.

Any sandy materials removed are classified as PASS (as per Section 4.4) and therefore must be transported off site immediately if allowed to dry (i.e. become oxidised). Once stockpiled, materials must be contained within a 0.5m high earth bunded area, preventing any runoff of free water. Any free water may be acidic and harmful to the neighbouring environment. Any substrate upon which the material is placed, where no barrier to the existing soil is applied, will be tested for PASS and managed appropriately.

All stockpiled materials must be classified for reuse or disposal by a suitably qualified third-party professional. Given that majority of the stockpiled material will consist of >100mm rock, typical sample and chemical analysis will not be necessary given the material is inert solid rock. Rock material will ideally be reused in local construction activities on KI. In the case of any PASS materials being removed, typical sample and chemical analysis will be undertaken. All post dredging classification results and any subsequent proposed management actions will be provided to EPA for endorsement.

5.5.2 Grab Dredging

Material dredged from Areas 3 and 4 will be side cast directly adjacent the dredging site. The 275t crane can operate safely with a 35-40m boom radius, so the operator will place the material as far as practically possible from the trench, to minimise the risk of it being transported back into the excavated trench by the action of swell and currents. The barge will then move back and forth on its anchors using its forward and aft winches. In this way, the entire dredging area can be covered without having to redeploy the anchors which minimises impact to the seagrass habitat. Similarly, the two-dimensional motion allows the grab to place over a larger disposal area. The target DMPAs are 2 to 5 times larger than the Dredging Areas 3 & 4 and placing material randomly within the target DMPAs will avoid excessive mounding of spoil.

Standard process for grab movements requires the grab to be marginally raised above the water surface before slewing across. The crane operator will monitor the position of the grab for nominated placement area, bring the crane slew to a halt before lowering the grab into the water followed by opening the grab. Grab will be released as close as possible (~0.3m) to the seabed to reduce plume dispersal potential. Depths will be determined using a recent hydrographic survey layered within the crane operators grab positioning software.

All DMPA's are over sandy seabed surface as defined by the benthic assessment.

In regards to PASS, any side casted dredge material placed on the seabed do not present an Acid Sulfate Soil risk due to negligible risk for exposure to oxygen.

Figure 11, 12 & 13 below, illustrate the approximate disposal locations for each dredging area.

Figure 12 Dredging Arrangement for Areas 1 & 2

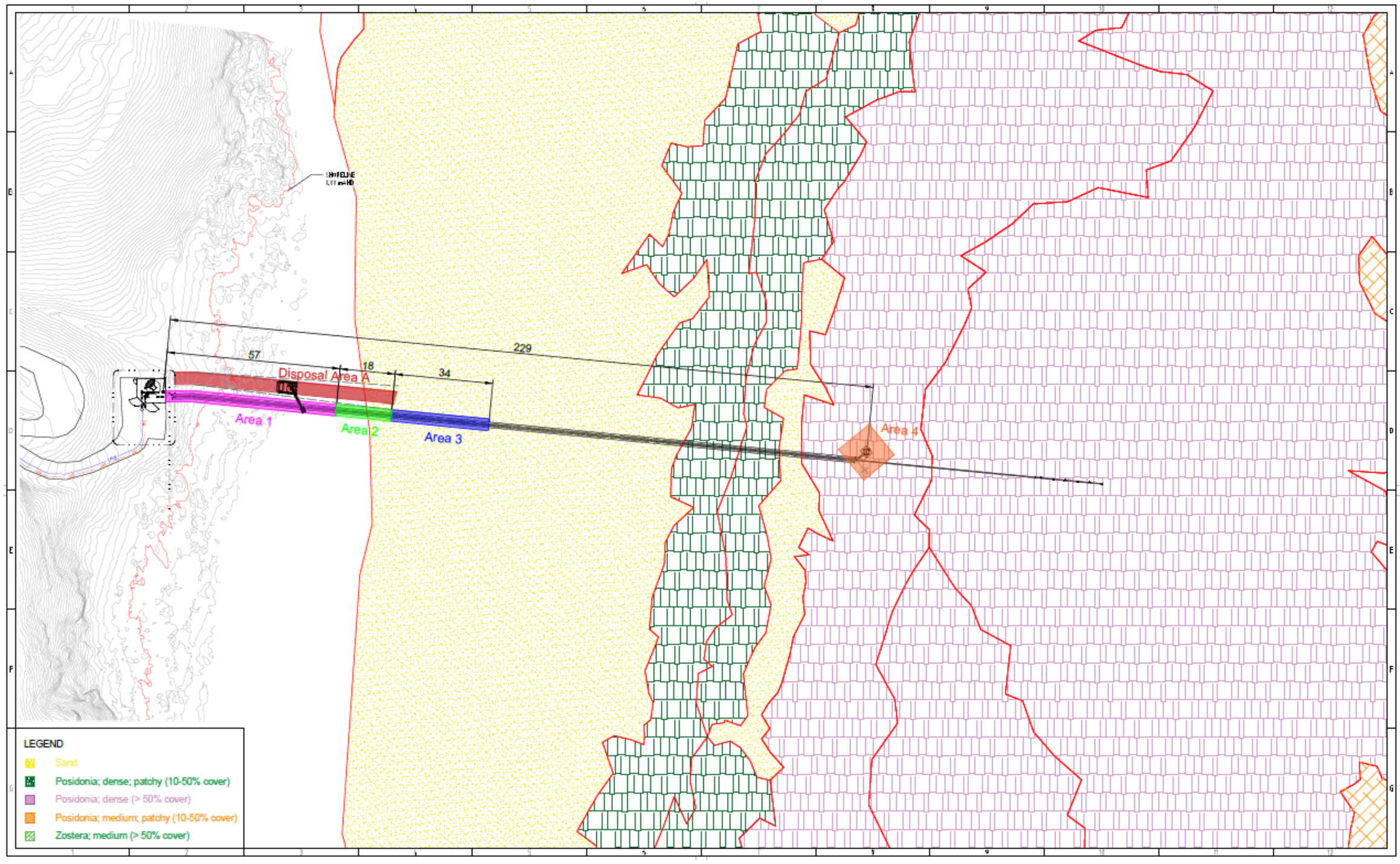


Figure 13 Dredging Arrangement for Area 3

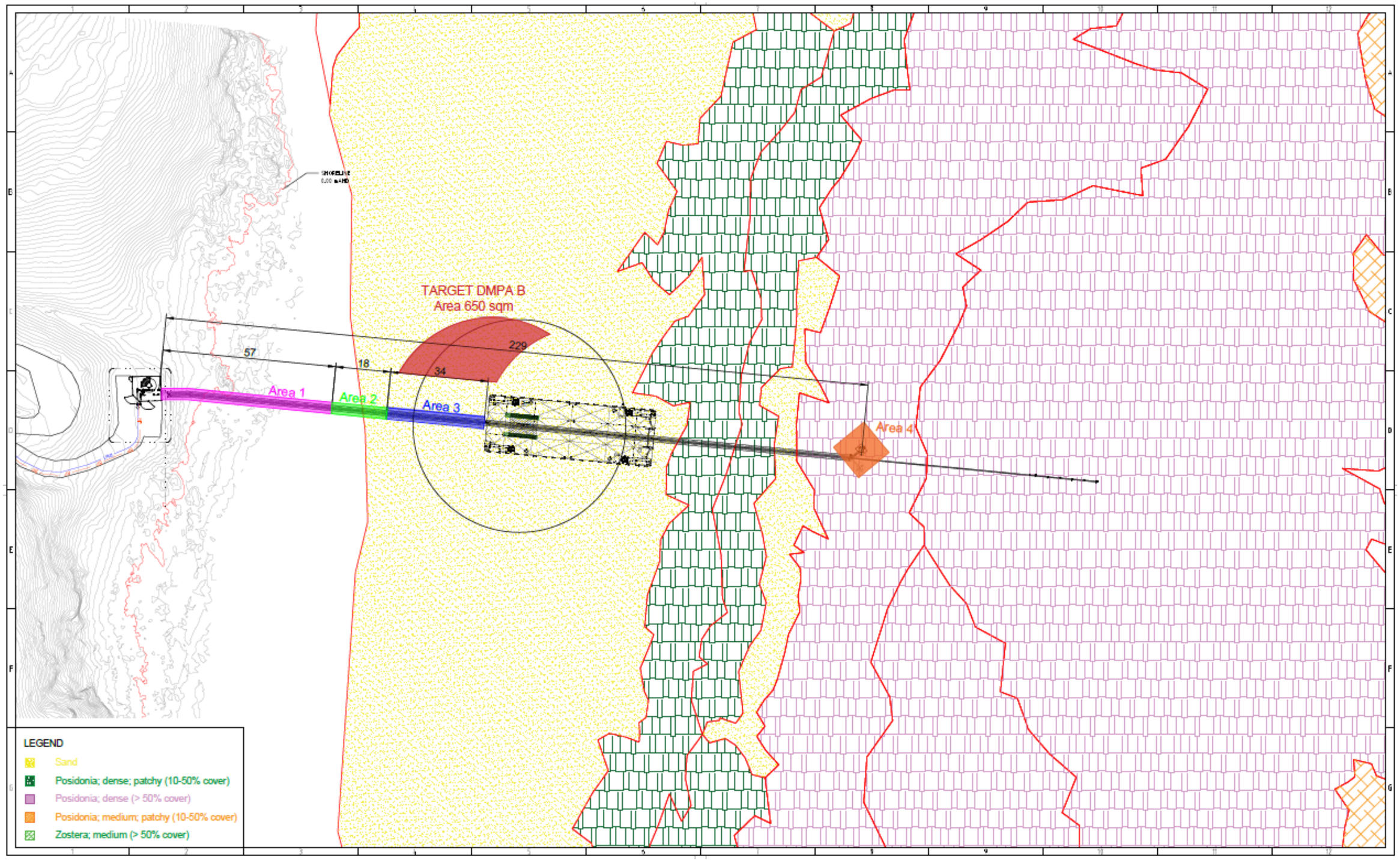
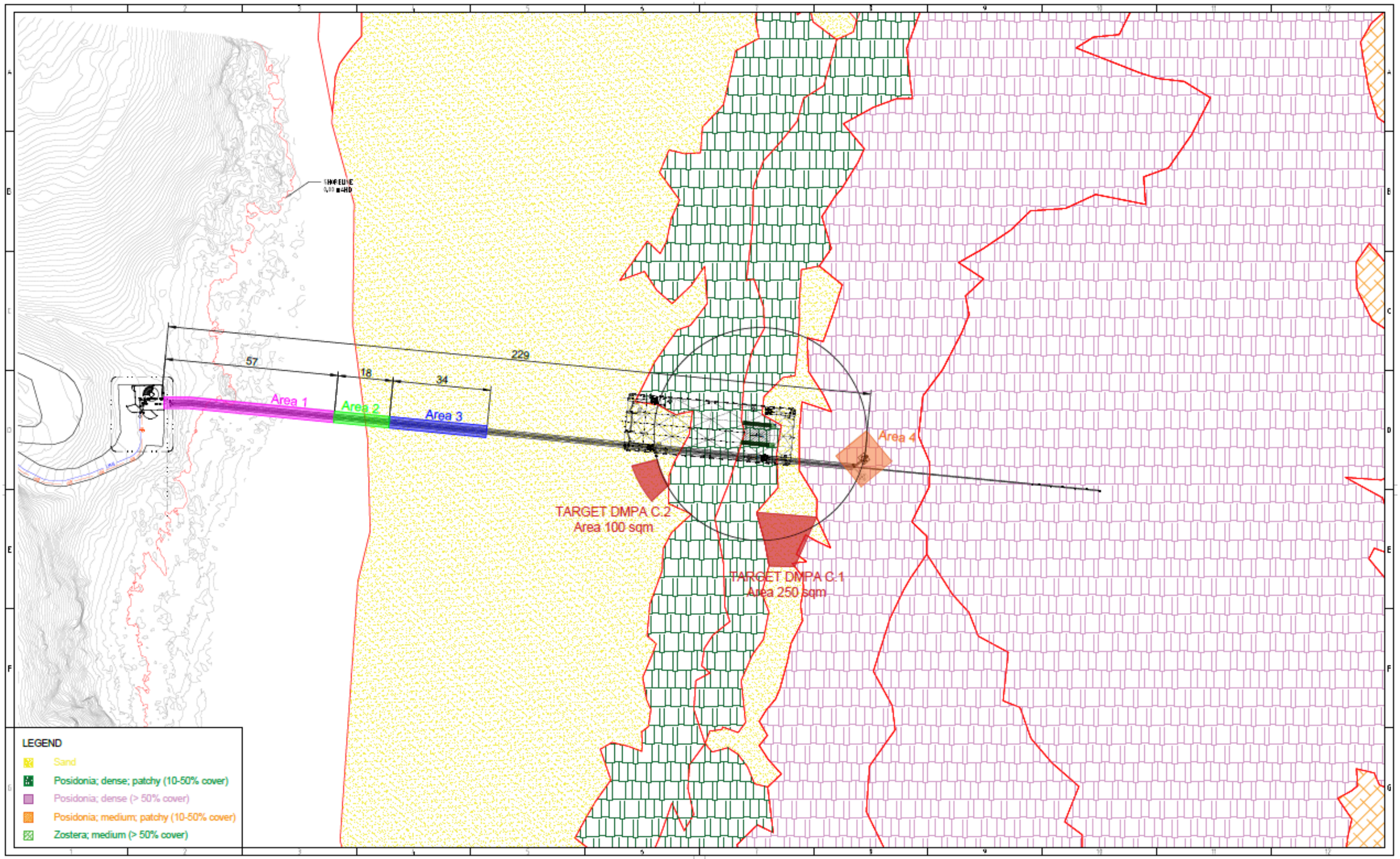


Figure 14 Dredging Arrangement for Area 4

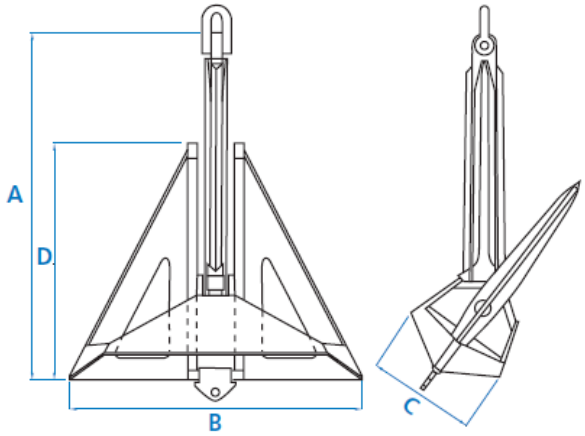


5.6 Anchor Placement Management Plan

As illustrated in the dredging arrangements for both Area 3 and 4, the RockSea barge will be positioned to align with the centreline of the trench and be fixed at the excavation site using a 4-Point Mooring System. A 4-Point Mooring system consists of 4 x hydraulic winches, 4 x 250m x 38 mm wires, 4 x 2.5 t Delta Flipper anchors, 4 x fairleads, as well as 4 x local control units and 1 x central control unit.

The Delta Flipper is a drag embedment anchor which offers multiple advantages including:

- Excellent penetration in different kinds of soil.
- No rotation, which means no decrease of holding capacity.
- Highly efficient when comparing anchor weight to holding power.
- Streamlined open construction reduces drag and quickens penetration.
- Outstanding stability given its relatively short shank.



Flipper Delta					
weight		A	B	C	D
lb.	kg	mm	mm	mm	mm
2205	1000	2605	1960	740	1560
5512	2500	3150	2660	1005	2130
11023	5000	3945	3300	1260	2660
16535	7500	4565	3850	1435	3080
22046	10000	5040	4270	1600	3400
26455	12000	5335	4530	1705	3600
33069	15000	5735	4845	1830	3875
44092	20000	6405	5410	2010	4320
71650	32500	7320	6200	2310	4930
88185	40000	7850	6650	2480	5290

Figure 15 Flipper Delta Anchor Design

Figure 15 below shows how a drag embedment anchor develops its holding capacity. The holding capacity of the anchor depends on many factors, including:

- The weight of the anchor (A).
- The weight of the soil in the failure wedge (B).
- The friction of the soil in the failure wedge along fracture lines (C).
- Friction between fluke surface and soil (fluke area) (D).
- The bearing capacity of shank and mooring line (E).
- The friction of the mooring line in and on the soil (E).

Upon placement, the anchor will penetrate to a certain depth and will travel a certain horizontal distance, called the drag length. After installation, the anchor is capable of resisting loads equal to the installation load without further penetration and drag. When the installation load is exceeded, the anchor will continue to penetrate and drag until the soil is capable of providing sufficient resistance or the ultimate holding capacity has been reached. When the anchor reaches its ultimate holding capacity (i.e. it will not resist any higher loads), a wedge shaped piece of soil (in front and above the anchor) will fail.

Figure 16 & 17 below, show the 4-point mooring spread for both dredging configurations. To minimise impact to seagrass meadows, the stern anchors in Area 3 Configuration and bow anchors in Area 4 Configuration will be placed in sand. For safety reasons, the remaining 2 anchors are required to be placed at a 45° angle 200m from the barge, falling onto a dense area of seagrass. This anchor placement location is unavoidable for safety reasons, any other suitable placement locations are also (generally) dense with seagrass.

However, given the mild weather conditions under which these dredging works must take place (0.2m seas; 10 knots winds), it is expected that the installation loads will not be exceeded and therefore no further penetration and drag will take place. A 2.5t Delta Flipper anchor developing installation loads only will impact an area of approximately 15 m^2. The dredging of Areas 3 and 4 will occur at different points in time meaning 2 trips will be required. Therefore, the total seagrass affected area will be:

$$Total\ Affected\ Area\ (m2) = 2\ trips\ x\ 2\ anchors\ x\ 15\ m2 = 60\ m2$$

MC will ensure that all measures are taken to minimise this impact even further (e.g. identifying sandy patches within the dense Posidonia area for anchor placement where possible).

It is important to note that maritime law requires the barge to be under control by the bargemaster at all times and any anchor handling or use of spuds is the decision of the master. That means that anchors may need to be rehandled and wires tensioned as necessary.

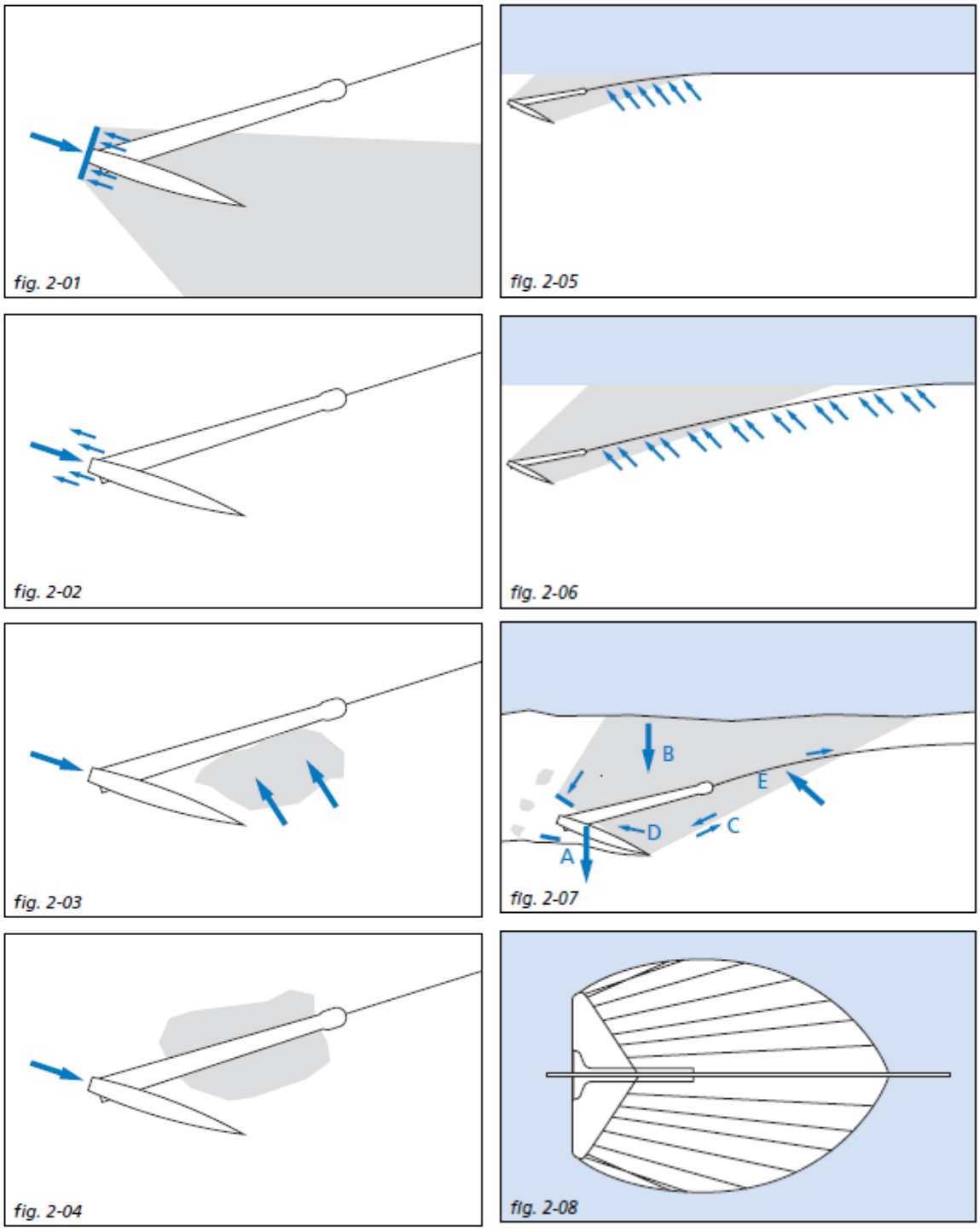


Figure 16 Anchor Setting Mechanism

Figure 17 - 4-Point Mooring Spread (Area 3 Configuration)

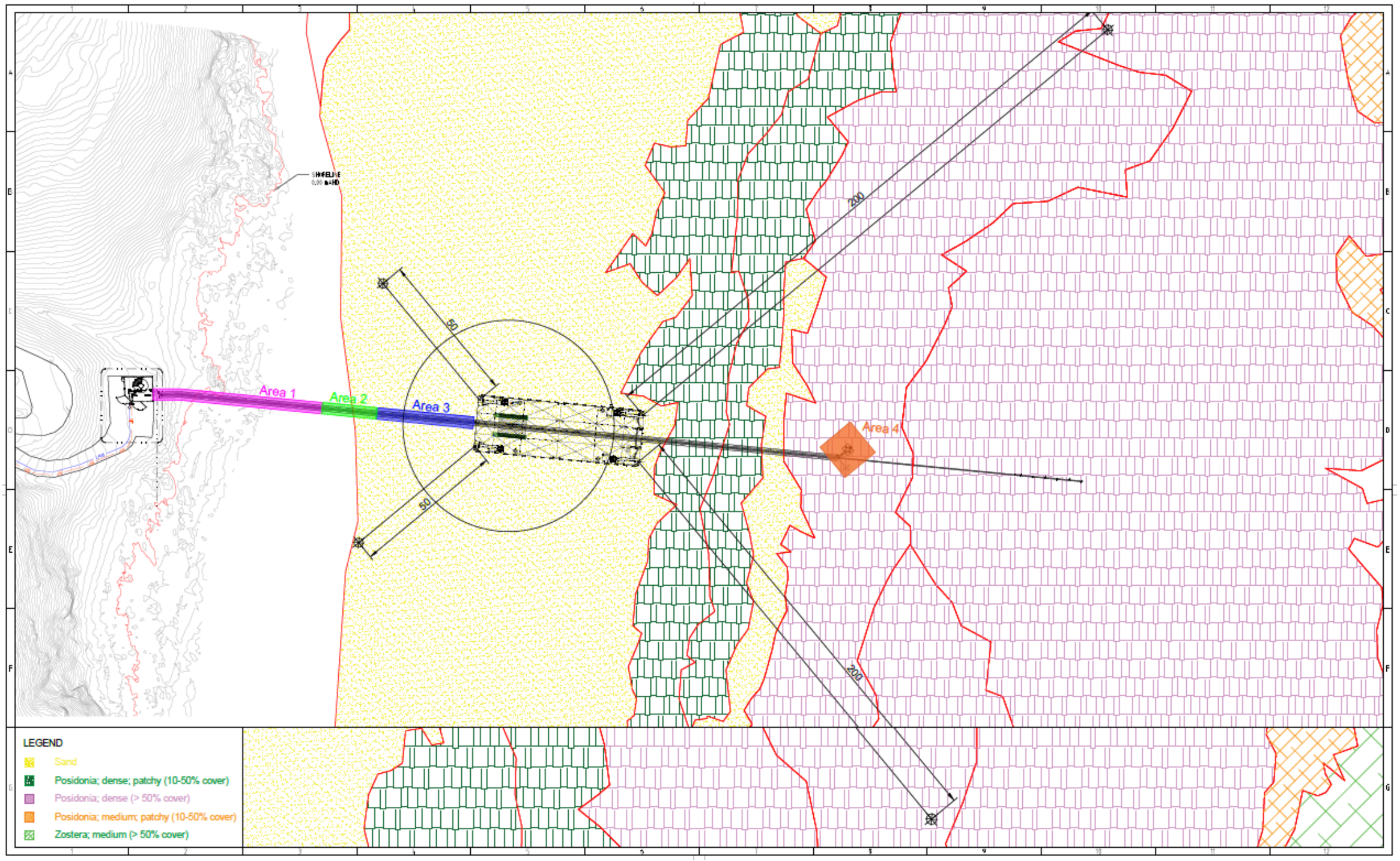
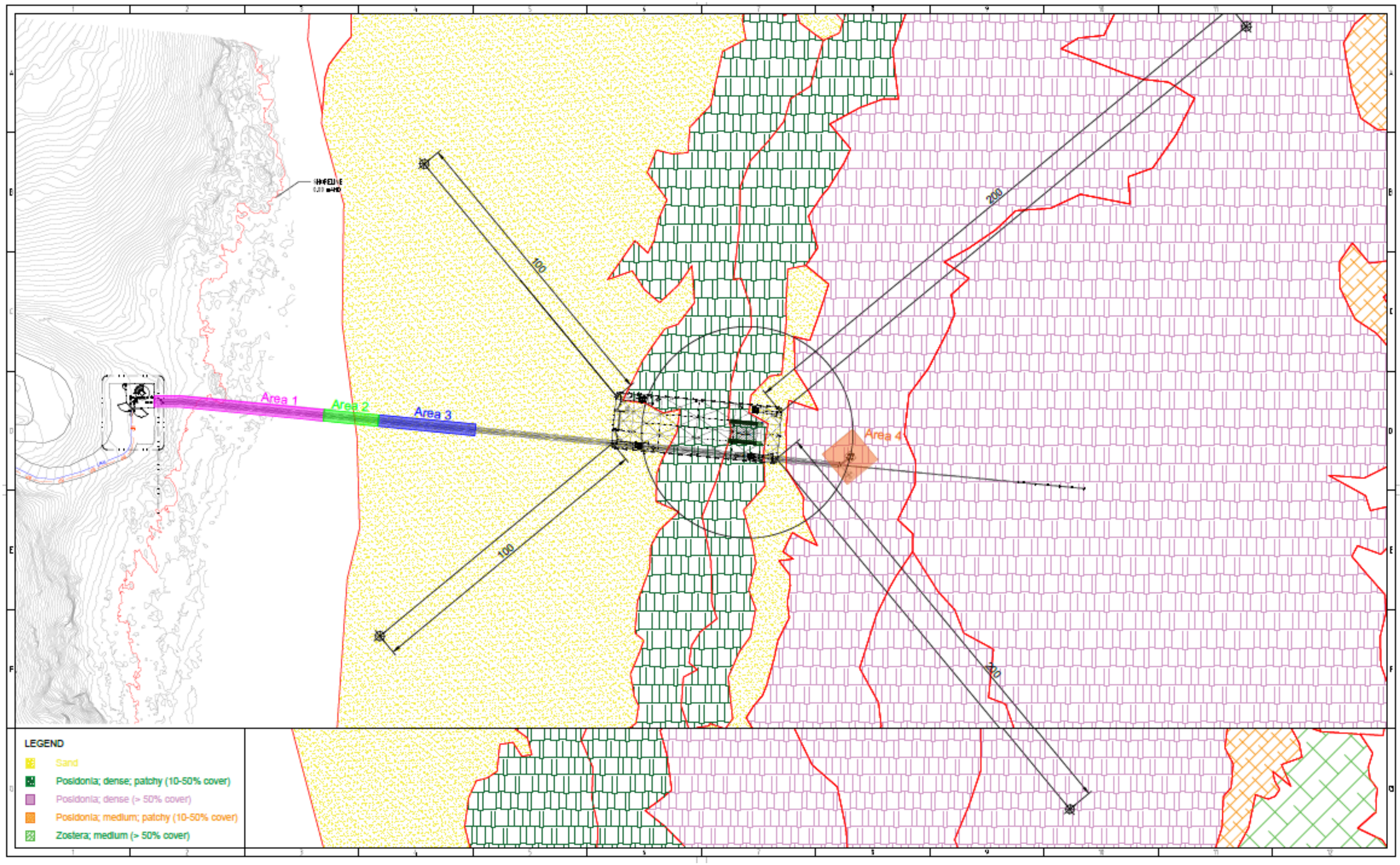


Figure 18 - 4-Point Mooring Spread (Area 4 Configuration)



6 ENVIRONMENTAL RISK MANAGEMENT

The environmental risks associated with this project are listed below. Each of the mitigation measures associated with these risks are detailed below.

6.1 Community Engagement and Public Relations

Maritime Constructions will comply with the Stakeholder Engagement Plan developed by head contractor JHGO, to keep the local community informed of ongoing dredging management activities.

6.2 Water Quality Management

Water quality management is low risk for this dredging activity due to the virgin sand and rock materials and short operational periods. For clarity, Works are split into the two separate methods as detailed below.

Dredge Area 1 and 2 – Excavator from temporary causeway:

- Duration is approx. 60 days
- Dredging is to be carried out in a near-shore, high-energy environment.
- Spoil is mostly rock (metasandstone) and clean sands.
- Surrounding impact zone is bare sand and rock.

Dredge Area 3 and 4 – Grab from crane on barge:

- Duration is 2 days total
- Dredging in Area 3 and 4 is expected to be completed immediately before, and during the same weather window, as pipe laying operations and installation of the intake structure, respectively. For these activities, almost perfect sea conditions are required (swell of less than 0.2m and winds of less than 10 knots). Therefore, dredging of these two areas will be carried out under very calm seas and controlled environments.
- Area 3 comprises sand
- Area 4 comprises sand with fresh seagrass

Based on the above, no Water Quality Monitoring Plan is proposed for these works as per discussions with the EPA. This is because turbidity alarm triggers are not an effective regulatory measure for a short period of activity with limited means of mitigating turbidity and the inherent low risk of fine sand sediments.

Turbidity monitoring is only effective if there is potential for regular persistent source of fines in the water column that will have a sustained impact to the receiving environment and therefore turbidity monitoring would aid the decision process to pause works if turbidity increased. In this case there is little scope to pause works since barge works are confined to good weather window only and dredging would be over before any real effective stop works event could be implemented. Furthermore, a stop in works will result in lost opportunity to take advantage of a good weather window which puts increased risk of requiring barge pack up and return visit resulting in risk of needing re-dredging and increased anchor handling.

Dredge activity will be monitored visually for any unprecedented plume formation beyond the work area (i.e. >500m).

6.2.1 Emergency response measures

In the event that there is an uncontrolled release of sediment during excavation or placement at the temporary causeway, a silt curtain can be used to contain turbidity at the source. This is only effective under a set range of circumstances but should be actioned if possible, to reduce the total release of materials in the water column. This will be dependent on the tidal and swell conditions and safety of access/deployment.

6.2.2 Potential Acid Sulfate Soils (PASS) effecting Water Quality

Analysis results from the sediment sampling activity identified all samples were PASS. In consultation with the EPA, the potential for actual generation of acid is low given the high neutralising capacity of the alkaline marine environment. Secondly, acid generation is only possible for materials that are exposed to oxygen. Therefore, the only risk is with dredge areas 1 and 2 where dredge material is allowed to drain. Dredge areas 3 and 4 will only temporarily be exposed and immediately placed back underwater.

Based on discussions with the EPA, there are no specific mitigation measures required however it will be important to monitor water quality for pH fluctuations during causeway construction where dredge material is exhumed from the water and drained. If there are any sources of acid than there is expected to a minor influence within 1m of the causeway's water edge. Therefore to ensure that there are no adverse pH effects beyond the immediate causeway edge, crew will monitor at approximately 1m from the causeway at the operating chainage and compare with readings from distances of 5m and 50m perpendicular to the causeway alignment. Monitoring sites 50m acting as the control site and 1m expected to show minor pH changes if any.

pH readings between 5m and 50m distances should be identical and consistent with background conditions. Any lower pH readings at 1m (compared with 5 and 50m) should be reported to the EPA and management actions confirmed.

Testing frequency for the first 3 days of dredging operations will initially be every 2 hours during dredging works. If findings are within the specified acceptable parameters the frequency will revert to once daily during dredging operations.

Records will be collected in accordance with the form included in in Annexure 7.4. pH records to be provided to the EPA along with calibration certificates.

Bags of lime must be kept in storage for rapid response to treat dredge material where acid generation has been verified.

6.3 Air Quality (Dust and Odour) Management

Dust and odour management are low risk for this dredging activity. All dredge spoil will either be coarse material and/or be discharged in water preventing it from drying out and becoming an air-quality risk. Dredge Areas 1, 2 & 3, consist of rock and clean sands, which are not likely to generate any persistent odour; Dredge Area 4, which is likely to include sea grasses, will be discharged in water at 229m from the shore, and therefore is not an odour-risk activity.

6.4 Noise Management

Noise management risk is an important consideration for these works. Noisy activities will be limited to Monday to Saturday between 7 am to 7 pm. Construction activities on Sundays and Public Holidays will be compliant with the mandatory construction noise provisions of Part 6, Division 1 of the *Environment Protection (Noise) Policy 2007*.

The dredging contractor will take reasonable and practicable measures to minimise noise impacts to sensitive land users. Hours of operations, and/or methods, may be modified if necessary, based on complaints received directly or to the EPA. All public complaints will be logged onto the complaints register and reviewed on an as needed basis by the project team and with the EPA. Works may be put on HOLD if required and as negotiated with the EPA.

6.5 Waste and Litter Management

Waste and Litter management is a high risk to the environment. The project is split into two areas: Site compound and Dredge locations. Each area always requires waste management with litter avoidance practices to be maintained.

All waste oil, rags and other hydrocarbon impacted materials must be contained in watertight dry containers and disposed of appropriately.

6.5.1 Site compound

Housekeeping at the site compound must be maintained on a constant basis with the appropriate provision of waste and recycling bins, bunded waste oil storage and appropriate storage of parts and equipment.

6.5.2 Dredge location

The excavator, crane barge and support plant must be maintained on a constant basis with provision of a waste bin on each and regular inspection for litter and loose items such as rags and packaging. Any item that enters the water must be retrieved immediately using a support vessel, provided it is safe to do so.

6.6 Hazardous Material Storage / Use

6.6.1 Fuel handling

On site fuelling is limited to the excavator, crane and genset's on barge and are managed with a self-contained on deck fuel storage tank and trailer mounted self-bunded fuel transfer tank. Fuel transfer trailer will be stored up at the laydown / storage area (refer Figure.5).

Depending on the site layout and accessibility to trafficable areas with fuel tanker access, fuel delivery and filling of vessel tanks may present a spill risk to the environment. To ensure these risks are appropriately managed, the following measures are required as a minimum:

- Pre-start checks of plant and machinery
- General housekeeping, hazardous material storage and waste management
- Functional spill kits (including marine booms connected and ready)
- Fuelling procedures and checklists (Appendix 6.2)

Land based fuelling activities will be carried out away from the shoreline and accessed via a 4WD and trailer. Any fuel transfer will involve a temporary bund under any fuel transfer points.

Operators are required to follow the necessary checks and steps for every fuelling event to ensure there are no preventable risks to the environment. Operators must not accept any delivery of fuel if for any reason the condition of the equipment or fuelling area does not meet the requirements of the above checklists and procedures.

6.6.2 Spills of Dangerous Goods or Hazardous Materials

Pollution from activities associated with the storage, maintenance and bunkering of machinery and equipment and the handling use and storage of Dangerous Goods or Hazardous Materials. All contractor representatives using any Dangerous Goods or Hazardous Materials or carrying out any bunkering of plant, equipment or machinery must ensure storage and use of such materials is in accordance with EPA requirements for the immediate environment.

All contractors and visitors involved in such activities must be aware of the location and correct use of spill management equipment. Consult with the project personnel for further advice.

6.7 Flora and Fauna

As per Contract Clause 5.2.4.2(k), impact to native flora or fauna is to be avoided at all times. The Subcontractor must not destroy, remove or clear trees or shrubs from any lands used or occupied by the Subcontractor in the execution

of the Works without the prior approval of JHGO JV. Additionally, JHGO will be notified immediately if the presence of fauna on site is interfering with conduct of the works.

For works carried out within the marine environment, a Native Vegetation Clearance Report is in place that outlines the proposed clearance areas and species of marine plants impacted by the dredging works. Seagrass vegetation has been mapped and there is no lower-impact alternative for the seawater intake and brine disposal pipelines. This document can be provided separately if required by the EPA. Refer Section 4.5 for further detail.

All Contractors representatives must ensure materials are stored in such a way as to not disturb or potentially disturb native fauna by unloading plant/materials in designated areas. Bunting will be erected if required, and dredging will cease if there are any safety concerns for either the flora or fauna.

6.8 Marine Mammals

SA whale migration starts in May and finishes in October, with frequent sightings occurring between June and September. Operators must visually monitor for the presence of marine mammals around the site at all times (i.e. within 300m of the dredge locations) and look for any strange behaviour. Dolphins and seals are known to proactively enter close proximity of a working dredge and may take advantage of feeding opportunities. If any whales within 100m, or dolphins and seals are spotted within 50m, operator is cut power to any vessels / dredge equipment until mammals move outside observation zone.

Any incidents/hazards must be reported through the internal reporting system and toolbox records. All marine fauna sightings will be logged by the excavator operator/barge master, including behaviour, actions if required into a Marine Fauna logbook/sheet. Submit records and findings, if any, to Department for Environment and Water (DEW).

6.9 Biosecurity

Maritime Constructions employ the use of 'Biofouling Management Plans' (BMP) consistently when travelling to different project sites. These plans outline the nature and attributes of the project vessels and provides documentation and methodology of the cleaning and antifouling techniques used to prevent biofouling and biosecurity management.

BMP's are finalised before departure and are subject to change depending on actual project commencement date, vessel availability, scope change, mechanical etc.

Endorsement in writing from PIRSA to use the specified vessels, barges and equipment in the marine waters of Kangaroo Island with regards to biofouling and pest management is required prior to departure.

6.10 Items of Cultural & Aboriginal Heritage

The activity of dredging may uncover items of cultural significance. If at any time during the work, an Aboriginal site or a site containing items that could be associated with aboriginal occupation are uncovered, or any item or site of any cultural, archaeological or heritage significance is discovered or disturbed, work shall cease immediately, and the Site Supervisor will immediately notify SA Water Representative for advice (Aboriginal Heritage Act 1988).

As per SA Water Aboriginal Heritage Standard Operating Procedure (SOP), the SA Water Project Manager will notify the contractor when works can resume, a decision that will be made in partnership with the SA Water Environment, Land and Heritage Expertise (ELHE) Team.

6.11 Severe weather refuge

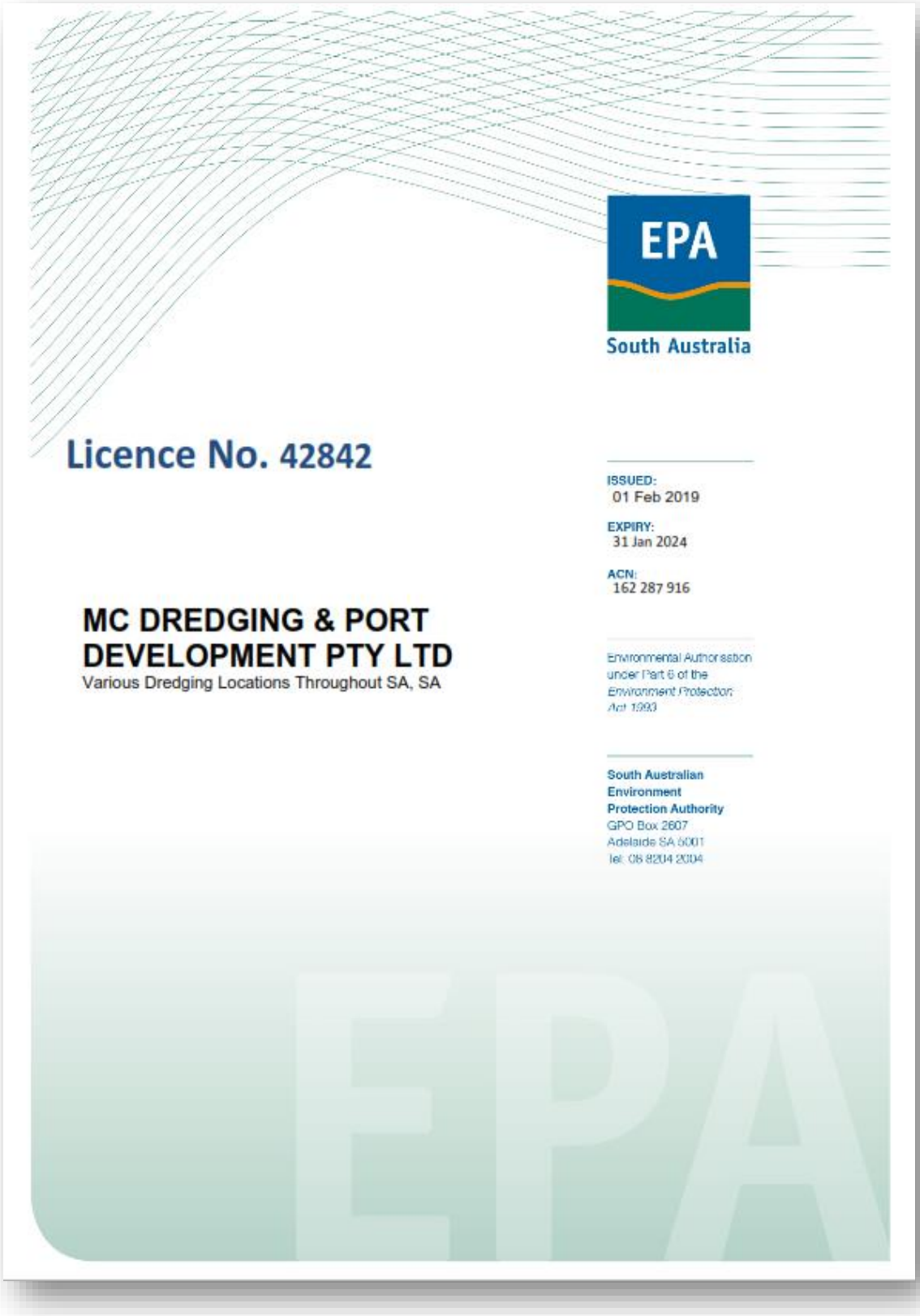
Marine works will only be possible during a good weather window and hence the weather will be monitored with crew and plant on standby daily until a suitable weather window emerges. Prior to works commencing, marine plant will either be located in Kingscote or Port Adelaide.

In the event of un-forecasted extreme weather, any marine plant at risk will seek refuge at American River located approximately 8 nautical miles from the construction site.

7 ANNEXURES

- [7.1] Site Specific EPA Dredge Licence No. (front page only)
- [7.2] Sediment Analysis Laboratory Report
- [7.3] Relevant checklists and procedures
- [7.4] Ph monitoring record during causeway construction

7.1 Site Specific EPA Dredge Licence No. (front page only)



EPA

South Australia

Licence No. 42842

ISSUED:
01 Feb 2019

EXPIRY:
31 Jan 2024

ACN:
162 287 916

MC DREDGING & PORT DEVELOPMENT PTY LTD

Various Dredging Locations Throughout SA, SA

Environmental Authorisation under Part 6 of the *Environment Protection Act 1993*

South Australian Environment Protection Authority
GPO Box 2607
Adelaide SA 5001
tel: 08 8204 2004

7.2 Sediment Analysis Laboratory Report

Provided separately to the EPA

7.3 Relevant Checklists and Procedures

7.3.1 Fuel Transport and Bunkering Checklist

The objective of this checklist is to ensure the Fuel Transportation and Bunkering Procedure is strictly adhered to so as to ensure the work is carried out safely & without causing any environmental hazard and is in line with the company's safe work procedure.

If you have NOT been TRAINED – DO NOT REFUEL – All refuelling must only be undertaken by employees who have been trained in the procedure.

This safety checklist is to be completed before the commencement of any bunkering operations.

REFUELLING MUST NOT BE CARRIED OUT IF ALL THE STEPS HAVE NOT BEEN COMPLETED.

Key Process to be followed – ENSURE A PRE TASK DISCUSSION HAS TAKEN PLACE PRIOR TO INITIATING REFUELLING		
Steps	**Set Up - Prior to filling**	**Done**
1.	Ensure vessel is moored at appropriate wharf location secured, allowed for tidal movements and positioned for ease of fuel removal.	☐
2.	Position orange cones and refuelling signs to isolate an area of approximately 50m radius around the site to protect the area from ignition sources.	☐
3.	Display red bunkering flag on the navigation mast to alert other vessels in the area that you are taking on board potentially explosive materials.	☐
4.	Shut down all engines that may generate a spark.	☐
5.	Isolate tanks being filled using shut off valve and notify all personnel of the intention to re-fuel.	☐
6.	Obtain and place a yellow plastic Jerry Can and overflow hose and connect to the quick connect fitting on the breather neck, ensuring the hose is inserted into the Jerry Can and can is stable.	☐
7.	Ensure there is a fully charged Fire Extinguisher and Fire Bucket is in easy reach as a precautionary measure.	☐
8.	Ensure a fully equipped or sealed Spill Kit is available within easily reachable area.	☐
9.	Dip the fuel tank and record the reading. This is important so as to inform the driver of the approximate quantity of fuel required.	☐
10.	Close all engine room doors, hatches and portholes.	☐
11.	In consultation with the truck driver, position the truck as close as possible to the vessel to enable the pumping of fuel safely and efficiently. The truck should be positioned to enable the hose to be tied off to the vessel, ensuring it remains out of the water.	☐

Commencing the Refuelling Operation		
12.	Deploy the filler hose from the tanker placing a rag/ plug over the end of the hose to contain any potential spills and restrain appropriately to ensure the hose does not enter the water.	☐
13.	Unclip the fuel filler cap and remove.	☐
14.	Remove the rag/plug and connect the hose to the quick connect fitting on the filler nozzle. A person must man the dispenser nozzle whilst re-fuelling at all times.	☐
15.	Instruct the driver to commence refuelling with the refuelling pump set at its lowest possible flow rate setting. This will reduce the air displacement and also reduce any fuel 'blow back' or potential for spillage as a result of pumping the fuel too fast.	☐
16.	Fill tanks with required amount of fuel (80% of tank capacity). If you are unsure of the individual tank capacity you must strictly observe the practise outlined in the next step. NEVER assume the fuel level, if you are unsure stop and verify with the dip stick.	☐
17.	During refuelling process, dip the fuel tank being filled at least twice to monitor and verify the fuel level rather than rely on the assumed litres pumped. *(visual clarification of the fuel level on the dip stick provides a far clear evaluation of the fuel level as opposed to the fuel gauge on the fuel truck)*	☐
18.	Once filled, remove hose and replace the rag/ plug and re-dip tanks according the fill level.	☐

19.	Replace cap on fuel filler pipe.	☐
20.	Repeat steps 5-16 for remaining tanks.	☐

Completing the Refuelling Operation		
21.	Once all tanks have been completed, remove hose from vessel and return to tanker ensuring hose does not contact water.	☐
22.	Obtain the cartage invoice from the driver.	☐
23.	Open all engine room doors, hatches and portholes and allow them to vent.	☐
24.	Pack up and store all re-fuelling equipment including signs and cones and store appropriately.	☐
25.	Remove the red bunkering flag from the mast and store.	☐
26.	Enter the engine room and inspect the bilges for any fuel that may be leaking. Also inspect the water for any sign of plume indicating fuel leakage	☐
27.	Re-configure the tanks ready for use.	☐
28.	Forward all appropriate paperwork to head office for processing.	☐

Vessel Name		Date of Refuel	
Location		Project Code	
Project / Site Supervisor			
Fuel Supplier		Litres Received	
Fuel Supplier Representative acknowledgement:			
I acknowledge that I am satisfied that the above steps have been undertaken to enable me to transfer fuel to the vessel / plant requiring refuelling:			

7.3.2 Safe Work Procedures

SAFE WORK PROCEDURE

MARITIME CONSTRUCTIONS

SPILLS AND LEAKS – CLEANUP PROCEDURES

SPECIAL INSTRUCTIONS:

1. Always review the Safety Data Sheet before undertaking any task involving hazardous substances and ensure a risk assessment is performed BEFORE use, taking particular note of the clean-up procedures and document this in your assessment.

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
1. Prevention and control of spills and leaks	Integrity of containers, etc	Packages and containers should be stored and handled in a manner which will not expose them to physical damage or falling, etc. Pipelines carrying liquids should be inspected regularly for evidence of leaks or damage, which should be rectified before serious leaks occur. Ensure that valves on pipelines are in operable condition and shut off flow. Provide means to drain pipelines into suitable receptacles if necessary. Keep supply of pipeline repair fittings and supplies to rectify leaks. Keep containers and drums of liquid closed securely during movement. Handle drums and containers carefully to prevent tipping and falling.	Ensure integrity of pallet racking. Do not overload pallet racking. Keep area around pipelines clear to allow access for inspection. Service valve glands regularly. Receptacles must be able to contain contents of pipeline. Do not transport or move open drums or containers.
2. Spill control procedures	Hazardous exposure	Areas likely to be adversely affected by spill or leak must be identified before hand, and evacuation procedures developed, and persons trained. Suitable spill control kits and materials must be obtained and made available in areas where substances are stored, handled or used. Key personnel in each area must be trained in spill control procedures. Suitable means of preventing entry of substances into sewers, drains and waterways must be provided at all likely entry points. Emergency services should be advised of potential spills or leaks, including possible environmental pollutants.	Conduct audit of premises to identify hazards and risk areas. Spill control kits must match the type and size of possible spill. Provide instruction in emergency procedures and use of PPE. Provide suitable drain covers and bunding materials. Provide manifest of substances.
3. Corrosives (acids, alkalis, hypochlorite's)	Exposure to corrosive substances	Procedures to remove persons who may be affected to a safe place must be provided where a spill or leak could result in a risk to health and safety. Train all persons in the implementation of emergency procedures. Clearly display emergency services contacts in areas where an emergency could arise. Emergency shower and eye-wash facilities must be provided in areas where an exposure is likely to occur. Suitable first aid facilities should be readily available in case of exposure.	Provide alternative emergency assembly areas where the areas may be affected by wind-borne substance. Wear **eye, hand, body and respiratory protection** when dealing with spill or leak of corrosives materials.
4. Herbicides and pesticides	Environmental hazard	Keep quantity of spill absorbent material close to storage. Avoid breathing vapours, ventilate area, consider evacuation of others. Mop up spilt material and place into sealed containers for disposal.	Wear **eye and hand protection**. Wear **respiratory protection.** Wear **respirator** for larger spills.

SAFE WORK PROCEDURE

MARITIME CONSTRUCTIONS

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
		Dispose of spilt material at an approved chemical waste disposal facility. Do not allow spillage or residue to enter drains or watercourses.	Use rubber mats or similar items to prevent entry into drains.
5. Water-based paints and coatings	Environmental risk	All waste paint, cleaning materials, etc, must be properly labelled and disposed of at an approved chemical disposal facility. Contain spills, use absorbent mats or material to clean up, and prevent spillage entering drains or waterways. Ventilate area to remove paint fumes, prevent fumes entering other areas. Place waste in a properly labelled sealed container or drum for disposal.	Provide suitable containers for the disposal of waste substances. Wear **eye and hand protection**. **Respiratory protection** may be required for large spills.
6. Flammable and combustible liquids	Fire and explosion	Prevent further spill or leak if possible, and only if safe to do so. Eliminate all ignition sources from spill area, evacuate area if necessary. Prevent spill from entering drains and watercourses. If large spill, appropriate personal protective equipment will be required for persons entering area (persons must be specifically trained in procedures to follow in cases of spills of flammable liquids). Soak up spill if possible (Note – material used to soak up spill will also be highly flammable and must be handled as flammable material). Notify emergency services if threat to persons, property or the environment. Do not allow re-entry into area until area has been decontaminated.	Suitable **footwear** to be worn. **No smoking or ignition sources**. Use portable bund or sand bags. Wear **body protection** (gas suit), self-contained **breathing apparatus**. Wear **PVC gloves**, **apron**, and **respirator** fitted with appropriate gas filter. **Do not** dispose of as landfill.
7. Dry materials, powders	Dust; toxic dust	Cover spill with tarpaulin or other cover to prevent spread of dust by wind. Close windows to prevent entry of wind into spill area if indoors. Use suitable tools or implements to pick up material and place into bags. Contaminated material should be disposed of according to local regulations. Use industrial vacuum cleaner to clean up residual dust in spill zone.	**P1 dust mask or particulate filter must be worn.** Wear **eye and hand protection**. Avoid spilling dust in work area. Avoid inhaling dust.
8. Gas leak	Flammable gas Toxic gas	Shut off gas supply at cylinder or drum, or main shut off valve. Eliminate all ignition sources in area and downwind. Consider evacuation of area if leak cannot be fully shut down. Do not enter area unless appropriate respirator and PPE is worn. Shut off gas supply at cylinder or drum. Evacuate area and areas downwind which may be affected by spread of gas.	Wear **eye and hand protection.** Eliminate ignition sources. Advise emergency services. Wear **eye, hand and respiratory protection.** Advise emergency services.

PRECAUTIONS:
The following precautions are to be observed, and suitable safety and warning signs as indicated displayed in areas where these procedures are carried out.

Additional respiratory protection required for large spill or leak or leak of toxic gas or substance.

MARITIME CONSTRUCTIONS

SAFE WORK PROCEDURE

FUEL TRANSPORT AND BUNKERING

SPECIAL INSTRUCTIONS:

1. Quantities over 1,000 L of Class 3 petroleum products are subject to Dangerous Goods Transport requirements.
2. Marine Oil Spill Response can be contacted on 8348 9504
3. Environmental Protection Authority (EPA) can be contacted on 1800 623 445

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
1. Specification and Construction	Fall of persons, Movement of tank Pumps and hoses	Walkways and ladders should be constructed to allow safe access and movement on tanks- fall protection should be provided where a person could fall from a height of 2 meters or more. Electric pumps, if used, must be intrinsically safe type approved for handling flammable liquids, and must be fitted with remote emergency stop switches. Hoses and fittings must be of a design approved for use with fuels. Hoses must be kept dry and clean.	Tankers and tanks must be of an approved design and be registered to carry fuels. Check seals and clamps to ensure that hoses do not leak in use.
2. Transport	Fire Risk Spill	Do not convey fuel in passenger compartment of vehicle. Tanks for fuel transport must be secured and earthed to vehicle chassis. Fuel containers are to be secured from movement or accidental damage. Ensure company's "Emergency Response and Action Plan" is well understood by operators and emergency contact numbers are available in passenger compartment.	Ensure earth strap is attached. Label all containers clearly with the contents of the container. No smoking or ignition sources. Avoid carriage in enclosed vehicles (where possible). Suitable fire extinguisher must be carried in vehicle or vessel. Emergency PPE and spill kit must be carried with vehicle or vessel.
3. Handling	Inhalation of vapours, dry skin, dermatitis, irritation to eyes	Decanting of fuel must be carried out in a well-ventilated area. Avoid direct contact with petrol and fuels on skin. Avoid splashing of fuel and avoid getting fuel on eyes.	No smoking or ignition sources. Eliminate static electricity sources. Wear PVC gloves Wear eye protection at all times.
4. Bunkering	Fire risk, spill	**Bunkering work must be carried out in the following order:** 1. Ensure vessel is moored at appropriate wharf location secured, allowed for tidal movements and positioned for ease of fuel removal. 2. Position orange cones and refuelling signs to isolate an area of approximately 50m radius around the site to protect the area from ignition sources. 3. Display red bunkering flag on the navigation mast to alert other vessels in the area that you are taking on board potentially explosive materials.	No smoking or ignition sources. Eliminate static electricity sources. Wear PVC gloves. Wear eye protection at all times. Use high viz clothing at all times. A person must be assigned to monitor mooring lines to prevent the vessel hanging due to tide movement and extra weight from

SAFE WORK PROCEDURE

MARITIME CONSTRUCTIONS

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
		4. Shut down all engines that may generate a spark. 5. Isolate tanks being filled using shut off valve and notify all personnel of the intention to re-fuel. 6. Obtain and place a yellow plastic Jerry Can and overflow hose and connect to the quick connect fitting on the breather neck, ensuring the hose is inserted into the Jerry Can and can is stable inside a containment bund. 7. Ensure there is a fully charged Fire Extinguisher and Fire Bucket is in easy reach as a precautionary measure. 8. Ensure a fully equipped or sealed Spill Kit is available within easily reachable area. 9. Dip the fuel tank and record the reading. This is important so as to inform the driver of the approximate quantity of fuel required. 10. Close all engine room doors, hatches and portholes. 11. In consultation with the truck driver, position the truck as close as possible to the vessel to enable the pumping of fuel safely and efficiently. The truck should be positioned to enable the hose to be tied off to the vessel, ensuring it remains out of the water. 12. Deploy the filler hose from the tanker placing a rag/ plug over the end of the hose to contain any potential spills and restrain appropriately to ensure the hose does not enter the water. 13. Unclip the fuel filler cap and remove. 14. Remove the rag/plug and connect the hose to the quick connect fitting on the filler nozzle. A person must man the dispenser nozzle whilst re-fuelling at all times. 15. Fill tanks with required amount of fuel (typically 80% of tank capacity). Once filled, remove hose and replace the rag/ plug and re-dip tanks according the fill level. 16. Replace cap on fuel filler pipe. 17. Repeat steps 5-16 for remaining tanks. 18. Once all tanks have been completed, remove hose from vessel and return to tanker ensuring hose does not contact water. 19. Obtain the cartage invoice from the driver. 20. Open all engine room doors, hatches and portholes and allow them to vent. 21. Pack up and store all re-fuelling equipment including signs and cones and store appropriately.	fuel. A person must be assigned to monitor the fuel breather to prevent overfilling. Ensure truck is positioned and hose is fastened. Ensure fuel hose is positioned in a way that it does not come into contact with the water. Lower the fuel pumping rate gradually for the last 20% of desired fill quantity as an extra precautionary measure to avoid any chance of overflow. In event when the line of sight between the person manning the nozzle and the truck operator is obstructed, a third person must be deployed at a place visible to both of them to relay information between them. At the end of refuelling, the nozzle should have a rag around it to prevent fuel from leaking.

SAFE WORK PROCEDURE

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
		22. Remove the red bunkering flag from the mast and store. 23. Enter the engine room and inspect the bilges for any fuel that may be leaking. Also inspect the water for any sign of plume indicating fuel leakage. 24. Re-configure the tanks ready for use. 25. Forward all appropriate paperwork to head office for processing.	

PRECAUTIONS:
The following safety and warning signs as indicated displayed in areas where these procedures are carried out.

SAFE WORK PROCEDURE

MARITIME CONSTRUCTIONS

BUNKERING FUEL ANCHOR BARGE TO DREDGE

SPECIAL INSTRUCTIONS:

1. **As you use this Safe Work Procedure, please notify your Supervisor or Project Manager of any changes that you recommend. This will ensure this SWP is constantly reviewed. Please refer to Document Change Procedure MC-IMSPR01D**

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
Notify crew of intention to refuel.	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	The skippers on the Dredge and Anchor Barge are to inform all crew of the intention to refuel by means of VHF radio or verbal direct.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket.
Secure Anchor Barge to Dredge	Crush, MOB, pinching, rope burn	Pre plan the manoeuvre to come alongside the dredge – have all fenders in place so as to avoid steel to steel contact – have mooring lines ready.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket.
Delineate area	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	Delineate area with orange safety cones, set up danger refuelling signs, and make sure the dredge is flying the solid red (b) Bravo flag to indicate fuel bunkering.	Hi-viz work clothing, safety boots, safety glasses, gloves lifejacket.
Deploying fuel hose from Engine Compartment	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	Check dust cap in on the fuel hose nozzle - Pull out the hose and lay on Anchor Barge deck - do not allow hose to sit in the water, having hose in water will leave an oily plume. Check the condition of hose for tears / leaks. Have one Oil Only Poly Strong Needle punched Absorbent Pad on the deck to lay the nozzle on.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket, extinguisher
Connect over flow spill container to breather pipe on Dredge	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	Connect spill container to breather pipe with cam lock hose connection to catch diesel Fuel in the advent of an overflow or blow back.	Hi-viz work clothing, safety boots, safety glasses, gloves lifejacket.
Pre-dip tanks	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	Pre-dip fuel tanks so you are aware of the level and have an idea of how much fuel will be needed to bunker into each tank.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket, extinguisher

SAFE WORK PROCEDURE

MARITIME CONSTRUCTIONS

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
Fuel hose to fuel tank inlet pipe on Dredge	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	Place the fuel hose nozzle to the fuel tank inlet pipe. A Marine Spill Kit and foam fire extinguisher must be ready for immediate use in the event of a spillage. Contents of 240L Marine Spill Kit: 1 x 240 L yellow wheelie bin (clearly labeled "Marine Spill Response") 4 x 3 m x 125mm Absorbent Marine Booms, 2 x 5 ltr "K-Sorb" bio-degradable Floating Absorbent, 20 x Oil Only Poly Strong Needle punched Absorbent Pads, 5 x Waste bags & ties, 1 Security Lock Tag, 1 x full instructions and MSDS (on inside lid), 1 x Protective PVC Gloves and 1 x Clean-up implements set (broom, brush, scoop)	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket, extinguisher
Monitor refuel process	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	Monitor the refuelling process at all times. A crew member must always be in visual sight of the Anchor Barge and be able to communicate with the operator at all times.	Hi-viz work clothing, safety boots, safety glasses, protective PVC gloves, lifejacket, extinguisher
Engines	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	All engines onboard the Dredge **must** be shut down while refuelling is in progress.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket, extinguisher
Spill kit	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	Spill kit is to be on hand and ready to use.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket.
Fire protection	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	Foam Extinguisher on hand and ready to use in case of emergency.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket.
Smoking policy	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	No smoking or naked flames while refuelling is in progress.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket.
General Public	Fuel spill, fire, environmental impacts, personnel injury, hazards to	All general boating public must be kept well away at all times while refuelling. By using the tender vessel or work boat, guide the boating public away from Dredge and Anchor Barge.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket.

SAFE WORK PROCEDURE

MARITIME CONSTRUCTIONS

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
	general public		
Report		Report any spillage, problems etc. to the Supervisor immediately.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket.
Refuelling Complete	Fuel spill, fire, environmental impacts, personnel injury, hazards to general public	Take nozzle out of filler pipe. Place Oil Only Poly Strong Needle punched Absorbent Pad under the nozzle to catch any droplets, – replace dust cap. Take hose back onboard Anchor Barge and stow in Engine compartment. Put fire extinguisher back in bracket.	Hi-viz work clothing, safety boots, safety glasses, gloves, lifejacket.

PRECAUTIONS:
The following precautions are to be observed and suitable safety and warning signs as indicated displayed in areas where these procedures are carried out.

MARITIME CONSTRUCTIONS

SAFE WORK PROCEDURE

Marine Spill Control & Clean Up

Spills of oils, fuels and similar products can find their way into run-off ponds, collection dams, sumps and larger bodies of water when working over water. There are risks associated with mechanical plant and equipment failure's such as ruptured hydraulic oil hose, fuel spill during refuelling, coolant and other leaking systems. This can result in contamination of the water. It is important to deal with a spill as soon as possible, before further damage occurs. A spill can escape a confined area due to a wind change, the rise and fall of the tide, or simply by seepage.

The spill must be contained in an area that is suitable for the recovery and clean-up operation. Prevent the spill from entering drains, sewage systems, pipes and cable ducts to avoid risk of explosion or further contamination of the environment.

Spill kits are only to be used for genuine spill scenarios, NOT bilge, repair or maintenance works - these should be pre-planned and additional materials sourced. Keep spill kits in place for genuine emergencies.

SPECIAL INSTRUCTIONS:

1. Before attempting any spill clean-up, Identify the material and refer to SDS for safe handling, emergency response and disposal.
2. Ensure the area is safe to enter - Be aware of fumes and approach from upwind.
3. Ensure personal protection equipment is worn.
4. Attach safety lines to personnel if entering the water.

The eight steps of a spill control and clean-up are:

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
1. Alert	Lack of communicaton	Positive Communication with all key personnel Seek Assistance if necessary (Project Supervisor/ Project Manager / WHS Coordinator) and or Emergency Services (Call 000) if spill is unsafe or too large	Alert Supervision
2. Protect	Exposure to chemicals	Wearing gloves and goggles and stop the spill if safe to do so.	Safety Googles PVC Gloves
3. Safety	Fire and explosion	Turn off ignition and spark risks and take all safety precautions when dealing with flammable fluid spills	Isolate ignition sources
4. Deploy	Working over water Drowning Manual Handling injury Slips, Trips and Falls	Deploy Booms to contain spill. Always begin deployment 'downstream'. Booms should be clipped together (designed to overlap) before deployment and tied to vessel or shore with suitable marine rope once deployed.	Safety Googles PVC Gloves

SAFE WORK PROCEDURE

MARITIME CONSTRUCTIONS

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
		NB: Absorbent Marine Booms have a limited life span and are not intended for indefinite deployment or reuse.	
5. Apply	Working over water Drowning Manual Handling injury Slips, Trips and Falls	Apply absorbents inside the boom to cover the spill. Pull booms towards the shore / bank or vessel to concentrate the spill ready for applying the absorbents. **Use "Oil-Only" Floating Absorbent Pads** For SMALL SPILLS – meaning 'light sheen', good for covering a larger area with minor oil/fuel product on surface > - Deploy Absorbent Pads over the water once booms are deployed to absorb oil from the contained water area. Pads are "oil & fuel only" and will repel water. They can be wrung out and reused many times. Count pads to ensure all are retrieved. Collect pads with rake or pole once all contamination is removed. - Additional absorbents, oil skimmers or other equipment may be used to remove contained oil from water surface. **Use "K-SORB" Biodegradable Hydrophobic Fibres** For LARGER SPILLS – meaning 'thick sheens' with greater quantities of fuel/oil product on surface or equipment > - Break up fibres if necessary, into small particles, to increase surface area of absorbent (apply the product by hand, scoop or blower close to water surface to prevent waste) - Gently agitate K-Sorb over the spill area if possible to ensure all contamination is collected Skim K-Sorb from the water surface using a leaf rake or similar (K-Sorb will float for weeks, but avoid leaving K-Sorb on the water for prolonged periods)	Safety Googles PVC Gloves Ensure all spill response absorbents are reclaimed
6. Disposal	Working over water Drowning Manual Handling injury Slips, Trips and Falls	Collect all contaminated material and place into 'Waste Bags' and cable ties closed. With majority of product absorbed and contaminated material removed from the water surface into Waste Bags, it is a good practice to "Prop-Wash" the area to disperse any residual material. **Do not** use any dispersent products i.e. 'Comprox' Dispose of contaminated booms and absorbents in accordance with local EPA regulations. Ask supervisor if unsure. Keep failed equipment / parts (e.g. hydraulic hose) for investigative purposes in a safe storage / bunded area.	Safety Googles PVC Gloves Correct disposal of waste

SAFE WORK PROCEDURE

MARITIME CONSTRUCTIONS

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
7. Reporting event	Lack of communication	All spill events shall be reported immediately the Site Project Supervisor. **ONLY Supervisor / Manager to Report all marine spill events**. There is no minimum spill quantity for escalation of reporting events. 1. Immediately contact internal 'Marine Survey Administrator' • Ph: 0459 152 751 2. Contact: Flinders Ports - Outer Harbour Signal Station • Ph: 8248 3505 NB: Signal Station duty officer will contact DPTI – Marine Operations / Marine Safety 3. Contact: EPA • Free Call: 1800 623 445 • Ph: (08) 8204 2004 Refer to: SPR005-1 Incident Reporting and Investigation Procedure	Ensure Supervisor is notified immediately upon identifying a spill to water.
8. Restock	Missing supplies for a potential future incident	Request restock immediately Ensure replacement of stock is completed as soon as possible.	

PRECAUTIONS:
The following precautions are to be observed, and suitable safety and warning signs as indicated displayed in areas where these procedures are carried out.

Additional respiratory protection required for large spill or leak or leak of toxic gas or substance.

MARITIME CONSTRUCTIONS

SAFE WORK PROCEDURE

FUEL TRANSPORT & ON-SITE REFUELLING

SPECIAL INSTRUCTIONS:

1. Quantities over 1,000 L of Class 3 petroleum products are subject to Dangerous Goods Transport requirements.
2. C1 Combustible Liquids (e.g., diesel), and C2 Combustible Liquids (e.g., lubricants) are to be treated as Flammable Liquids for the purposes of placarding when the combined aggregate quantity of Combustible Liquids and Packaged dangerous goods Class 3 exceeds 1,000 L.
3. **As you use this Safe Work Procedure, please notify your Supervisor or Project Manager of any changes that you recommend. This will ensure this SWP is constantly reviewed. Please refer to Document Change Procedure MC-IMSPR01D.**

Task sequence	Identified hazards in task	Key processes to be followed	Precautions / PPE required
1. Specifications and construction	Standards Falls of persons Movement of tank Pumps and hoses	Tankers and tanks for the road transport of fuel must conform to AS 2809 – *Road tanker vehicles for dangerous goods*. Walkways and ladders should be constructed to allow safe access and movement on tanks – fall protection should be provided where a person could fall from a height of 2 metres or more. Removable tanks must be provided with a means of safely securing the tank to the vehicle. Electric pumps must be an intrinsically safe type approved for handling flammable liquids, and be fitted with remote emergency stop switches. Hoses and fittings must be of a design approved for use with fuels. Racks or containers should be provided to keep hoses clean and dry.	Tankers and tanks must be of an approved design and be registered to carry fuels. Tanks must have a current compliance plate attached. **Fuel must not be carried in other than approved tanks.** Emergency stops should be placed at operators and drivers positions. Check seals and clamps to ensure that hoses do not leak in use.
2. Transport	Fire risk Placarding of vehicles Emergency information	Tanks for fuel transport are to be secured and earthed to vehicle chassis. Ensure that containers are earthed to prevent static build up during transport. Do not convey fuel in passenger compartment of vehicles. Fuel containers are to be secured from movement or accidental damage. Adequate means of ventilation is to be provided (e.g., roof ventilator, grille vent, etc) for fuel carried in enclosed compartments. Vehicles carrying fuel in excess of the placarding quantity for the Class and Packing Group must carry the appropriate required placards and class labels. An Emergency Procedures Guide (EPG) for the products carried on the vehicle must be carried in the passenger compartment of the truck.	**Ensure earth strap is attached.** **Label all containers** clearly with the contents of the container. **No smoking or ignition sources**. Avoid carriage in enclosed vehicles where possible. Suitable **fire extinguisher** must be carried on vehicle. Emergency PPE and spill kit must be carried with placarded loads.
3. Handling	Inhalation of vapours Fire risk Dry skin, dermatitis Irritation to eyes	Decanting and mixing of fuel should be carried out in a well-ventilated area. Provide earthing straps to eliminate build up of static electricity. Avoid direct contact with petrol and fuels on skin. Avoid splashing of fuel, and avoid getting petrol or fuel in eyes.	**No smoking or ignition sources**. Eliminate static electricity sources. Wear **PVC gloves** and **apron**. Wear **eye protection** at all times.

SAFE WORK PROCEDURE

MARITIME CONSTRUCTIONS

4. On-site refuelling	Fire risk	Eliminate ignition sources in vicinity of refuelling operations. Switch off engines of plant and vehicles before commencing refuelling. Do not leave pump or fuel hose unattended during refuelling. Restrict entry to site to persons directly involved in refuelling operation. Do not overfill fuel tanks, and clean up spills or leaks immediately. Avoid contact with fuels and oils during refuelling.	**No smoking or ignition sources**. Wear **eye and hand protection.**
5. Spills and leaks	Fire and explosion risk Harmful contact Environmental risk	Eliminate all ignition sources –pumps, etc. Advise emergency services (Police, Fire Brigade) immediately giving details of type of emergency, exact location, any casualties, etc. Secure site and prevent entry of persons not involved in emergency. Consider evacuation of area if risk of fire or explosion is possible. Follow advice and instructions given by emergency response personnel. Avoid contact with skin and eyes, and remove contaminated clothing. Avoid inhalation of vapours, work upwind if possible, or use respirator. Prevent entry of fuels and oils into drains or waterways. Absorb spill with oil-sorb or pads, and place into sealable container. Dispose of waste at approved chemical waste disposal facility.	Notify emergency services immediately of any spill or leak which may present a risk to persons or property. **Consider personal safety. Attend to problem only if safe to do so.** Wear PPE commensurate with scale or type of leak or spill. Use mats over drains, and bund around area to contain spillage. Do not dispose of in landfill.
6. LPG refuelling	Placarding quantity Fire and explosion risk	Placarding quantity for LPG is 500 L water capacity of cylinders or tank. Ensure that all components are matched and in good working condition. Eliminate all ignition sources before commencing refuelling operation. Avoid contact with gas, and prevent contact with liquid. Shut off gas supply at tank immediately in case of leak in filling system. Do not overfill LPG fuel tank – fill only to 80% of capacity.	**No smoking or ignition sources** turn off engine, lights, radios, etc. Wear **eye and hand protection.** Replace caps over all LPG filling fittings to protect seals. **Do not overfill LPG fuel tanks.**
7. Placarding of vehicles	Tanks – Class 3 flammables	Vehicles transporting fuels must be fitted with Emergency Information Panels (EIPs) measuring 800mm x 600 mm on each side of the tank, which carry the following information – • The Proper Shipping Name of the product carried • The UN Number of the product • The HAZCHEM Code for the product • The relevant Class label(s) assigned to the product • The name and number of who to contact for information in an emergency, and the Emergency Services response number. The vehicle must also be fitted with Class labels 250mm square at the front and rear of the vehicle.	Placards and class labels must be displayed when the vehicle is transporting dangerous goods. Empty tanks, containers and packages are to be treated as full for the purposes of placarding unless they have been purged of all traces of the substance for which placarding was required. Vehicle fuel tanks do not form part of a placard load.

SAFE WORK PROCEDURE

PRECAUTIONS: The following precautions **MUST BE OBSERVED** and safety and warning signs as indicated displayed in areas and on vehicles where these procedures are carried out.	

7.4 pH monitoring record during causeway construction

Date	Time	Working Chainage	Sea Height & direction	Wind speed & direction	Temperature	Tide	pH @ 1m	pH @ 5m	pH @ 50m	Remarks (i.e. rain, fauna activity)

Decision step – If pH at 5m is different to 50m, report to Manager. 1m is expected to be slightly lower pH due to Acid Sulfate Soil.